Classification of the Vegetation of Point Reyes National Seashore Golden Gate National Recreation Area, Samuel P. Taylor, Mount Tamalpais, and Tomales State Parks, Marin, San Francisco, and San Mateo Counties, California

Association for Biodiversity Information
In Cooperation with The California Native Plant Society and
California Heritage Program
Wildlife and Habitat Data Analysis Branch
California Department of Fish and Game
1307 R Street, Room 202
Sacramento, CA 95814

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ABSTRACT:

The National Park Service (NPS), in conjunction with the Biological Resources Division (BRD) of 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 during the 1990's, thereby providing a baseline study for further analysis at the Regional or Service - wide level. The vegetation units of this map were determined through stereoscopic interpretation of aerial photographs supported by field sampling and ecological analysis. The vegetation boundaries were identified on the photographs by means of the photographic signatures and collateral information on slope, hydrology, geography, and vegetation in accordance with the Standardized National Vegetation Classification System (October 1995). The mapped vegetation reflects conditions that existed during the specific years and seasons that the aerial photographs were taken. Several sets of aerial photography were utilized for this project: 1) NOAA 1:24,000 March 1994 Natural Color Prints (Leaf Off) covering Point Reyes NS, the northern portion and southern coastal portions of Golden Gate NRA, and the western two thirds of Mt. Tamalpais State Park; 2) Pacific Aerial Survey 1:24,000 August 1995 Natural Color Prints (Leaf On) covering the southern portions of Golden Gate NRA and the San Francisco Watershed district; 3) Pacific Aerial Survey 1:24,000 November 1995 Natural Color Prints (Leaf Change) covering Samuel P. Taylor State Park and portions of the GGNRA; 4) 1:36,000 August 1991 Natural Color Prints (Leaf On) covering the eastern portion of Mt. Tamalpais State Park; 5) 1:12,000 August 1990 Natural Color Prints (Leaf On) covering Samuel P. Taylor State Park. (Supplemental data set - not interpreted off of); 6) 1:12,000 June 1993 Natural Color Prints (Leaf On) covering coastal portions of Mt. Tamalpais State Park (Supplemental data set - not interpreted off of); 7) Hammon - Jensen - Wallen 1:12,000 August 1996 CIR Prints and Diapositives (Leaf On) covering the Vision Fire Burn Area; 8) 1:12,000 April 1984 CIR Prints were provided to fill in small gaps in the Drakes Bay area; 9) Radman Aerial Surveys 1:12,000 April 1993 Natural Color Prints covering Angel Island; 10) Only the Black and White DOQQ (San Francisco NE) was available for Alcatraz Island. There is an inherent margin of error in the use of aerial photography for vegetation delineation and classification.

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VEGETATION SAMPLING AND CLASSIFICATION

INTRODUCTION

The U.S. Geological Survey and National Park Service formed a partnership in 1994 to map the vegetation of United States National Parks using NatureServe's National Vegetation Classification, the standard adopted for reporting vegetation information among federal agencies (Grossman *et al.* 1998). Goals of the projects include providing baseline ecological information to resource managers in the parks, putting these data into regional and national contexts, and providing opportunities for future inventory, monitoring, and research activities. Each park has a vegetation team that follows a standardized field sampling and vegetation classification protocol to document the various vegetation types found in that park, and conduct accuracy assessments of the aerial photo interpretations provided by the mapping team (USGS 1997). The final products consist of a digital and hardcopy vegetation map, descriptions of each vegetation type, a key to the types, and all related metadata files (original field forms, plot database, and accuracy assessment points). This report presents the work conducted at Point Reyes National Seashore, Golden Gate National Recreation Area, The San Francisco Municipal Water District Lands, and adjacent cooperating Mount Tamalpais, Tomales Bay, and Samuel P. Taylor State Park Units, conducted from 1997 to 2003.

BACKGROUND

The vegetation classification used in this report, the U.S. National Vegetation Classification (USNVC), has been developed by The Nature Conservancy and the Association for Biodiversity Information, in partnership with the network of Natural Heritage Programs. Additional support has come from federal agencies and the Ecological Society of America. A first edition of the classification has been released that provides a thorough introduction to the classification, its structure, and the list of vegetation units known from the United States, as of April 1997 (Grossman *et al.* 1998). Refinements to the classification occur in the process of application, leading to ongoing proposed revisions that are reviewed both locally and nationally.

Not all vegetation types are equally mappable at a certain scale. Coordination between the aerial photo interpreters and the vegetation classification team is needed to resolve the best way to map the types, whether directly at the association level, the higher classification levels, such as at the alliance, or as a mosaic or mapping unit. Thus, not all types described in this report are necessarily exhibited on the vegetation map.

STUDY AREA

Point Reyes National Seashore (PRNS) was established in September of 1962 and encompasses approximately 71,000 acres of diverse habitats, including grasslands, coastal scrub, broadleaved evergreen woodlands and coniferous forests. Within the general vicinity of the National Seashore there are a number of public and private land holdings that have also been interpreted and mapped for the project. These include the following areas:

- Privately owned land including portions of the town of Inverness, Olema, and Bolinas, land east of the Bear Valley Trail to Olema Creek, Audubon Canyon Ranch, and a narrow band along State Highway 1 north to Preston Point.
- Samuel P. Taylor State Park
- Tomales Bay State Park
- Stinson Beach

Areas in the general vicinity of Point Reyes National Seashore that were not part of the mapping effort include:

- The Marin Municipal Water District (Kent Lake Area)
- Portions of the towns of Bolinas, Inverness Park, Stinson Beach and Inverness
- Duxbury Reef Reserve and Point Reyes Headlands Reserve (below the mean high water)
- Farallon Islands National Marine Sanctuary

Golden Gate National Recreation Area (GGNRA), established in 1983, covers over 76,000 acres of land, including extensive stands of chaparral, coastal scrub, grasslands, broadleaved woodlands and old growth redwood forests. Within the general vicinity of the Golden Gate National Recreation Area there are a number of public and private land holdings that have been interpreted and mapped for the project. They include the following areas:

- Golden Gate National Recreation Area Proper
- Muir Woods National Monument
- Mount Tamalpais State Park
- Marin Headlands
- The Presidio of San Francisco
- Angel Island State Park (delineated, but only partially interpreted, no training data)
- Fort Funston
- Sweeny Ridge
- The San Francisco Municipal Water District Lands

Areas in the general vicinity of the Golden Gate National Recreation Area that were not part of the mapping effort include:

- Adjacent Mid Peninsula Regional Open Space lands
- Edgewood County Park
- Portions of Montara State Beach and San Pedro Valley County Park

Point Reyes National Seashore & Golden Gate National Recreation Area - General Description

Point Reyes National Seashore is located southwest of Tomales Bay on the western side of the San Andreas Fault Zone. East of the National Seashore, the Bolinas Ridge runs in a northwest to southeasterly direction with elevations averaging around 1500 feet. Within the park boundaries, the Inverness Ridge runs parallel to the Bolinas Ridge, just west of the towns of Inverness, Inverness Park, Point Reyes Station and Olema. Several peaks along the Inverness

Ridge (Mount Vision, Point Reyes Hill, Mount Wittenberg and Firtop) are around 1300 feet. West of the Inverness Ridge the land slopes gently towards the Point Reyes Beach, much of it occupied by pastoral lands. The northern ten percent of the Point Reyes Peninsula is occupied by a Tule Elk Reserve. It extends from approximately Pelican Point to the Tomales Bluff. Located south of Mount Vision and west of the Phillip Burton Wilderness Area, the Drakes Estero and Estero De Limantour form a substantial portion of the low areas within the park. The Limantour Spit forms a barrier to the Drakes Bay allowing for a small opening of several hundred feet on the western edge of the estuaries. The southern part of the National Seashore is primarily pastoral lands, Phillip Burton Wilderness Area, and steep cliffs just below the Point Reyes Lighthouse and the Sea Lion Overlook. The southeastern edge of the National Seashore beyond the Phillip Burton Wilderness Area adjoins the town of Bolinas. The Point Reyes Bird Observatory is located in this area just north of the U.S. Coast Guard facility.

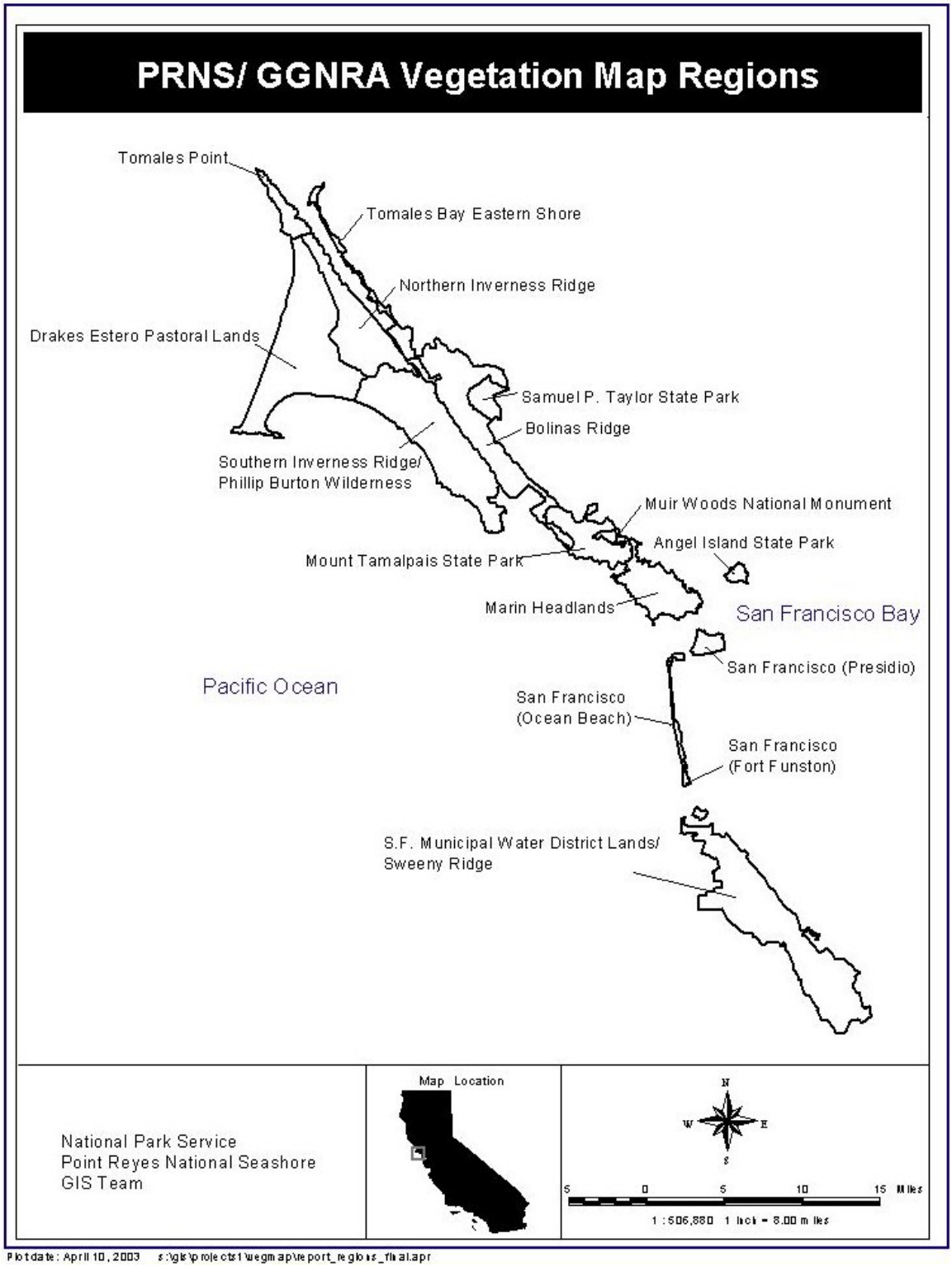
Golden Gate National Recreation Area is divided up into two general areas: the northern half administered by the National Park Service, and the southern portions administered by other public agencies. The northern portions lie just east of the San Andreas Fault Zone (the Olema Valley) and form a substantial portion of the Bolinas Ridge. Further south, but still within the administrative jurisdiction of the NPS is the Marin Headlands area, located south of the Muir Woods National Monument. South of the Golden Gate Bridge, GGNRA is made up of numerous small beaches including Ocean Beach, Lands End, China Beach and Baker Beach. Included in this portion of GGNRA is the Presidio of San Francisco north of California Street. South of Fort Funston, is the Sweeny Ridge, which contains the southern most portions of the GGNRA.

Point Reyes National Seashore - General Regions

For purposes of general mapping, descriptions and sample allocation, this portion of the study area was divided into seven mapping regions pertaining primarily to its geo - environmental location, vegetation communities and administrative status. See Figure 1, the seven regions of the study area are:

1. *The Northern Inverness Ridge*
2. *The Southern Inverness Ridge including most of the Phillip Burton Wilderness*
3. *The pastoral lands surrounding Drakes Estero*
4. *Samuel P. Taylor State Park*
5. *The interior portions of the study area adjacent to the eastern shores of Tomales Bay*
6. *Tomales Point*
7. *Golden Gate National Recreation Area north of Mt. Tamalpais State Park*

Figure 1 - Index Map to Regions



The following paragraphs briefly describe the vegetation and ecology for each of the seven zones:

The Northern Inverness Ridge
This area is located south of Pelican Point and includes Tomales Bay State Park, land west of the town of Inverness and south to approximately the Limantour Road. The southern extent of this zone is defined approximately by the southern most stands of bishop pine. Much of the area contains extensive stands of bishop pine (*Pinus muricata*), often with a mix of coast live oak (*Quercus agrifolia*) and madrone (*Arbutus menziesii*). This area was most affected by the Vision Fire in October of 1995.

The Southern Inverness Ridge
Occupying the majority of the Phillip Burton Wilderness area, this region is somewhat cooler and foggier and receives more rainfall than the northern portions of the Inverness Ridge. Much of the area is covered with stands of Douglas - fir (*Pseudotsuga menziesii*) that give way to various associations within the coyote brush alliance closer to the coast. The lower elevations contain extensive open stands of coyote brush (*Baccharis pilularis*) often with native grasses including California oatgrass (*Danthonia californica*) and purple needlegrass (*Nassella pulchra*). There are several natural lakes within this region, including Ocean Lake, Wildcat Lake and Pelican Lake.

The Pastoral Lands surrounding Drakes Estero
Much of this low lying region is dominated with several types of both native and non - native perennial grasslands as a result of the approximately half dozen working dairy and cattle ranches in the area. Several large estuaries are found within this region, including Abbotts Lagoon, Drakes Estero and Estero De Limantour. This area contains the most significant stands of Pacific Reedgrass alliance (*Calamagrostis nutkaensis*) in addition to non - native perennials such as velvetgrass (*Holcus lanatus*). Many of the swales in this region contain sedge - rush type meadows. Closer to the Point Reyes Beach, extensive stands of tufted hairgrass alliance (*Deschampsia cespitosa*) are found adjacent to the Sir Francis Drake Highway. Along the Point Reyes Beach proper much of the dune has been stabilized by the exotic European beach grass (*Ammophila arenaria*). Small stands of dune sagebrush (*Artemisia pycnocephala*) and goldenbush (*Ericameria ericoides*) occur on back dunes slightly inland from the European beach grass. Significant stands of yellow bush lupine (*Lupinus arboreus*) still remain near the Point Reyes Lighthouse.

Samuel P. Taylor State Park
Samuel P. Taylor State Park is bisected by the Sir Francis Drake Highway and Lagunitas Creek. Its southern boundary is the Marin Watershed and western edge is the Bolinas Crest. On the hills to the south and west of Lagunitas Creek (on north to east facing slopes), extensive stands of Douglas - fir alliance (*Pseudotsuga menziesii*) occur. Narrow corridors of coast redwood (*Sequoia sempervirens*) or mixes of Douglas - fir (*Pseudotsuga menziesii*) and coast redwood (*Sequoia sempervirens*) are found down slope in concave draws and riparian zones, especially along Lagunitas Creek. Extensive stands of California annual grasslands occur on west and south facing slopes north of the highway. Broadleaf woodland communities including stands of California Bay alliance *(Umbellularia californica)* with

lesser amounts of Coast Live Oak alliance (*Quercus agrifolia*) often extend up south facing drainages.

The Interior Portions of Study Area, Adjacent to the Eastern Shores Tomales Bay
This narrow band along California Highway 1 contains GGNRA land administered by the National Park Service. There are numerous private in - holdings along this corridor, which stretches from the Point Reyes Station to Preston Point. The dominant communities are California annual grasslands, although one area near Millerton contains a significant stand of California oat grass (*Danthonia californica*). Small stands of the invasive shrub gorse (*Ulex europaeus*) were noted just east of Preston Point on south facing slopes.

Tomales Point
Located north of the Historic Pierce Point Ranch and McClures Beach, this portion of the study area is occupied primarily by low rolling hills, steep cliffs and grasslands. Access is limited, and is restricted primarily to the Tomales Point Trail. The western portions of Tomales Point are dominated by perennial grasses including: velvetgrass *(Holcus lanatus),* non - native ryegrass *(Lolium sp.),* tall forbs including wild radish *(Raphanus sativa)* and small evergreen shrubs such as yellow bush lupine *(Lupinus arboreus).* Further east, on the bay side of Tomales Point, there are small stands of blue blossom *(Ceanothus thyrsiflorus),.* Small riparian areas that are fed by creeks draining into Tomales Bay support stands of arroyo willow *(Salix lasiolepis)* and red alder *(Alnus rubra).*

Golden Gate National Recreation Area North of Mt. Tamalpais State Park
This region contains the only significant stands of chaparral in the study north of Mount Tamalpais State Park. It is bounded on the west by the Olema Valley, and ends at the crest of the Bolinas Ridge. Portions of the ridge support mixed stands of coast redwood (*Sequoia sempervirens*) and Douglas - fir (*Pseudotsuga menziesii*). Upper slopes and ridge tops support a number of chaparral communities, including stands of sensitive manzanita (*Arctostaphylos nummularia*).

Golden Gate National Recreation Area - General Regions
For purposes of general mapping descriptions, this portion of the study area was divided into six mapping regions relating primarily to its geo - environmental location, vegetation communities and administrative status. See Figure 1, the six regions of the Study Area include:

1. *Mount Tamalpais State Park*
2. *Muir Woods National Monument*
3. *The Marin Headlands and Tennessee Valley Region*
4. *Angel Island*
5. *The San Francisco Area*
6. *Sweeney Ridge and the San Francisco Watershed*

Mount Tamalpais State Park
Mount Tamalpais State Park is located just north of Muir Beach and includes the coastal areas around Rocky Point. It continues to the northeast along a narrow corridor adjacent to

Ridgecrest Boulevard to the summit of Mt. Tamalpais. Its boundaries follow the Bolinas Ridge just north of the town of Stinson Beach. Much of the park contains extensive stands of California annual grasslands and chaparral, including several rare species of manzanita. The northern most extensive stands of coyote brush (*Baccharis pilularis*) - California sagebrush (*Artemisia californica*) are found on south facing slopes just east of Bolinas Lagoon.

Muir Woods National Monument
Muir Woods National Monument is completely surrounded by Mt. Tamalpais State Park and occupies the majority of the watershed for Redwood Creek. On lower north and east trending slopes, extensive stands of old - growth redwood and Douglas - fir forests still exist.

The Marin Headlands and Tennessee Valley Region
This region contains the actual Marin Headlands area north of Bonita Cove and the low hills and valleys including the Tennessee, Gerbode and Oakwood valleys. This zone contains some of the most extensive stands of purple needle grass in the study, in addition to other types of both native and non-native perennial grasses. Coastal access is limited for the most part to the Coyote Ridge, Coastal, and Tennessee Valley trails.

Angel Island State Park
Located in the San Francisco Bay just east of Sausalito, Angel Island State Park is predominantly broadleaf hardwood communities, both native and exotic. Much of the island is covered with a mix of live oak and bay, with non - native invasive stands of Monterey pine and blue gum (*Eucalyptus globulus*). Recent efforts have been successful in removing much of the eucalyptus from the island. Vegetation polygons were delineated, but not labeled for this portion of the study area. No field training data were available.

The San Francisco Area
This region includes the San Francisco Presidio, the beaches west of the city, Lands End and Fort Funston. Much of the area is covered with non - native species. However, there are several stands of coyote brush (*Baccharis pilularis*) mixed with lizard - tail (*Eriophyllum staechadifolium*). Several restoration efforts are ongoing in the Fort Funston area to re - introduce dune habitat that was previously invaded by stands of ice plant.

Sweeny Ridge and the San Francisco Municipal Water District lands
This is the largest and southern - most region in the GGNRA area of the study. The area contains certain communities, such as the Holly - leaved cherry alliance (*Prunus illicifolia*), and Eastwood manzanita alliance (*Arctostaphylos glandulosa*) that are more frequently found in the southern portion of the state. The region is extremely diverse and occupies an area just west of the Interstate 280 Freeway and generally east of Montara Mountain and Skyline Boulevard. Extensive stands of coast redwood (*Sequoia sempervirens*) with an understory of tanoak (*Lithocarpus densiflorus*) occur along Skyline Boulevard in the western edge of the study. Down - slope from Skyline Boulevard, in the canyons and ravines, Douglas - fir (*Pseudotsuga menziesii*) mixed with bay or bay and live oak can be found. At lower elevations, closer to the Crystal Springs Reservoirs on south facing slopes and ridgelines, extensive stands of chamise (*Adenostoma fasciculatum*) or mixes of chamise - Eastwood manzanita (*Arctostaphylos glandulosa*) occur.

METHODS

Planning

In general, the field methods used for developing the classification followed the methodology outlined by the NBS / NPS Vegetation Mapping Program (USGS 1994). Following is a presentation of the entire methodology as it applied to the PRNS / GGNRA mapping project.

PRNS / GGNRA is considered a large - sized mapping area (USGS 1994). It occurs within portions of four ecological subsections; Point Reyes (263Ak), Marin Hills and Valleys (263Al), San Francisco Peninsula (261Ai), and Santa Cruz Mountains (261Af) (Miles and Goudey 1997). A gradsect (Gillison and Brewer 1985) sampling approach was considered. However, due to the lack of availability of even scale GIS coverages of driving ecological variables during the outset of this project, such as soils, geology, topography, and climatic information, the gradsect approach used was opportunistic, based on expert opinion of the ecologists including Todd Keeler - Wolf (California Heritage Ecologist) and Michael Schindel (Oregon Heritage Program). This opportunism in site selection was based on knowledge of varying climate, geology and topography throughout the complex study area. The general protocol in site selection involved picking representative vegetation polygons of all types as they were represented in all parts of the study area. This selection was stratified based on what was considered to be accessible by the field crews.

A one - day meeting was held on October 24, 1996 to bring together project team members from the National Park Service, ESRI, TNC, and GGNRA. This meeting focused primarily on discussing the Vegetation Inventory and Mapping Program, existing park data, and specific interests and issues of the park.

During the meeting, imagery, basemaps, and other pertinent collateral materials were reviewed and evaluated. Included in this inventory were the following data:

- Fire management plots
- Earthwatch plots (450 total) conducted from 1990 - 1996
- Range management data
- Wildlife surveys and habitat monitoring efforts (Tule Elk, Monarch Butterfly and 180 points with vegetation data showing neotropical migratory bird point - count sites)
- Habitat restoration plots in alien species habitat
- Rare plant plots (300 sites total)
- Digital Ortho - photo Quads

At this meeting a preliminary classification derived from published information on California Vegetation (Sawyer & Keeler - Wolf, 1995) and on unpublished information based on local data, was presented. This classification was refined following the joint reconnaissance trips in March 1997 with the air photo interpreter team, NPS ecologists, and the vegetation classification team (Keeler - Wolf and Schindel).

This reconnaissance trip clarified both the nature of the classification units and their aerial photo signatures. A minimum mapping unit of 0.5 ha guided decisions about how to treat

various mapping units as complexes or mosaics. Based on the reconnaissance trip, the air photo interpreters attempted to identify all of the different aerial photo signatures that might correspond to the vegetation types. By April of 1997, mapping protocols (see mapping report) were sufficiently stabilized to permit the air photo interpreters to begin delineating polygons throughout the mapping area. Between April and June 1997 three shipments of preliminary line work were sent to the Heritage ecology classification team.

Sample Allocation
The classification team determined that in lieu of a formal GIS gradsect approach, the best approach was to divide up the mapping area into the 13 geographic regions (see above discussion). Due to time and budget constraints an average of three plots per vegetation type was proposed. The allocation was an iterative process. Several times throughout the field sampling period from June 1997 to September 1998 the Heritage ecologists took the aerial photographs delineated by the photo interpreters and select polygons based on the following underlying assumptions:

- Each vegetation type mapped by the photo interpretation team was to be selected from each of the thirteen geographic regions in which it occurred
- If different driving environmental variables existed in certain parts of the mapping area (for example ultramafic geology, or areas above the average summer fog belt), they were identified for sampling even if preliminary delineations by the air photo interpreters did not indicate distinctly different vegetation signatures
- Each selected polygon was chosen subjectively based on its accessibility (including land ownership, distance from roads or trails, terrain considerations)
- A sufficient number of polygons were selected each time to provide field crews working in GGNRA, Point Reyes, and Marin State Parks with alternate samples in case those originally chosen proved to be inaccessible
- Additional vegetation types were added to the preliminary classification based on feedback from field crews. These new types were added to the sample allocation.
- Based on feedback from the field crews on the detectability of vegetation types from aerial photos, some vegetation types were selected for sampling based on the growing body of field knowledge by the sampling crews. Thus, occurrences of those types that were not captured by the air photo selection process were targeted by the field crews based on their cumulative field experience

Selected polygons were marked using orange grease pencil on acetate copies of the linework overlaid and affixed onto contact prints of the aerial photographs. Sets of marked up photos were sent back to the field crews, who took the selected photos, or scanned copies of them out into the field to assure proper orientation. Regular communication between the NPS field crews and the heritage ecologists was assured by periodic meetings. The heritage ecologists provided a tracking system of number of plots sampled of each type versus number of plots still needed for each type to help focus the field teams on target types.

Plot Sampling
Plots data was collected using the California Native Plant Society Relevé Field Protocol (see CNPS website: www.cnps.org for complete methodology and field form). This methodology

meets and exceeds the minimum criteria for vegetation plot data needed to conform to the national vegetation classification. Plots were of variable size (generally 400 square m for scrub and herbaceous vegetation and 1000 square m for forests and woodlands) and shape. Plots were placed subjectively by the crews by selecting a representative portion of the stand and the each plot's location was recorded with GPS. Plots were not permanently marked. The following people participated as regular members of the vegetation sampling crews:

Point Reyes National Seashore:

- Shannon Klohr
- Leslie Allen
- Mishon Martin
- Mark Endries
- Mehrey Vaghti
- Pam van der Leeden

Golden Gate National Recreation Area:

- Lara Woods
- Sharron Farrell

Marin State Parks:

- Cynthia Roye

Field sampling was completed in fall 1998. A total of 366 plots were collected.

Archiving and Analysis of Data

The sampling began prior to the release of the TNC - NPS Plots database, so a separate database using Paradox software (version 5.0) was created by CNPS vegetation ecologist Bruce Bingham. All data was entered into a database developed specifically for this mapping project. Data was entered by staff at the GGNRA and by staff at the California Heritage Program in Sacramento. Data was quality controlled by Heritage ecologist and the assistant ecologist at the California Native Plant Society.

The analysis of plot data collected in 1997 - 1998 was undertaken using the PC - Ord software suite of ordination and classification tools (McCune and Mefford 1997). PC - Ord allows disparate types of data to be fed directly into classification programs such as TWINSPAN (Hill 1979) or Cluster Analysis (McCune and Mefford 1997), whether entered in various spreadsheet, database, or condensed formats.

Following the 1997 - 1998 sampling 360 vegetation plots were available for analysis. The classification analysis for all sampling data followed a standard process. First, all sample - by - species information was subjected to two basic TWINSPAN runs. The first was based on presence / absence of species with no additional cover data considered. This provided a general impression of the relationships between all the groups based solely on species membership. The second was based on the standard default run where cover values are converted to 5 different classes including:

- Class I Merely present - 2%
- Class II >2 - 5%
- Class III >5 - 10%
- Class IV >10 - 20% and
- Class V >20% cover

These cover values are reasonable for most vegetation. The first three cover classes compose the majority of the species values. This second run demonstrated the modifications cover values can make on the group memberships. Depending on the size of the data set the default runs were modified to show from 6 to 12 divisions (the largest data sets were subdivided more than the smaller data sets. A minimum group size of three was specified for all runs. The intent was to display the natural divisions at the finest level of classification (the association) rather than the alliance level.

Following each of these runs, consistent groupings were identified and compared. Following the identification of natural groups in TWINSPAN, Cluster Analysis using Ward's scaling method and Euclidean Distance (McCune and Mefford 1997) measure was employed for an agglomerative view of grouping as opposed to the divisive grouping in the TWINSPAN algorithm. Specifically, the TWINSPAN algorithm starts by using reciprocal averaging to divide up the species cover data starting with the most dissimilar plots and working to the most similar (thus considered a divisive technique). Whereas, Cluster Analysis uses predetermined linkage algorithms to start with plots that are most similar and progressing to show the sequence of coarser divisions between all of the plots (agglomeration). The congruence of groupings between TWINSPAN and Cluster Analysis was generally close. Disparities were resolved by reviewing the species composition of individual samples. Most of these uncertain plots either represented transitional forms of vegetation that could be though of as borderline misclassified plots, or outliers with no similar samples in the data set.

1. Because of the size of the data set initial TWINSPAN runs were made to help break the data into further finer levels which were in - turn re - analyzed using TWINSPAN and cluster analysis, this process is known as progressive fragmentation (Bridgewater 1989). The full data set was first analyzed together, and then broken into distinct subsets, and those individually analyzed. Subsets included riparian shrub and tree dominated plots, upland herbaceous plots, shrub - dominated plots, and non - riparian tree dominated plots.

2. Following cluster analysis and TWINSPAN analysis of all subsets of the primary new data set each plot was re - visited within the context of the cluster it had been assigned to in order to quantitatively define the membership rules for each alliance. These membership rules were defined by species constancy and species cover values and were translated into a preliminary plot - based classification.

3. The preliminary classification was tested in the field during the accuracy assessment of 1999 - 2000 and was refined into the key presented in this report.

This set of data collected throughout the mapping area was to be used as the principal means of defining the association composition throughout the mapping area. As a result careful scrutiny of the membership of each grouping defined had to be employed to establish membership rules for all existing plot data and set the standard for the definition of the associations defined as one of the products of this report.

In general the process followed these steps:

a. Run outlier analysis on data, including sub - sets, to determine most distantly related plots
b. Run presence - absence TWINSPAN to determine general arrangement of species along the gradient of axis 1 of DCA (both Reciprocal Averaging techniques of species - by - sample scores)
c. Run different permutations of TWINSPAN to see the general variation in arrangement of samples. These permutations were based on shifting the pseudospecies cut values using from 1 to 6 cut levels and from allowing the minimum group size to vary from 2 to 5. Samples generally held together well and main gradient did not vary
d. Settle on the final representative TWINSPAN run to use in the preliminary labeling
e. Preliminarily label alliance and association for each of the samples
f. Identify major break points (main divisions) in TWINSPAN of full data set and subject major subsets of data to individual TWINSPAN runs
g. Run cluster analysis (Ward's method) to test congruence with the subsetted TWINSPAN groupings
h. Developing decision rules for each association and alliance based on most conservative group membership possibilities based on review of species cover on a plot - by - plot basis
i. Use decision rules developed in the new data to assign vegetation names to all existing data.

Despite the strong influence of outlier plots (plots that did not fit neatly into analysis groupings) on the arrangement of the main body of vegetation data we chose not to remove them from the analysis. Although outliers were typically removed for additional analysis to clarify the main groupings of samples, they were considered as valid samples in the final enumeration and description of types. Because the sampling scheme tended to under - represent the rare types, based on their rare bio - environments, these relatively unique samples were considered important. They were often the only representatives of rare alliances defined from areas beyond the boundary of the study. In some cases they represented unusual species groupings here - to - fore un - described, and were viewed as affording perspective into unusual vegetation types that would deserve further sampling at some future date.

Description Writing

Following the analysis of the plot data and the development of the key and classification, descriptions were written using the currently available template provided by the Association

for Biodiversity Information (now NatureServe). Two primary writers were Michael Schindel (ABI Oregon Heritage program) and Sau San (California Native Plant Society). Todd Keeler - Wolf (California Heritage) also wrote several and edited all of the descriptions, including all of the alliance level descriptions. These alliance level descriptions were reformatted and quality controlled by Karen Converse of the California Department of Fish and Game. Authors of the individual descriptions are indicated by the names of the formally described associations in the vegetation classification.

Accuracy Assessment (AA)

Following the plot sampling, analysis and development of the key ecologists and air photo interpreters convened to discuss the allocation of accuracy assessment points. Our discussion focused on the estimation of accuracy by the photo interpreters for each of the mapped types. Based on the photo interpreter's estimation of their accuracy (we asked to estimate their accuracy in intervals of 5%) The heritage ecologist arrived at a set of sample sizes for each of the types mapped.

The formula for the suggested sample size was calculated using the normal approximation from the binomial distribution based on Cochran (1977, Sampling Techniques, 3rd Edition (p. 75):

- $n = (t^2pq) / d^2$
- n = number of samples
- t = abscissa of a normal curve that cuts off an area of a (alpha)
- p = estimated variance, proportion correct
- q = 1 - p
- d = discrepancy.

For this sampling exercise, the following parameter were set for all classes: alpha = .05, t = 1.96, d = .15, p is estimated for each class in the table below, under the column Estimated Proportion correct.
For the first class, the number of samples, n, is calculated by:

- $n = (1.96^2 * .95 * .05) / .2^2$
- n = (3.8416 * 0.0475) / .04
- n = 4.5, or rounded up, 5 samples

In brief, the two primary considerations for selecting sample size are 1) the "p" level, a guess of how accurately we labeled a particular vegetation type in the mapping effort and 2) the "d," or margin of error in the estimate of how well we guessed the accuracy of a given vegetation type to be between the actual accuracy of the vegetation type (known as upper case "P") and the estimated accuracy (lower case "p" as described above). In general, as your certainty in the "p" value increases, the number of samples required for accuracy assessment goes down. As the allowable discrepancy ("d") between the actual accuracy ("P") of a mapping type and its predicted accuracy ("p") increases (e.g., you are more lenient about the margin of error) the fewer the samples required. These concepts are further discussed in texts such as Cochran (1977). In most cases we set the margin of error between the actual and predicted accuracy to

be 15% (a generally used estimate in AA). In some cases where there are not enough polygons of a certain type to make the calculated sample size we have dropped the margin of error to allow for fewer samples. In each case where we have done this we list the margin of error chosen if other than 15%. Included is a partial list of selected AA sample numbers for the first part of the vegetation map completed (Table 1). An additional selection was made for the rest of the park later in the year (Table 2).

Random Selection for Accuracy Assessment
Since only a portion of the approximately 11, 000 polygons could be field checked due to time and budget constraints, a random selection was desired, so that the results of the sample selected could be an indicator for map accuracy. The sample selection was constrained to public properties, and selected private properties for which access was granted.
The selection process proceeded as follows:

1) Select all polygons in the sample frame of properties accessible. Eighty percent of all polygons sampled where chosen to be within 300 meters of roads and trails.
2) Remove as candidates for selection any polygon that had been visited in the field.
3) For each class to be assessed, use a random number generation to select n polygons. A standard ArcView script is included to do this, it was modified to select a certain number, rather than percent. The random selection process is based on records, giving equal probability to both small and large polygons.
4) Centroids for polygons were downloaded into a GPS unit, and maps of selected polygon boundaries, and centroids were plotted over aerial photos to provide field crews a means to reconnoiter to the polygon, which was checked.
5) Centroids of all polygons were inspected in a GIS with a DOQQ backdrop. In cases where centroids did not fall in a representative portion of the polygon, the point was manually moved to a representative location within the polygon.

Approximately one - third of the accuracy assessment polygons were not provided by heritage ecologists due to time constraints, and were selected by NPS project leader. These were not formally stratified or randomly selected.

The accuracy assessment field data was collected by NPS staff under the leadership of Pam van der Leeden and Dave Schirokauer.

Table 1. List of Types Selected for the Initial AA of the First 12 Modules for PRNS June 16, 1999 and Summary of Accuracy Assessment Sample Sizes for the PRNS - GGNRA Vegetation Map: Second Installment November 3, 1999**.** For those vegetation types that have an insufficient number of polygons we are suggesting that as many polygons as possible be collected (noted below). Thus, although in this installment 784 samples are suggested, the actual number possible will be somewhat lower than this (~ 700).

Vegetation Type - AIS Estimated Accuracy - Total Polys in 12 Modules			**Suggested sample size**
67020 CA Annual Grassland with Native Component Mapping Unit Alliance			
	70%	314	36
47010 European Dunegrass Alliance			
	95%	84	9
47030 Introduced Perennial Grassland Mapping Unit Alliance			
	80%	83	28
51010 Saltgrass Alliance			

Vegetation Type	- AIS Estimated Accuracy - Total Polys in 12 Modules		Suggested sample size
	85%	60	22
52040	Tufted Hairgraqss Alliance		
	70%	31	13 (d = 25%)
52030	Rush Alliance		
	90%	259	16
46021	*Calamagrostis nutkaensis* / *Baccharis pilularis* Association		
	70%	37	13 (d = 25%)
46022	*Calamagrostis nutkaensis* / *Carex spp. / Juncus spp*. Association		
	70%	66	36
55020	Bulrush - Cattail - Spikerush Marsh Mapping Unit Alliance		
	90%	29	16
62060	Dune Sagewort - Goldenbush Complex Mapping Unit Alliance		
	80%	113	28
64030	Pickleweed Alliance		
	90%	?	16
56010	Cordgrass Alliance		
	80%	12	10 (d = 25%)
24056	*Baccharis pilularis* - *Nassella pulchra* Association		
	70%	41	36
24058	*Baccharis pilularis* - Native Grassland Component Association.		
	80%	131	28
24052	*Baccharis pilularis / Lupinus arboreus / Lupinus chamissonis* Association		
	70%	267	36
24063	*Baccharis pilularis / Carex obnupta / Juncus patens* Association		
	75%	103	33
24059	*Baccharis pilularis / Toxicodendron diversilobum* Association		
	85%	613	22
24066	*Baccharis pilularis / Corylus cornuta* Association		
	70%	12	visit all
24065	*Baccharis pilularis* - Non - native Grassland Mapping Unit Association		
	80%	15	10 (d =25%)
24064	*Baccharis pilularis* - *Rubus ursinus* - Weedy Association		
	75%	235	33
24053	*Baccharis pilularis / Polystichum munitum* Association		
	70%	32	13 (d = 25%)
24999	Gorse Alliance		
	90%	5	sample all
19010	Yellow Bush Lupine Alliance		
	80%	41	28
30050	Salmonberry Alliance		
	75%	15	12 (d = 25%)
20010	California Wax Myrtle Alliance		
	70%	44	13 (d= 25%)
03030	Bishop Pine Alliance		
	90%	51	16
02015	*Pseudotsuga menziesii / Umbellularia californica / Rhamnus californica* Association		
	85%	52	22
21480	Sensitive Manzanita Alliance		
	(90%)	NA	n=16
21110	Chamise Alliance		
	(90%)	NA	n=16
21140	*Adenostoma fasciculatum / Arctostaphylos glandulosa / Quercus wislizeni* Association.		
	(75%)	NA	n=33
21210	Eastwood Manzanita Alliance		

Vegetation Type	- AIS Estimated Accuracy - Total Polys in 12 Modules		Suggested sample size
	(70%)	NA	n=36
21250	Holly - leaf Cherry Alliance		
	(70%)	NA	n=33
21460	Coffeeberry Alliance		
	(80%)	NA	n=28
24057	*Baccharis pilularis - Avena barbata* Association		
	(75%)	NA	n=33
24051	*Baccharis pilularis - Toxicodendron / Monardella* Association		
	(75%)	NA	n=33
24080	California Sagebrush Alliance		
	(75%)	NA	n=33
30040	Poison Oak Alliance		
	(75%)	NA	n=33
20020	Blueblossom Alliance		
	(75%)	NA	n=33
30010	Hazel Alliance		
	(85%)	NA	n=22
01090	Giant Chinquapin Alliance		
	(85%)	NA	n=22
01070	Tanoak Alliance		
	(80%)	NA	n=28
01012	*Umbellularia californica* / *Polystichum munitum* Association		
	(70%)	NA	n=36
01014	Umbellularia californica / *Quercus agrifolia* / *Toxicodendron diversilobum* Association		
	(70%)	NA	n=36
01030	Eucalyptus Alliance		
	(90%)	NA	n=16
12021	*Quercus agrifolia - Umbellularia californica* Association		
	(80%)	NA	n=28
02010	Douglas - fir Alliance		
	(90%)	NA	n=16
02011	P*seudotsuga menziesii / Umbelullaria californica / Polystichum munitum* Association		
	(90%)	NA	n=16
02015	P*seudotsuga menziesii / Umbellularia californica* / *Rhamnus californica* Association		
	(90%)	NA	n=16
02020	P*seudotsuga menziesii / Lithocarpus densiflorus / Rhamnus californica* Association		
	(70%)	NA	n=33
02013	P*seudotsuga menziesii / Quercus agrifolia* Association		
	(80%)	NA	n= 28
19000	California Buckeye Alliance		
	(70%)	NA	n=36
32080	Arroyo Willow Alliance		
	(70%)	NA	n=36
07060	Mixed Willow Mapping Unit Alliance		
	(70%)	NA	n=36
07071	*Alnus rubra / Rubus spectabilis - Sambucus racemosa* Association		
	(70%)	NA	n=36
07072	*Alnus rubra* / *Salix lasiolepis* Association		
	(70%)	NA	n=36
		Total	1,347

RESULTS

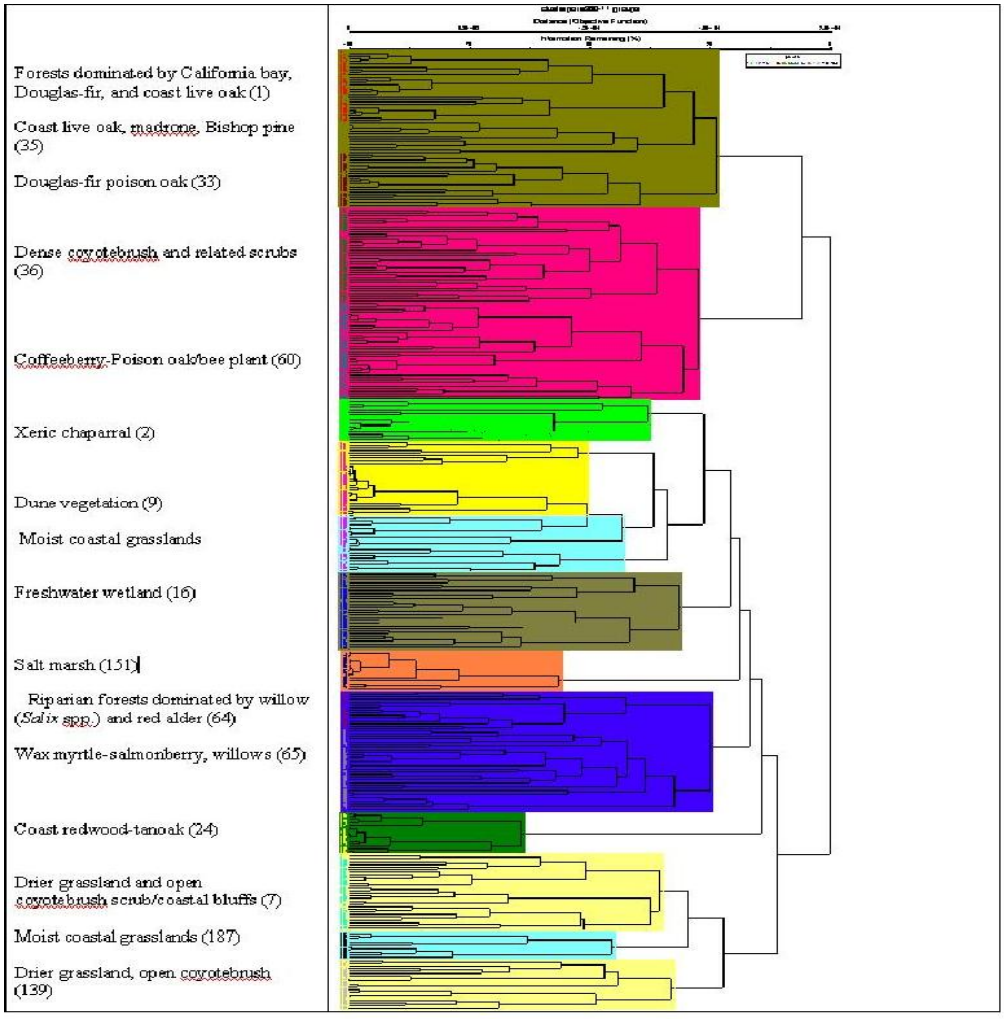
Community Types (plant associations)

A total of 64 new vegetation associations were described in the course of this survey. An additional 17 variants were recognized because they contained structural or floristic patterns somewhat different from other stands in the type. However, there were insufficient samples taken to substantiate their validity as vegetation associations. Although not described, these variants are indicated in the vegetation key (where they are simply labeled as "plots" with their most dominant species used as a preliminary means for identification) . A total of 366 vegetation plots were collected and 1532 accuracy assessment points were taken.

Analysis of the vegetation plot data identified eleven main ecological groups or as we call them herein; "meso - clusters". The principle underlying the definition of these groups is organizing associations and plots based primarily on broadly shared ecological processes and vegetation, rather than primarily on the vegetation classification hierarchy alone. Such groupings provide a more ecological perspective on associations and alliances, emphasizing the shared geographic, site, and disturbance factors that shape vegetation patterns. These meso - clusters may be considered as broad vegetation types within a biogeographic region that share similar habitats (e.g., ecological processes, abiotic factors, and environmental gradients) and that have broadly similar species composition. These meso - clusters may be considered to be aggregations of vegetation sample plots that are broader than the standard National Vegetation Classification Alliance and Association definitions, but narrower, typically than the formation level in the National classification hierarchy. They are defined by floristic and environmental similarity and are conceptually similar to the "Ecological Groups" now being defined nationally by NatureServe (Don Faber - Langendoen, Editor. 2001 Plant communities of the Midwest; Classification in an ecological context show web address). These meso - clusters were determined by analyzing the TWINSPAN and cluster analysis diagrams of the vegetation plots (see figure 1). Because these groups were typically defined by the mid - level breaks in TWINSPAN and Cluster Analysis algorithms, we call them "meso - clusters" indicating their mid - level position in the numerical classification of the plots. The eleven meso - clusters are presented below. They are ordered below as they appeared from left to right on the first ordination axis selected in the final representative TWINSPAN run.

- Freshwater wetland herb,
- Dune vegetation,
- Moist coastal grasslands,
- Drier grassland and open coyotebrush scrub,
- Dense coyotebrush and related scrubs,
- Forests dominated by California bay, Douglas - fir, and coast live oak,
- Forests dominated by tanoak and Coast redwood,
- Riparian forests dominated by willow (*Salix* spp.) and red alder,
- Bishop pine forest and mesic chaparral (including chinquapin, sensitive manzanita, and blue - blossom Ceanothus),
- Xeric chaparral (including serpentine and non - serpentine types),
- Salt marsh.

Figure 1: Example of meso - clusters within a cluster analysis for the full data set of 366 plots. The different colored groupings are different meso - clusters defined in the Ward's method Euclidian distance cluster analysis (McCune and Mefford (1997). The coloring shows the extent of the meso - cluster and indicates where the break in the cluster linkages occur, which define the uniqueness and distinctiveness (judged from Euclidian Distance, a similarity measure) of each meso - cluster. Names on the left are generic labels for the 15 total groups of plots selected in this individual run of cluster analysis and the number in parentheses is the group name (defined by the first vegetation plot number in each group). These can be further aggregated up to the 11 final mesoclusters. Because the final meso - cluster groupings were derived from Twinspan analysis, which does not display well, this graphic does not show the final ordered arrangement defined in the report.



The difference between the standard national vegetation classification (NVCS), see following classification list, a floristic and physiognomic classification, and the true ecological relationships between the vegetation plots became clear as the analysis proceeded. The natural ecological groupings above, for example did not always have a one - to - one relationship between the middle and upper hierarchical units of the national classification and the ecological setting they occurred in. For example, the most extensive vegetation alliance, the coyotebrush (*Baccharis pilularis*) alliance, had individual associations that occurred within dense coyotebrush and related scrubs, moist coastal grasslands, drier coastal grasslands, moist coastal grasslands, and dune vegetation. Vegetation alliances characterized by the dominance of shrubs did not always fall into meso - cluster groups that were shrub - dominated. For example, plots of the Hazel (*Corylus cornuta*) alliance were clustered within all plots that contained forests dominated by California bay, Douglas - fir, and coast live oak. These issues have bearing on the ability to assess the accuracy of the mapping.

Development of Fuzzy Logic" for Accuracy Assessment

As this was the first map produced using the new USGS and NatureServe specifications for vegetation mapping in National Parks done in California, this was taken to be an experiment in our ability to discern vegetation patterns at different levels of resolution in the national vegetation classification. The philosophy of this mapping effort was to strive for the most accurate and detailed photo - interpretation - based classification possible, with the understanding that there would likely be a need to "back - off" to lower levels of classification hierarchy for some of these mapping units, following an accuracy assessment. The rationale for developing different levels of "correctness" using the formal rules is to enable a standardized labeling process to meet requirements of accuracy for each of the mapping units. For example if we could not achieve a high level of accuracy at the alliance level we could map to the "superalliance" level for that particular mapping unit (see below for definition of these terms). If we still couldn't achieve an acceptable level of accuracy for the superalliance level we could back off further to the meso - cluster level, and if we still could not achieve an acceptable level of accuracy there, we could back off to the super - cluster level (see Appendix A for AA Confusion Matrixes and Scores).

Due to the high probability of year to year variation of vegetation, the relatively low resolution of the original aerial photographs, and the high physical similarity of many vegetation types within the mapping area, we suspected that a simple "yes" or "no" for accuracy would yield disappointing and unrealistic results. Many of the vegetation types are so physically similar that it takes a detailed field - based estimate of cover of the component species to determine if a type is a member of one association or another. Many of these associations and alliances are ecologically similar as well. Thus, the photo - identification of these look - a like and act - a like vegetation types would be expected to be relatively imprecise.

A common accuracy assessment procedure compares the label assigned to a polygon in the map (map label) with the label assigned to the same polygon using 'ground truthing' (evaluation sites). Using a traditional method, only one possible answer (considered to be the best answer by an 'expert' in the field) is compared to the map label. However, vegetation map classes do not always lend themselves to unambiguous measurements. While a map

label of *Pseudotsuga menziesii / Umbellularia californica / Polystichum* association may be considered absolutely correct for a particular site, a user might consider acceptable a map label of *Pseudotsuga menziesii* Alliance. An alternative method for evaluating map accuracy, and the one chosen for use in this assessment, is based on the use of fuzzy sets, first developed by Gopal and Woodcock (1994). The use of fuzzy sets to evaluate vegetation maps has now occurred on vegetation maps of the Stanislaus National Forest, (Woodcock and Gopal, 1992) the Modoc and Lassen National Forests (Milliken, et al 1997) the four southern California National Forests, (Franklin, et al. 1999), Suisun marsh (Keeler - Wolf et al. 2000) and others. With the fuzzy logic method of accuracy assessment, for each evaluation site, all map classes including the map label are assigned a ranking based on a linguistic scale as to their degree of match with the ground data. The linguistic scale, and corresponding numeric score, used in this assessment is shown below:

Fuzzy Logic Rules for PRNS - GGNRA Accuracy Assessment:

- 0 = completely wrong life form and very low ecological similarity
- 1 = same life - form (e.g., shrub, tree, or herb - grass), not ecologically related in cluster analysis
- 2 = same sub lifeform (e.g., tall wetland herb, short annual grass), but not necessarily ecologically related in cluster analysis) or could be different life form, but share diagnostic species or somewhat ecologically related (this level would be termed the “super - cluster” level of accuracy)
- 3 = same alliance or similar alliance within same meso - cluster in the quantitative analysis, but diagnostic species not shared for association (this is the meso - cluster level of accuracy)
- 4 = same alliance or similar alliance within same meso - cluster and diagnostic species shared, but doesn’t meet key definitions (this is called the “super - alliance” level of accuracy)
- 5 = perfect, meets key definitions for the vegetation type or mapping unit

Using the ground - collected data with a set of decision rules (described below in the key), a ranking of 0 to 5 was assigned to all map classes at each evaluation site. These rankings can then be used to measure: a) how frequently the map label was the best choice for the site; b) how frequently the map label was acceptable at diminishing levels of confidence. A complete cross walk matrix for all possible combinations of classification units with their associated score is shown in Appendix 1.

In order to determine the best possible means to apply the most accurate classification to individual mapping polygons in the study area, a flexible attribution logic based on the ecological similarities of the vegetation was developed. This method used the ecological relationships determined in the quantitative analysis and the fuzzy logic rules discussed above to develop a detailed set of relationships that would allow the most appropriate labeling of the mapping units based on their discernability and interpretation reliability.

We developed the following general ecological categories to have a regular and hierarchical set of categories for the levels of accuracy scoring from 2 to 4 in the fuzzy logic discussed above. The general terms we used were:

- Level 2 Supercluster
- Level 3 Mesocluster
- Level 4 Superalliance

Each of these ecologically related vegetation groupings were given names. Appendix A displays the detailed crosswalk between the coded mapping units, the three fuzzy logic vegetation groupings above and the vegetation classification hierarchy using the NVCS.

New Types of Vegetation

As this was one of the first systematic quantitative inventories of the plant communities of Central Coast of California, a very large percentage of the vegetation types identified are newly discovered. 51 of the 64 formally described associations and alliances have not been defined prior to this study (Sawyer and Keeler - Wolf 1995). These are being incorporated into the continuously revised state classification and are being fed into the National Vegetation Classification System.

DISCUSSION

Field survey methods resulted in a comprehensive survey of the vegetation at the alliance level. Following the use of the key for several months of accuracy assessment, only a few minor variants were found to not be included. Additional use of the classification for a California Native Plant Society "Alliance - a - thon" in May 1999 netted only a few new minor additions in the Point Reyes portion of the mapping area. The results of the opportunistic and iterative sample allocation proved to be quite effective, despite the lack of GIS coverages to drive the allocation, as has occurred in some other large National Parks such as Yosemite and Glacier. However, the associations described did not always fit our field plot species composition. A process where classification plots could be collected over a longer period and in an iterative manner (testing and re - testing the key and augmenting samples and modifying the key accordingly) would have produced more satisfying results in the long run. We suspect that closer to 500 plots of classification data would have been necessary to fully flesh - out the association level classification. The predetermined minimum sample size of 3 to make a new association definition used to strategize the number of plots we could afford to take in this study should have been increased to about 5.

Because the majority of the descriptions are based on the mapping area and not beyond, we have a difficult time determining the relationships of these new types and their range and conservation status. As noted in the following descriptions, the range, species composition and environment of these associations globally are impossible to currently define. In fact, it is very likely that with further investigation we will discover that some of the minor associations defined in this study will be subsumed into more broadly defined associations. Thus, as with all early classifications, these descriptions should be thought of as preliminary and subject to review following the collection of more data from similar vegetation elsewhere in coastal California.

Some of the more interesting results of this study included the definition of at least five new alliances:

- Coffeeberry (*Rhamnus californica*),
- California wax myrtle (*Morilla californica*),
- Sensitive Manzanita (*Arctostaphylos nummularia*),
- Hazel (*Corylus cornuta*),
- Slough sedge (*Carex obnupta*),
- Common rush (*Juncus effusus* var. *brunneus*)
- Mt. Tamalpais manzanita (*Arctostaphylos hookeri* var. *montana*) alliances.

A much clearer understanding of the ecological relationships between the dune scrub, coastal terrace prairie, coastal scrub, and coastal forest and woodland communities was developed as a result of this study. In particular the seral relationships between coastal grasslands and *Baccharis pilularis* alliance stands, their transition to more mature stands dominated by coffeeberry (*Rhamnus*), the invasion of coastal scrub by Douglas - fir, and the stability of chaparral and woodland / forest interfaces resulting from exposure and soil differences became evident. The role of *Baccharis pilularis* alliance and related "northern coastal scrub" alliances in the central and north coast ranges of California has been shown to be complex. Some stands are clearly long lived and are products of long and relatively disturbance - free periods (this includes the local representative associations of the coffeeberry, blueblossom, holly - leaved cherry, and poison - oak alliances). Others are clearly shorter - lived and more transitional to forests (*Pseudotsuga - Baccharis* association), herbaceous wetlands and moist grasslands (*Baccharis pilularis / Carex obnupta - Juncus patens* Association, *Baccharis pilularis / Danthonia californica* Association, *Baccharis pilularis / Deschampsia cespitosa* Association), or drier grasslands (*Baccharis pilularis /* Annual grass Association, *Baccharis pilularis / Nassella pulchra* Association, *Baccharis pilularis - Rubus ursinus* / weedy herb Association).

The study area contains some of the best remaining patches of native coastal grasslands and graminoids in the state. Yet, these too also have been shown to have a complex history. Some are clearly well adapted to repeated grazing and demonstrate increased shrub cover without these disturbances (including Juncus patens and Juncus effusus alliance stands, some stands of *Deschampsia cespitosa* Alliance, *Festuca rubra* alliance, *Danthonia californica* alliance, and *Nassella pulchra* alliance). Others are more long - persisting based on high levels of water or year - round coastal breezes and are less likely to transition to shrub or tree dominated vegetation (including stands of *Calamagrostis nutkaensis* alliance, *Carex obnupta* alliance, *Scirpus microcarpus* alliance)

Some of the most useful results of this study were the conclusions from the initial accuracy assessment. These enabled us to re - think the logic to the accuracy assessment and develop the concepts of the superalliance, mesocluster, and supercluster. We believe these techniques will be valuable for many additional vegetation mapping projects and will shed further light on the proper resolution to expect for mapping various types of vegetation throughout the United States and the world.

FINAL CLASSIFICATION OF THE VEGETATION OF POINT REYES NATIONAL SEASHORE, GOLDEN GATE NATIONAL RECREATION AREA, SAMUEL P. TAYLOR, MOUNT TAMALPAIS, AND TOMALES STATE PARKS, MARIN, SAN FRANCISCO, AND SAN MATEO COUNTIES, CALIFORNIA

Note: all 366 plots are assigned to either an association, alliance or other taxonomic level of the classification. Each type described in this project is classified here according to NVCS standard. Types not classified in the existing NVCS system have been assigned a location in the hierarchy are represented by a "?" at the end of their NVCS code. Classification codes are indicated where alliance is established, a "?" following the upper hierarchy prefixes indicates an undetermined alliance. Plots that are not currently assigned to an association are inserted into the most likely alliance.

I. CLASS: FOREST. TREES USUALLY OVER 5 M TALL WITH THEIR CROWNS INTERLOCKING (GENERALLY FORMING 60 - 100% COVER).

I.A. SUB - CLASS: EVERGREEN FOREST. EVERGREEN SPECIES GENERALLY CONTRIBUTE > 75% OF THE TOTAL TREE COVER.

I.A.6 GROUP: Winter - rain broad - leaved evergreen sclerophyllous forest

I.A.6.N.b Formation: Lowland or submontane winter - rain evergreen sclerophyllous forest

I.A.6.N.b.1 EUCALYPTUS SPP. FOREST ALLIANCE - pi code 01030
(EUCALYPTUS SPP. FOREST ALLIANCE)
Eucalyptus spp. - pi code 01030

I.A.6.N.b.? GIANT CHINQUAPIN ALLIANCE - pi code 01090
Chrysolepis chrysophylla / Vaccinium ovatum Association - pi code 01091

I.A.6.N.b.4 CALIFORNIA BAY ALLIANCE - pi code 01010
(UMBELLULARIA CALIFORNICA FOREST ALLIANCE)
Umbellularia californica - Lithocarpus densiflorus Association (Preliminary) - pi code 01011
Umbellularia californica / Polystichum munitum Association pi code - 01012
Umbellularia californica - Quercus chrysolepis Association - pi code 01013
Umbellularia californica - Quercus agrifolia / Toxicodendron diversilobum Association - pi code 01014

I.A.6.N.b? TANOAK ALLIANCE - pi code 01070

I.A.6.N.b? PACIFIC MADRONE ALLIANCE - pi code 12030

I.A.8.N.a Formation: Giant temperate or subpolar needle - leaved evergreen forest

I.A.8.N.a.1 COAST REDWOOD ALLIANCE - pi code 02050
(SEQUOIA SEMPERVIRENS FOREST ALLIANCE)
Sequoia sempervirens / Lithocarpus densiflorus / Vaccinium ovatum Association

- pi code 02051
Sequoia sempervirens - Pseudotsuga menziesii - Umbellularia californica Association - pi code 02052

I.A.8.N.a.8 DOUGLAS - FIR ALLIANCE - pi code 02010
(PSEUDOTSUGA MENZIESII GIANT FOREST ALLIANCE)
Pseudotsuga menziesii / californica / Polystichum munitum Association - pi code 02011
Pseudotsuga menziesii / Baccharis pilularis Association - pi code 02012
Pseudotsuga menziesii / Quercus agrifolia Association - pi code 02013
Pseudotsuga menziesii / Quercus chrysolepis Association - pi code 02014
Pseudotsuga menziesii / Umbellularia californica / Rhamnus californica Association - pi code 02015
Pseudotsuga menziesii / Lithocarpus densiflorus / Rhamnus californica Association - pi code 02020 (preliminary)

I.A.8.N.b Formation: Rounded - crowned temperate or subpolar needle - leaved evergreen forest

I.A.8.N.b.7 BISHOP PINE ALLIANCE - pi code 03030
(PINUS MURICATA FOREST ALLIANCE)
Pinus muricata - Arbutus menziesii / Vaccinium ovatum Association - pi code 03031

I.A.8.N.b.? MONTEREY PINE / MONTEREY CYPRESS ALLIANCE - pi code 03120

II.A.4.N.a.2 SAGENT CYPRESS ALLIANCE - pi code (preliminary)
(CUPRESSUS SARGENTII WOODLAND ALLIANCE)

I.B SUB - CLASS: DECIDUOUS FOREST. DECIDUOUS TREE SPECIES GENERALLY ` CONTRIBUTE >75% OF THE TOTAL TREE COVER.

I.B.2 GROUP: Cold - deciduous forest

I.B.2.N.a Formation: Lowland or submontane cold - deciduous forest

I.B.2.N.a.52 RED ALDER ALLIANCE - pi code 07070
(ALNUS RUBRA FOREST ALLIANCE)
Alnus rubra / Rubus spectabilis - Sambucus racemosa Association - pi code 07071
Alnus rubra / Salix lasiolepis Association - pi code 07072

I.B.2.N.e Formation: Seasonally flooded cold - deciduous forest

I.B.2.N.e.18 YELLOW WILLOW ALLIANCE - pi code 07030
(SALIX LUCIDA SEASONALLY FLOODED FOREST ALLIANCE)

II.B.2.N.b.8 BLACK WILLOW ALLIANCE - pi code 07040
(SALIX GOODDINGII TEMPORARILY FLOODED WOODLAND ALLIANCE)

II.B.2.N.b.14 RED WILLOW ALLIANCE - pi code 07050
(SALIX LAEVIGATA TEMPORARILY FLOODED WOODLAND ALLIANCE)

III.B.2.N.d.36? MIXED WILLOW ALLIANCE - pi code 07060
Salix lasiolepis - Salix lucida Association - pi code 07061
Salix lasiolepis - Salix Rubus Association - pi code 07062

II. SUBCLASS: WOODLAND: OPEN STANDS OF TREES USUALLY OVER 5 M TALL WITH CROWNS NOT USUALLY TOUCHING (GENERALLY FORMING 25 - 60% COVER)

II.A GROUP: Evergreen woodland

II.A.5.N.a Formation: Sclerophyllous extremely xeromorphic evergreen woodland

II.A.5.N.a.4 COAST LIVE OAK ALLIANCE - pi code 12020
(QUERCUS AGRIFOLIA WOODLAND ALLIANCE)
Quercus agrifolia (Arbutus menziesii) - Umbellularia californica Association - pi code12021 (preliminary)
Quercus agrifolia / Toxicodendron diversilobum (Corylus cornuta) Association - pi code 12022

II.B.2 GROUP: Deciduous woodland

II.B.2.N.a Formation: Cold - deciduous woodland

II.B.2.N.a.2 CALIFORNIA BUCKEYE ALLIANCE - pi code 14020
(AESCULUS CALIFORNICA WOODLAND ALLIANCE)

II.B.2.N.b . Formation: Temporarily flooded cold - deciduous woodland

II.B.2.N.b.14 RED WILLOW ALLIANCE - pi code 07050
(SALIX LAEVIGATA TEMPORARILY FLOODED WOODLAND ALLIANCE)

III. SUBCLASS: SHRUBLAND. SHRUBS OR TREES USUALLY 0.5 TO 5 M TALL WITH INDIVIDUALS OR CLUMPS NOT TOUCHING TO INTERLOCKING (GENERALLY FORMING >25% CANOPY COVER).

III.A. GROUP: EVERGREEN SHRUBLAND. EVERGREEN SPECIES GENERALLY CONTRIBUTE >75% OF THE TOTAL SHRUB AND / OR TREE COVER.

III.A.2.N.a . Formation: Temperate broad - leaved evergreen shrubland

III.A.2.N.a.2 YELLOWBUSH LUPINE ALLIANCE - pi code 19010
(LUPINUS ARBOREUS SHRUBLAND ALLIANCE)

III.A.2.N.c . Formation: Sclerophyllous temperate broad - leaved evergreen shrubland

III.A.2.N.c.? SENSITIVE MANZANITA ALLIANCE - pi code 21480
Arctostaphylos nummularia - Vaccinium ovatum - Chrysolepis chrysophylla Association - pi code 21481

III.A.2.N.c.4 EASTWOOD MANZANITA ALLIANCE - pi code 21210
(ARCTOSTAPHYLOS GLANDULOSA SHRUBLAND ALLIANCE)
Arctostaphylos glandulosa - Quercus wislizeni Association - pi code 21260

III.A.2.N.c.8 WOOLLY - LEAF MANZANITA (Arctostaphylos Tomentosa) ALLIANCE - pi code 21450

III.A.2.N.c.? MOUNT TAMALPAIS MANZANITA (*Arctostaphylos hookeri ssp. Montana*) ALLIANCE - pi code 21440
Arctostaphylos hookeri ssp. Montana Association - pi code 21440

III.A.2.N.c.? MIXED MANZANITA MAPPING UNIT - pi code 21470

III.A.2.N.c.25 LEATHER OAK ALLIANCE - pi code 21270
(QUERCUS DURATA SHRUBLAND ALLIANCE)
Quercus durata - Arctostaphylos glandulosa Association - pi code 21270

III.A.2.N.c ? HOLLY - LEAFED CHERRY ALLIANCE - pi code 21250
Baccharis pilularis / Prunus illicifolia Association - pi code 24067 (preliminary)

III.A.2.N.c.2 CHAMISE ALLIANCE - pi code 21110
(ADENOSTOMA FASCICULATUM SHRUBLAND ALLIANCE)
Adenostoma fasciculatum - Arctostaphylos glandulosa - Quercus wislizeni Association - pi code 21140
Adenostoma fasciculatum - Mimulus aurantiacus Association - pi code 21142

III.A.2.N.c ? CALIFORNIA COFFEEBERRY ALLIANCE - pi code 21460
Rhamnus californica - Baccharis pilularis / Scrophularia californica Association - pi code 21461

III.A.2.N.b Formation: Hemi - sclerophyllous temperate broad - leaved evergreen shrubland

III.A.2.N.b? CALIFORNIA WAX MYRTLE ALLIANCE - pi code 20010
Morilla californica Association - pi code 20010

III.A.2.N.b.1 BLUE BLOSSOM ALLIANCE - pi code 20020
(CEANOTHUS THYRSIFLORUS SHRUBLAND ALLIANCE)
Ceanothus thyrsiflorus s - Baccharis pilularis - Toxicodendron diversilobum Association
- pi code 20020
Ceanothus thyrsiflorus - Vaccinium ovatum - Rubus parviflorus Association - pi code 20020

III.A.4.N.a . Formation: Microphyllous evergreen shrubland

III.A.4.N.a ? GORSE ALLIANCE - pi code 24999
Ulex europaeus Association - pi code 24999

III.A.4.N.a ? MIXED BROOM ALLIANCE - pi code 24040

III.A.4.N.a.? COYOTEBRIUSH ALLIANCE (unable to key) - pi code 24099

III.A.4.N.a.24 MIXED COYOTEBRUSH ALLIANCE - pi code 24050
(BACCHARIS PILULARIS SHRUBLAND ALLIANCE)
Baccharis pilularis - Artemisia californica - Toxicodendron diversilobum / Monardella villosa Association - pi code 24051
Baccharis pilularis / Lupinus arboreus / Lupinus chamissonis Association - pi code 24052
Baccharis pilularis / Polystichum munitum Association - pi code 24053
Baccharis pilularis - Ceanothus thyrsiflorus Association - pi code 24054
Baccharis pilularis - Rhamnus californicus - Rubus parviflorus Association - pi code 24055
Baccharis pilularis / Nassella pulchra Association - pi code 24056
Baccharis pilularis / Annual Grassland Association (preliminary) - pi code 24057
Baccharis pilularis / Native Grassland Association (preliminary) - pi code 24058
Baccharis pilularis - Toxicodendron diversilobum Association - pi code 24059

Baccharis pilularis - Eriophyllum staechadifolium Association - pi code 24060
Baccharis pilularis / Danthonia californica Association - pi code 24061
Baccharis pilularis / Carex obnupta - Juncus patens Association - pi code 24063
Baccharis pilularis - Rubus ursinus / weedy Association - pi code 24064
Baccharis pilularis - Non - native Grassland Association - pi code 24065
Baccharis pilularis - Corylus cornuta Association (preliminary) - *pi code 24066*
Baccharis pilularis - Prunus illicifolia Association (preliminary) - pi code 24067
Baccharis pilularis / Deschampsia cespitosa Association - pi code 24068
Baccharis pilularis / Dudleya farinosa Association - pi code 24069
Baccharis pilularis - Holodiscus discolor Association - pi code 24070

III.A.4.N.a.3 CALIFORNIA SAGEBRUSH ALLIANCE - pi code 24080
(ARTEMISIA CALIFORNICA SHRUBLAND ALLIANCE)

III.A.4.N.a.10 DUNE LUPINE / GOLDENBUSH ALLIANCE - pi code 62063
(LUPINUS CHAMISSONIS - ERICAMERIA ERICOIDES SHRUBLAND ALLIANCE)
Lupinus chamissonis - Ericameria ericoides Association - pi code 62061

III.B. GROUP: DECIDUOUS SHRUBLAND. DECIDUOUS SPECIES GENERALLY CONTRIBUTE >75% OF THE TOTAL SHRUB AND / OR TREE COVER

III.B.2.N.a . Formation: Temperate cold - deciduous shrubland

III.B.2.N.a ? POISON OAK ALLIANCE - pi code 30040
Toxicodendron diversilobum - Baccharis pilularis - Rubus parviflorus Association - pi code 30041

III.B.2.N.a ? HAZEL ALLIANCE - pi code 30010
Corylus cornuta / Polystichum munitum Association - pi code 30011

III.B.2.N.c Formation: Intermittently flooded cold - deciduous shrubland

III.B.2.N.c.4 MEXICAN ELDERBERRY ALIANCE - pi code 30020
(SAMBUCUS MEXICANA INTERMITTENTLY FLOODED SHRUBLAND ALLIANCE)

III.B.2.N.d . Formation: Temporarily flooded cold - deciduous shrubland

III.B.2.N.d.36 ARROYO WILLOW ALLIANCE - pi code 32080
(SALIX LASIOLEPIS TEMPORARILY FLOODED SHRUBLAND ALLIANCE)
Salix lasiolepis - Salix lucida Association - pi code 07061
Salix lasiolepis / Rubus spp. Association - pi code 07062
Salix lasiolepis - Salix gooddingii - Cornus glabra - pi code 32080

III.B.2.N.d.? SALMONBERRY ALLIANCE - pi code 30050
Rubus spectabilis Association - pi code 30050

V. SUB - CLASS : HERBACEOUS VEGETATION. GRAMINOIDS AND / OR FORBS (INCLUDING FERNS) GENERALLY FORMING >10% COVER WITH WOODY COVER USUALLY <10%.

V.A. GROUP: PERENNIAL GRAMINOID VEGETATION. GRAMINOIDS OVER 1 M TALL WHEN INFLORESCENCES ARE FULLY DEVELOPED, GENERALLY CONTRIBUTING TO >50% OF TOTAL HERBACEOUS COVER

V.A.1.N.i Formation: Tidal tropical or subtropical grassland

V.A.1.N.i.100 SALTGRASS ALLIANCE - pi code 51010
(DISTICHLIS SPICATA TIDAL HERBACEOUS ALLIANCE)
Distichlis spicata - Frankinia salina - Jaumea carnosa Association
- pi code 51011

V.A.1.N.i ? CORDGRASS (Spartina foliosa) ALLIANCE - pi code 56010

V.A.5.N.a Formation: Tall sod temperate grassland

V.A.5.N.a.12 PACIFIC REEDGRASS ALLIANCE - pi code 45020
(CALAMAGROSTIS NUTKAENSIS HERBACEOUS ALLIANCE)
Calamagrostis nutkaensis - Baccharis pilularis Association - pi code 46021
Calamagrostis nutkaensis - Carex spp. - Juncus spp. Association - pi code 46022

V.A.5.N.c Formation: Medium - tall sod temperate or subpolar grassland

V.A.5.N.c.1 EUROPEAN DUNEGRASS ALLIANCE - pi code 47010
(AMMOPHILA ARENARIA HERBACEOUS ALLIANCE)
Ammophila arenaria - Cardioniema ramosissimum Association - pi code 47010

V.A.5.N.d Formation: Medium - tall bunch temperate or subpolar grassland

V.A.5.N.d.11 CALIFORNIA OATGRASS - pi code 67040
(DANTHONIA CALIFORNICA HERBACEOUS ALLIANCE)
Danthonia californica - Aira caryophyllea Association - pi code 67040

V.A.5.N.f Formation: Short bunch temperate or subpolar grassland

V.A.5.N.f.1 PURPLE NEEDLEGRASS ALLIANCE - pi code 67030
(NASSELLA PULCHRA HERBACEOUS ALLIANCE)
Nassella pulchra - Baccharis pilularis Association - pi code 67030

V.A.5.N.i Formation: Intermittently flooded temperate or subpolar grassland

V.A.5.N.i.6 RED FESCUE (*Festuca rubra*) ALLIANCE - pi code 52050
(FESTUCA RUBRA INTERMITTENTLY FLOODED HERBACEOUS ALLIANCE)

V.A.5.I.i.? INTRODUCED COASTAL GRASSLAND MAPPING UNIT
- pi code 47030

V.A.5.N.j Formation: Temporarily flooded temperate or subpolar grassland

V.A.5.N.j.? SMALL FRUITED BULRUSH (Scirpus microcarpus) ALLIANCE - pi code 52070
Scirpus microcarpus Association - pi code 52070

V.A.5.N.j.19 TUFTED HAIRGRASS ALLIANCE - pi code 52040
(DESCHAMPSIA CESPITOSA TEMPORARILY FLOODED HERBACEOUS ALLIANCE)
Deschampsia cespitosa - Horkelia marinensis Association - pi code 52040
Deschampsia cespitosa - Danthonia californica: Association - pi code 52040

V.A.5.N.k Formation: Seasonally flooded temperate or subpolar grassland

V.A.5.N.k.14 RUSH ALLIANCE - pi code 52030
(JUNCUS EFFUSUS SEASONALLY FLOODED HERBACEOUS ALLIANCE)
Juncus effusus var. *brunneus* Association - pi code 52030
Juncus patens Association - pi code 52031

V.A.5.N.k.33 BULRUSH - CATTAIL (*Scirpus californica* - *Typha latifolia*) ALLIANCE - pi code 55040
(TYPHA SPP. - (SCIRPUS SPP., JUNCUS SPP.) SEASONALLY FLOODED HERBACEOUS ALLIANCE)
Scirpus californicus - *Typha latifolia* Association - pi code 55040

V.A.5.N.k.? BULRUSH - CATTAIL - SPIKERUSH MAPPING UNIT - pi code 55020

V.A.5.N.n Formation: Tidal temperate or subpolar grassland

V.A.5.N.n.16 SLOUGH SEDGE ALLIANCE - pi code 52060
(CAREX OBNUPTA TIDAL HERBACEOUS ALLIANCE)
Carex obnupta - *Juncus patens* Association - pi code52061

V.A.5.N.n.402 SPIKERUSH ALLIANCE - pi code 55050
(ELEOCHARIS SPP. TIDAL HERBACEOUS ALLIANCE)

V.B. SUB - CLASS: PERENNIAL FORB VEGETATION. FORBS (INCLUDING FERNS) USUALLY >1 M TALL WHEN INFLORESCENCES FULLY DEVELOPED GENERALLY CONTRIBUTING TO >50% OF TOTAL HERBACEOUS COVER.

V.B.2 GROUP: Temperate or subpolar perennial forb vegetation

V.B.2.N.b Formation: Low temperate or subpolar perennial forb vegetation

V.B.2.N.b.3 DUNE SAGEWORT ALLIANCE (Dune Sagewort - pi code 62064
(AMBROSIA CHAMISSONIS HERBACEOUS ALLIANCE)
Artemisia pycnocephala - *Cardioniema ramosissimum* Association - pi code 62060

V.B.2.N.b. ? DUNE SAGEWORT / GOLDENBUSH COMPLEX MAPPING UNIT

V.B.2.N.b.9 ICEPLANT ALLIANCE - pi code 62040
(MESEMBRYANTHEMUM SPP. - CARPOBROTUS SPP. HERBACEOUS ALLIANCE)

V.B.2.N.b ? COAST BUCKWHEAT (*Eriogonum latifolium*) ALLIANCE (preliminary) - pi code 62050

V.B.2.N.g Formation: Tidal temperate perennial forb vegetation

V.B.2.N.g.4 PICKLEWEED ALLIANCE - pi code 64030
(SARCOCORNIA PERENNIS - (DISTICHLIS SPICATA, SALICORNIA SPP.)) TIDAL HERBACEOUS ALLIANCE)
Salicornia virginica - *Distichlis spicata* - *Jaumea carnosa* Association - pi code 64032

V.C. GROUP : Hydromorphic rooted vegetation. Non - emergent graminoids and forbs structurally supported by water and rooted in substrate (e.g. pond weeds and water lilies).

V.C.2.N.a . Formation: Permanently flooded temperate or subpolar hydromorphic rooted vegetation

Note: *Hydrocotyle umbellata* (small stands at Abbotts Lagoon, Ocean Lake, and other fresh water lakes) no plots, but other stands reported for north coastal California, should sample. No formal alliance and no description

V.D. Formation: Annual graminoid or forb vegetation. Graminoids or forbs usually <0.5 m tall when inflorescences are fully developed, generally contributing >50% of total herbaceous cover.

V.D.2.N.d.1 CALIFORNIA ANNUAL GRASSLAND MAPPING UNIT - pi code 67010
(BROMUS (DIANDRUS, HORDEACEUS, MADRITENSIS) HERBACEOUS ALLIANCE)
Brachypodium distachyon Association - pi code 67010
Raphanus sativus Association - pi code 67010

V.D.2.N.d. ? CALIFORNIA ANNUAL GRASSLAND WITH NATIVE COMPONENT MAPPING UNIT - pi code 67020

FINAL FIELD AND PHOTO - INTERPRETATION KEY TO THE VEGETATION ALLIANCES AND DEFINED ASSOCIATIONS FROM THE POINT REYES NATIONAL SEASHORE, GOLDEN GATE NATIONAL RECREATION AREA, SAN FRANCISCO MUNICIPAL WATER DISTRICT LANDS, AND MT. TAMALPAIS, TOMALES BAY, AND SAMUEL P. TAYLOR STATE PARKS

February 15, 2002 (Note: an updated version of this key will be provided by NPS staff)

Instructions for following key: This is not a strictly dichotomous key. Due to the diversity of vegetation in the mapping area, and in order to avoid an excessively long document, I did not develop a series of couplets for each option. Instead, I have identified a set of characteristics with choices beneath each of these. The key will first lead the user to the general options and the individual selections for the vegetation associations will be listed beneath these options. To arrive at the correct choice, simply work through the numbered list of types that lead you from the more general to the most specific options until the best fit is reached. Each key group is identified by an alphanumeric code. All associations defined herein are derived from analysis of the 366 full relevé plots that were collected for the mapping and classification project in the 1997 - 1998 field seasons. Types that don't key to association level may be candidates for new types. Replicate samples in multiple stands need to be taken to describe these new types.

The preliminary key will direct you to the major groups such as forest / woodland, shrubland, herbaceous with the more specific choice beneath them. The more specific lists within these are generally based on presence / absence or dominance / subordinance of significant species until you arrive at the optimum choice. Important: SINCE THERE MAY BE MORE THAN TWO ALTERNATIVES IN A GROUP, BE SURE TO WORK THROUGH ALL OF THE OPTIONS IN A LIST BEFORE YOU DECIDE WHAT IS THE BEST CHOICE FOR YOUR STAND.

DEFINITIONS:

Dominance: (dominated, also strongly dominated by) this term refers to the preponderance of the vegetation cover in a stand of uniform composition and site history. It may refer to cover of an individual plant (as in dominated by *Pseudotsuga menziesii*, or it may refer to dominance by a physiognomic type as in 'stand dominated by shrubs". In the strict sense, dominance refers to the relative cover of one species or physiognomic type as compared to another species or physiognomic type. Anything over 50% relative cover is said to dominate a stand (however, see **dominance by layer**, below). Those species or physiognomic types that do not strongly dominate (considered to be 60% or greater relative cover) are treated in alternate keys so that precise estimation is not necessary to arrive at the correct determination in the key

Co - dominance (Codominated): Co dominance refers to two or more species in a stand with near equal cover. In general, co - dominance can occur among species which have anywhere between 30 and 60% relative cover.

Dominance by Layer: In the National Vegetation Classification tree, shrub, sub - shrub, and herbaceous layers are considered physiognomically distinct. A vegetation type is considered to belong to a certain physiognomic group if it is "dominated" by one layer. Layers are prioritized in order of height. The tallest layer, if it meets a minimum absolute cover of 10% is said to dominate and the type is usually named in the alliance level of classification by the most characteristic species in that dominant layer. Thus, if a stand has 12% trees, 50% shrubs, and 40% herbaceous species, it is a tree type and "dominated" by trees, even though the understory layers have greater cover. In some cases the herbaceous layer is taller than the shrub layer. In those cases the tallest layer takes precedence as in *Calamagrostis nutkaensis / Baccharis pilularis*.

Importance: (important) a species is considered "important" in a stand or a vegetation type if it is greater than 1% absolute cover. This term is usually contrasted with "dominant" to mean that the species referenced is always present in the vegetation and always greater than 1% cover, but not always dominant (>50% relative cover)

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

Absolute cover: The actual percentage of the ground (surface of the plot or stand) that is covered by a species or group of species. As in: " *Baccharis pilularis* covers between 5 and 10% of the stand" Absolute cover of all species or groups if added in a stand or plot may total greater than 100% because it is not a proportional number.

Shrubs: a multi stemmed woody plant that is between 0.2 and 5 m tall. Definitions are blurred at the low and the high ends of the height scales. Small multi - stemmed trees approximately 4 - m tall and large woody herbaceous species less than 5 dm tall are individually treated in the keys and distinguished from shrubs individually in the key. Sub - shrubs are considered as multi - stemmed woody plants less than 0.5 m tall on average.

Sparse: generic term relating to low widely spaced cover of individuals of a species or a physiognomic group. Sparsely vegetated is defined as < 2% cover of vegetation , sparse canopy is < 10% (see emergent)

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

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

The structural and compositional features of a stand are often combined into a term called <u>homogeneity</u>. For an area of vegetated ground to meet the requirements of a stand, it must be homogeneous.

Emergent: a structural layer of vegetation that rises above the main canopy layer . It may be large trees over mid sized or short trees, or large shrubs over denser sub - shrubs or herbaceous layers. Generally emergents are less than 10% absolute cover

Early Seral: Defined as recent post - disturbance stand that is relatively rapid transition to more mature vegetation. As in Baccharis alliance stands recolonizing pasture or annual grassland. Several Baccharis associations are defined as early seral (*B. pilularis - Rubus ursinus, B. pilularis* / perennial non - native grass).

Woody plant: any species of plant that has noticeably woody stems. Does not include herbaceous species with woody underground portions such as tubers, roots, or rhizomes.

Forest: In the National Vegetation Classification a forest is defined as a tree - dominated stand of vegetation with 60% or greater cover of trees

Woodland: Likewise, a woodland has between 25 and 60% cover of trees

Character Species: A character species is one that shows a distinct maximum concentration (usually by presence and not necessarily by abundance) in a well-defined vegetation type. Character species usually define associations and are typically found in virtually all stands of a given vegetation association. A character species can define a type with less than 1% absolute cover when specified.

Species Fidelity: The naming conventions of vegetation associations generally dictate that character species are present in all major stands of a given vegetation type. However, there are some stands that do not maintain a full complement of all diagnostic species. In general, the last listed species in an association name is the most likely to be absent in such stands.

Vegetation Types With Parenthetical Species : Some vegetation types include species names in parentheses to indicate species that are usually present (>70% of the stands) but not always. An example is Oak - (Madrone) - Bay.

General Notes:

In general, certain species are weighted more heavily than others in determining a vegetation type. Common or weedy species are often discounted, such as *Rubus ursinus*, poison oak, and many herbs. This is the rule of constancy. These widespread and adaptable species are usually found in many vegetation types and are not characteristic of any. In general, these widespread species only define vegetation when other more restricted species are not present.

In general, trees and shrubs are considered dominant because of their height (apical dominance) and may define a type even with very low cover. They will almost always be considered to dominate where lower growing species have equal or higher cover. For example no *Baccharis* - Poison Oak association is defined as lacking the other species that define the Baccharis associations. Example: a plot with 25% cover Poison Oak and 7% cover swordfern would key to *Baccharis* - Swordfern. Only when *Baccharis* and Poison Oak are present in high cover without swordfern or other character species would the stand key to the *Baccharis* - Poison Oak association. Along the same lines, if there is a species with high cover but no type exists in the key, the plot can key to another species with high cover. Example: a plot with 35% cover *Heteromeles* and 30% *Pinus illicifolia* would key to *Prunus* since there is no *Heteromeles* type defined in the mapping area.

Estimating cover using percents rather than cover classes is preferable because the key makes fine distinctions by percent cover of species. It is important to collect cover data that includes species that are not dominant but whose presence may cause the community to key to another type. Character species can make or break a type even though they may be relatively low in cover. It is also extremely helpful to have covers estimated to percent when reviewing plots whose type does not match the type that is mapped.

Plots can key to formation when dominant species would fit with that formation even though that species is not mentioned in the current field key.

Key to Main Vegetation Divisions:

I. Vegetation dominated by non - woody herbaceous species including grasses, graminoids, and broad - leaved herbaceous species. Tall shrub species, if present, of lower absolute cover than herbs and grasses (<115% or cover class 3a or lower). Subshrubs, if present, may form significant cover (up to 50% absolute cover, or cover class 4 or lower), but never taller than dominant herbaceous vegetation. Trees, if present, compose <10 or cover class 3a or lower)% absolute cover: **= <u>Division A, Herbaceous Vegetation</u>**

II. Vegetation dominated by woody shrubs or sub - shrubs. Trees, if present, generally less than 10% (cover class 3a or lower)absolute cover in stand, herbaceous species may total higher cover than shrubs, but are shorter in stature. Shrubs are always at least 10% cover (cover class 3a or greater) = **<u>Division B, Shrub Vegetation</u>**

III. Vegetation dominated by trees (at least 5 m tall). Tree canopy may be as low as 10 (cover class 3a or greater) over denser sub - canopies of shrub and herbaceous species = **<u>Division C, Tree Vegetation</u>**

<u>Division A Herbaceous Vegetation:</u>

Group 1: Vegetation Dominated by Grasses or Grass - like species, lacking a significant overstory of trees or shrubs, but may have low shrubs or subshrubs present in significant amounts, but these generally no taller than the dominant grasses**: = I. Native and non - native grasslands**

IA. Upland grasslands generally away from the immediate coast and not associated with saturated soil throughout the growing season, shrubs generally less than 15% cover (cover class 3a or lower) or if more, subshrubs over - topped by the dominant grass species:

A1. Grasslands dominated by non - native annual grass species with no more than 15% relative cover of native perennial species present in any stand . Dominant species include *Hordeum murinum, Bromus* spp.*, Lolium multiflorum* , *Brachypodium distachyon,* and *Avena* spp. = ***Bromus diandrus - B. Hordeaceus - Hordeum* sp. Alliance (California Annual Grassland Alliance) (67010)**

A2. Upland Grasslands with at least 15% relative cover of native perennial grass species may include scattered shrubs (up to 10% absolute cover, or cover class 3a or less) of *Baccharis pilularis* and *Artemisia californica.* Dominant native species include *Nassella pulchra, N. lepida, Danthonia californica, Hordeum brachyantherum, Deschampsia cespitosa,* and *Melica californica.*
= California Annual Grasslands with Native Component (**67020**): This is a mapping unit and represents at least three alliances based on the presence of dominant species:

a. Purple Needlegrass (*Nassella pulchra*) Alliance This alliance has one association defined locally by a scattered shrub cover of generally 10% (cover class 3a or lower) or less of *Baccharis pilularis* with *Nassella pulchra* as the dominant native grass = *Nassella pulchra - Baccharis pilularis* Grassland Association (67030) Note if *Baccharis* is > 15% (cover class 3a or greater) this type would key to the *Baccharis / Nassella pulchra* association (see **IIA. Section of key**)

b. California Oatgrass (*Danthonia californica*) Alliance. This alliance is represented locally by one defined association = *Danthonia californica - Aira caryophyllea* Grassland Association (67040)

c. Tufted hairgrass (*Deschampsia cespitosa*) Alliance. Upland stands of this alliance occur without mesophytic species such as *Juncus* spp. And usually include a high proportion of non - native species. Association not defined. For mesic stands see section **IE. (52040)**

d. Pacific Reedgrass (*Calamagrostis nutkaensis*) Alliance. Upland stands may mix with non - native annual or perennial grass species and include low shrubs of *Baccharis pilularis.* The following association would key here: *C. nutkaensis - Baccharis pilularis* Association (46021) See also section IE.

A3. Upland grasslands dominated by non - native perennial grasses with less than 15% relative cover of native perennials or non - native annual grasses. The following species are typical dominants and may occur in mixed or mono - specific stands: Tall Fescue (*Festuca arundinacea*), Velvetgrass (*Holcus lanatus*), Harding grass (*Phaleris aquatica*) , Perennial Ryegrass (*Lolium perenne*) There were insufficient samples to further define associations.
= Introduced Perennial Grassland (**47030**)

IB. Grasslands or vegetation dominated by grass - like plants associated with permanently wet or saturated soil throughout the growing season

B1. Vegetation dominated by members of the Rush (Juncacea) or Sedge (Cyperaceae) families associated with moist swales, marsh edges, and other moist - to - wet freshwater habitats apart from standing water: May also include stands co - dominated by rushes, sedges and the Pacific reedgrass (*Calamagrostis nutkaensis*, see also section **IE.**)

a. Stands dominated by Slough Sedge (*Carex obnupta*): **= Slough Sedge (*Carex obnupta*) Alliance (52031** grouped to **52030**) represented in the mapping area by:
C. obnupta - Juncus spp Association (52061)

Other stands have been defined in the accuracy assessment plots that include a mixture of *Calamagrostis nutkaensis, Juncus* spp. and *S microcarpus*. These have not been formally defined yet.

b. stands dominated by Small - fruited bulrush (*Scirpus microcarpus*) **= Small - fruited Bulrush (*Scirpus microcarpus*) Alliance**: (like **52031** but coarser texture, grouped to **52030**). Stands have been defined in the accuracy assessment plots that include a mixture of *Calamagrostis nutkaensis, Juncus* spp. and *S microcarpus*. These have not been formally defined yet. No associations defined (52070)

c. stands dominated by *Juncus patens* and / or *Juncus effusus* (usually var. *brunneus*).
1. Stands dominated by *Juncus effusus.* However, several other species of *Juncus* or *Luzula* including: *Juncus bufonius, Juncus patens, Juncus lesueurii, J. phaeocephalus* , or *Luzula comosa* may be common. May include substantial cover of mesic weedy species such as *Erechtites minima* **= Common Rush (*Juncus* spp.) Alliance (52032, grouped to 52030)** represented in the mapping area by the following association individuated by dominant species:
Juncus effusus (var. brunneus) Herbaceous Wetland Association

2. Stands co - dominated by and *J. effusus* (also may include hybrids) = *Juncus patens - Juncus effusus* stands (informally defined during accuracy assessment

B2. Vegetation dominated by true grasses or co - dominated by grass and members of the Rush (Juncacea) or Sedge (Cyperaceae) families:

a. Pacific reedgrass (*Calamagrostis nutkaensis*) is the principal grass. (46020)

IC. Grass - like vegetation of fresh water marshes and other standing fresh water:

C1. Vegetation dominated by relatively tall (1 - 3m) emergent aquatic graminoids

a. Vegetation dominated by California Bulrush (*Scirpus californicus*) including other emergent aquatic species such as *Sparganium erectum* and *Oenanthe sarmentosa* (insufficient plot data to define associations) **= Bulrush (*Scirpus californicus*) Alliance (55030)**

b. Vegetation co - dominated (at least 30% relative cover of each) by Bulrush and Cattail (*Scirpus californicus - Typha latifolia*) **= Bulrush - Cattail (*Scirpus californicus - Typha latifolia*) Alliance (55040)** represented in mapping area by:
Scirpus californicus - Typha latifolia Association:

c. Vegetation strongly dominated by Cattail (*Typha latifolia*) [insufficient plot data to define associations]= **Cattail Alliance (55040 in part)**

C2. Vegetation dominated by short to mid - size (0.5 - 1m) emergent aquatic graminoids

a. Vegetation characterized by Spikerush (*Eleocharis* spp.) **= Spikerush (*Eleocharis* spp.) Alliance) (55020 in part)** [insufficient plot data to define association] the single sample in mapping area is co - dominated by
Eleocharis macrostachya and *Torreyochloa pallida*

ID. Grass - dominated vegetation of salt marshes and tidal flats:

D1. Stands usually dominated (> 50% relative cover) by saltgrass (*Distichlis spicata*), or if not dominant, saltgrass has higher cover than any other single species . Vegetation of upper salt marsh edges, dominated or co - dominated by Saltgrass (*Distichlis spicata*). May have other salt marsh species such as *Jaumea carnosa* in + - equal amounts **= Saltgrass (*Distichlis spicata*) Alliance (51010)** represented by one association in the map area:
Distichlis spicata - Frankinia salina - Jaumea carnosa Association (51011)

D2. Vegetation of lower salt marshes usually adjacent to mud flats and tidal channels, dominated by the rhizomatous cordgrass (*Spartina foliosa*) = **Cordgrass (*Spartina foliosa*) Alliance** (56010) represented locally by:
Spartina foliosa Association

IE. Perennial grasslands typically of coastal terraces and dunes, usually within two miles of the coast and below 500 ft. elevation:

E1. Grasslands of stabilized sand dunes along the immediate coast, dominated by the non - native European Dunegrass (*Ammophila arenaria*): **= European Dunegrass (*Ammophila arenaria*) Alliance (47010)** represented locally by:
Ammophila arenaria - Cardioniema ramosissimum Association

E2. Grasslands of coastal terraces, swales, and slopes dominated by single and multiple combinations of introduced perennial species including Tall Fescue (*Festuca arundinacea*), Velvetgrass (*Holcus lanatus*), Harding grass (*Phaleris aquatica*), and Perennial Ryegrass (*Lolium perenne*) = **Introduced Perennial Grassland** (**47030**)

E3. Low to medium height (<1m) bunch - grass grassland of moist terraces and coastal bluffs, especially on the Point Reyes Peninsula

a. Stands dominated by Tufted Hairgrass (*Deschampsia cespitosa*)**.** May have a significant proportion of subshrubby *Baccharis pilularis* (up to 20% cover, cover class 3b or lower), but this is no taller than the dominant grasses **= Tufted Hairgrass (*Deschampsia cespitosa*) Alliance** (**52040**) Note: *Deschampsia* alliance can be upland or lowland. Presence of mesic species such as rushes and sedges would indicate Tufted Hairgrass alliance as keyed in this section. Presence of exotic annual grasses would indicate upland, Annual grasslands with Native component, as keyed in section **IA.**

Most plots represent the following association:
D. cespitosa - Danthonia californica: Association

A less common type on sandier soils includes the rare Point Reyes *Horkelia* as an indicator and is:
D. cespitosa - Horkelia marinensis Association

b. Stands dominated by Red Fescue (*Festuca rubra*) **= Red Fescue (*Festuca rubra*) Alliance (52050**, similar visually to **52040**, but rarer, insufficient plots to define associations**)**

E4. Tall (0.75 - 1.5 m) bunch grass grassland of moist coastal bluffs, swales, and depressions dominated by Pacific Reedgrass (*Calamagrostis nutkaensis*). May have *Baccharis pilularis* up to 50% (cover class 4 or lower) cover ,but *C. nutkaensis* is taller and higher cover . See also Division II section IIA, A1, c Baccharis of moist slopes, swales, and edges of wetlands.
= Pacific Reedgrass (*Calamagrostis nutkaensis*) Alliance (**46020**) represented locally by the following associations defined by >1 (cover class 2 or greater) cover of listed character species:

C. nutkaensis - *Baccharis pilularis* Association (46021)

C. nutkaensis - *Carex* - *Juncus* Association [may have up to 10% (cover class 3a or lower) *Rubus spectabilis* and several species of *Juncus* and *Carex*] (46022)

Group II : Vegetation dominated by Annual or Perennial Forbs = II

IIA. Vegetation dominated by tall non - native annual forbs including species such as *Raphanus sativa,*
Carduus pycnocephala, Brassica nigra* and *Conium maculatum. May or may not have significant annual grass component
= **Tall forb - like weedy vegetation of the *Bromus diandrus* - *B. Hordeaceus* - *Hordeum* sp. Alliance (California Annual Grassland Alliance)**
(67010)

IIB. Vegetation dominated by perennial non - native Iceplant (*Carpobrotus edulis*), generally of coastal dunes, iceplant generally > 50% relative cover = **Iceplant (*Carpobrotus edulis*) Alliance (62040)**

IIC. Coastal dune and bluff vegetation dominated by perennial forbs that may be slightly woody at the base. Total cover is typically relatively low, with much open sand. Note these species may also be considered sub - shrubs and can be keyed in the shrub key, as well.

C1. Vegetation of coastal bluffs and sandy headlands dominated by
Coast Buckwheat (*Eriogonum latifolium*) = **Coast Buckwheat (*Eriogonum latifolium*) Alliance** (**62051** in part) [insufficient plot data for association definition].

C2. Vegetation typically of stabilized dunes dominated by Dune Sagewort (*Artemisia pycnocephala*) with several other herbaceous species such as *Abronia* spp., *Camissonia* spp. and *Frageria chiloensis* present. Iceplant, if present, <50% relative cover.
= Dune Sagewort (*Artemisia pycnocephala*) Alliance (**62052** also **62051** in part) represented locally by:
Artemisia pycnocephala - *Cardioniema ramosissimum* Association

IID. Vegetation dominated (at least 16%, or cover class 3b or greater, absolute cover over a sometimes higher cover of short annual or perennial grasses such as *Distichlis spicata*) by the native perennial salt marsh sub - shrubby or herbaceous Pickleweed (*Salicornia virginica*) = *Salicornia virginica* Alliance (64030)
represented locally by one association

Salicornia virginica - *Distichlis spicata* - *Jaumea carnosa* Association (64032)

Division B Shrub - Dominated Vegetation:

Group 1: Sclerophyllous Temperate Broad - Leaved Shrublands dominated by typical chaparral shrub genera including; manzanita, chamise, Ceanothus, and scrub oaks = I Chaparral Vegetation

IA. Vegetation dominated by the needle - leaved chaparral shrub, chamise (*Adenostoma fasciculatum*). Chamise is often mixed with other shrub species, but is always at least 60% cover relative to all other shrub species in a stand
= Chamise (*Adenostoma fasciculatum*) Alliance (**21100 and includes most 21140)** the following key to local associations is provided:

A1. Chamise is strongly dominant with at least 80% relative cover, no other large shrub species form significant cover, the low drought - deciduous shrub *Mimulus aurantiacus* is present. Known from sedimentary rocks on upper slopes and spurs of Bolinas Ridge = ***A. .fasciculatum - Mimulus aurantiacus* Association** (21142)

A2. Chamise dominates but shares canopy with other shrubs

a. Eastwood Manzanita (*Arctostaphylos glandulosa)* is one of the secondary shrubs in the stand:

1. *A. fasciculatum* and *Arctostaphylos glandulosa* are frequently mixed with shrub interior live oak (*Quercus wislizeni frutescens*) and other shrubs in minor cover **= A. *fasciculatum - Arctostaphylos glandulosa - (Quercus wislizeni)* Association** (**21140**)

2. *A. fasciculatum* and *Arctostaphylos glandulosa* are mixed with *Ceanothus jepsonii* and the endemic grass *Calamagrostis ophitidis*, among other species. Occurs on serpentine outcrops on Mt. Tamalpais **= *A. fasciculatum - Arctostaphylos glandulosa - Ceanothus jepsonii / Calamagrostis ophitidis* Association (21140** in part)

3. *A. fasciculatum* and *Arctostaphylos glandulosa* are mixed with Toyon (*Heteromeles arbutifolia*) and numerous other shrub species represented by a few plots in SFM Watershed and S units of GGNRA, chamise may only marginally dominate = **Undifferentiated mixed chamise - eastwood manzanita - toyon plots** (**21140** in part) (insufficient plots for association description)

b. Leather oak (*Quercus durata*) is the principal secondary shrub in the stand, occurs on serpentine outcrops on Mt. Tamalpais **= *Adenostoma fasciculatum - Quercus durata* type** (**21140** in part ; insufficient samples for definition of association)

c. Buckbrush (*Ceanothus cuneatus*) is the principal secondary shrub in the stand, = undifferentiated **chamise - buckbrush accuracy assessment plot** (**21140** in part ; insufficient samples for definition of association)

IB. Vegetation dominated by species of Manzanita (*Arctostaphylos* spp.)

B1. Chaparral strongly dominated by the Sensitive Manzanita (*A. nummularia* var. *sensitiva*), restricted to sedimentary outcrops adjacent to forest on Mt. Tamalpais and adjacent Bolinas Ridge **= Sensitive Manzanita (*A. nummularia*) Alliance (21480)**: most plots fall within one association:

A. nummularia - Vaccinium ovatum - Chrysolepis chrysophylla association (**, 21481**) one plot has *Pickeringia montana* and *Arctostaphylos glandulosa* as subordinate species

B2. Chaparral strongly dominated by Eastwood Manzanita (*Arctostaphylos glandulosa*) **=Eastwood Manzanita (*Arctostaphylos glandulosa*) Alliance**: most plots fall within one association characterized by the presence of shrub interior live oak (*Quercus wislizeni frutescens*):

Arctostaphylos glandulosa - Quercus wislizeni Association (21260)

B3. Chaparral dominated by the endemic Mt. Tamalpais manzanita (*Arctostaphylos hookeri* ssp. *montana*), occurs on serpentine outcrops and mixes with species similar to those found in the *A. fasciculatum - Arctostaphylos glandulosa - Ceanothus jepsonii / Calamagrostis ophitidis* Association

= Mount Tamalpais Manzanita Alliance: (n=2) (21440) one association tentatively described from few plots:

Arctostaphylos hookeri ssp. Montana Association:

B4. Chaparral dominated by Woolly - leaf Manzanita (*Arctostaphylos tomentosa*) in mapping area found in SF Peninsula area only (insufficient plots for further differentiation**) = Woolly - leaf Manzanita (*Arctostaphylos tomentosa*) Alliance (21450)**

IC. Chaparral dominated by broad - leaved sclerophylls other than *Adenostoma* or *Arctostaphylos*

C1. Chaparral dominated by Leather Oak (*Quercus durata*), occurs on serpentine outcrops near Mt. Tamalpais **= Leather Oak (*Quercus durata*) Alliance** (**21270)** represented locally by:

Quercus durata - Arctostaphylos glandulosa association

C2. Chaparral dominated by Holly - leaf Cherry (*Prunus illicifolia*). Occurs primarily in the SF Municipal Watershed lands in the southern portion of the mapping area **= Holly - leaf Cherry (*Prunus illicifolia*) Alliance (21250)** one association is defined:

P. illicifolia / Sanicula crassicaulis Association

Additional variation is expressed in a few other plots and includes co - dominance with *Ceanothus thyrsiflorus*, *Baccharis pilularis* and *Ribes* spp.

C3. Scrub dominated by the broad - leaved sclerophyll coffeeberry *Rhamnus californica*). In composition and ecological setting this scrub is more related to coastal scrubs than true chaparral, being found in mesic coastal sites within summer fog belt, however, physiognomically the dominant species is chaparral - like.

= Coffeeberry (*Rhamnus californica*) Alliance: (21460) all plots fall within one association:

Rhamnus. californica - Baccharis .pilularis / Scrophularia californica Association (21461)

<u>Group II</u>. Scrub dominated by microphyllous or broad - leaved evergreen species generally considered to be part of the Northern Coastal Scrub Habitat. Includes Coyote brush, bush Lupines, mock heather, dune sagebrush, as well as blue - blossom *Ceanothus*, and the introduced gorse and broom species = II Coastal Scrub Vegetation

IIA. Scrubs characterized by a relatively high cover of Coyote Brush (*Baccharis pilularis*) in the shrub layer. These vary from low diversity, early seral, openly - spaced types verging on various grassland alliances to tall, dense multi - species scrubs which may or may not be seral to other scrub or forest types. = **Coyote Brush (*Baccharis pilularis*) Alliance** (**24050**) This is the most diverse and variable alliance in the mapping area, represented by 14 associations locally. The following key distinguishes the associations:

A1. Coyote brush in open stands with total shrub cover (for all shrub species) <50% absolute cover (*B. pilularis* >15% and <50% cover, or at least cover class 3b and less than cover class 5) mixed with various grass or herb species:

a. Generally occupies drier hills and slopes away from the immediate coast where Coyote brush appears to be colonizing grassland on upper slopes and ridges:

1. Purple needlegrass (*Nassella pulchra)* is the major native grass component although non - native annual grasses and forbs may co - dominate = *B. pilularis / Nassella pulchra* Association (24056)

2. non - native annual grasses, including slender wild oats (*Avena barbata*), ryegrass (*Lolium perenne, L. multiflorum*), soft chess (*Bromus hordeaceus*), and *Vulpia bromoides* are a significant herbaceous component, *Nassella pulchra* is not a significant component = *B. pilularis /* Non - native annual grasses Association (24065)

b. Coyote brush mixed with mesophytic grass species, found close to the coast, often represented by the low form of *B. pilularis.* These types are dynamically and floristically closely related to the grass alliances composed of the following associated species.

1. Tufted hairgrass (*Deschampsia cespitosa*) the major grass species =*B. pilularis - Deschampsia cespitosa* Association (Elliott and Wehausen 1974) (24068)

2. California oatgrass (*Danthonia californica)* the principal grass species = *B .pilularis - Danthonia californica* Association (24061)

3. non - native perennial grass species (including *Holcus lanatus, Phaleris aquatica, Festuca arundinacea)* associated with coyote brush, no formal association defined in accuracy assessment: = *B. pilularis /* non - native perennial grass *(Holcus lanatus - Festuca arundinacea - Plantago lanceolata - Phaleris aquatica)* association (defined in accuracy assessment)

c. Coyote brush associated with low coastal bluff and sand dune species along the immediate coast (note may or may not attain total shrub cover of >50%, or cover class 5 or greater):

1. low coastal bluff plots with cliff lettuce (*Dudleya farinosa*), association = *B. pilularis / Dudleya farinosa* association
2. coastal bluff plot with significant Thrift (*Armeria maritima*) and *Plantago erecta* insufficient for association description = *B. pilularis / Armeria maritima - Plantago erecta* plots
3. Dune scrub with Coyote brush associating with yellow bush lupine (*Lupinus arboreus*) and / or dune lupine *(L. chamissonis*), lupines may be near equal cover to *Baccharis = B .pilularis - Lupinus arboreus* (and / or *L. chamissonis*) Association (24052)
4. Dune scrub with coyote brush associating with mock heather (*Ericameria ericoides*) = *Baccharis - Ericameria* association (defined in accuracy assessment plots)

d. Coyote brush stands on moist slopes, in swales and adjacent to wetlands, mixed with mesophytic graminoids:

1. Coyotebrush mixes with Slough sedge (*Carex obnupta*) and rushes (either *Juncus patens* and / or *J. effusus*) these are character species and need only be in 1% or greater cover (cover class 2 or greater) = *B. pilularis / Carex obnupta - Juncus spp.* Association (24063)

2. Coyotebrush usually shorter than and in lower cover than associated Pacific reedgrass (*Calamagrostis nutkaensis*) = *C. nutkaensis - Baccharis pilularis* Association of *Calamagrostis nutkaensis* alliance (46021)

e. Coyote brush in relatively mesic early seral stages with understory of mesophytic weedy species (including annual and perennial non - native grasses and forbs) and California blackberry (*Rubus ursinus) = B. pilularis - Rubus ursinus* / weedy Association (24064)

f. other undifferentiated grassy samples include: *B. pilularis* occurs with weedy understory dominated by species such as */ Rumex acetosella* (insufficient data for formal association description), and a *B. pilularis / Agrostis pallens - Elymus glaucus* plot (insufficient data for formal association description)

A2. Coyote brush in dense scrubs mixed with other shrub species that may approach or equal coyote brush in cover (co - dominate), grasses relatively unimportant. Poison oak is frequent in the stands.

a. Poison oak (*Toxicodendron diversilobum)* is a major component (>5% cover, or cover class 3a or greater) in the stand, often approaching coyote bush in cover. Other diagnostic species in associations listed below, lacking (e.g., a coyotebrush plot with 25% cover *Toxicodendron* and 7% cover swordfern would key to *Baccharis* - swordfern) = *B. pilularis - Toxicodendron diversilobum* Association: (**24059**)

b. Ocean - spray (*Holodiscus discolor*) present in at least 1% cover (cover class 2 or greater) in stands in addition to other mesophytic species = *B .pilularis - Holodiscus discolor* Association (24062)

c. Coffeeberry (*Rhamnus californicus*) significant cover and thimbleberry (*Rubus parviflorus*) a characteristic component = *B. pilularis - Rhamnus californicus - Rubus parviflorus* Association: (**21490**)

d. Mesophytic scrub with Sword fern (*Polystichum munitum)* common in understory of scrub = *B. pilularis / Polystichum munitum* Association: (**24053)** (Grams 1977)

e. Relatively xerophytic scrub of s and sw - facing slopes with significant (>5% or cover class 3a or greater) California sagebrush (*Artemisia californica*) associated with dominant coyote brush. Lizardtail (*Eriophyllum staechadifolium*) if present, less than 1% cover (cover class 1) = *B. pilularis - Artemisia californica - Toxicodendron / (Monardella villosa)* Association: (**24051**)

f. Typically a dense coastal bluff type mixed with lizard - tail at least 1% cover (cover class 2 or greater) (*Eriophyllum staechadifolium). Artemisia californica* may be important = *B. pilularis - Eriophyllum staechadifolium* Association: (Baxter 1992) (24060)

g. Blueblossom *(Ceanothus thyrsiflorus*) is a major component occurs in GGNRA units = *B. pilularis - Ceanothus thyrsiflorus* Association: (**24054**)

h. Mixture of mesic chaparral with Holly - leaf cherry and Coyote brush , insufficient plots for association description (in GGNRA and adjacent SFWD lands) = B. *pilularis - Prunus illicifolia* plots

i. mesic mature scrub with Hazel (*Corylus cornuta)* matched by plots collected by 1990 Earthwatch team in Marin Headlands = *B. pilularis - Corylus cornuta* Association: (24062)

A3. Coyote brush associated with low coastal bluff and sand dune species along the immediate coast (note may or may not attain total shrub cover of >50%, or cover class 5 or greater)

a. low coastal bluff plots with cliff lettuce (*Dudleya farinosa*), association = *B. pilularis / Dudleya farinosa* association

b. coastal bluff plot with significant Thrift (*Armeria maritima*) and *Plantago erecta* insufficient for association description = *B. pilularis / Armeria maritima - Plantago erecta* plots

c. Dune scrub with Coyote brush associating with yellow bush lupine (*Lupinus arboreus*) and / or dune lupine *(L. chamissonis*), lupines may be near equal cover to *Baccharis = B. pilularis - Lupinus arboreus* (and / or *L. chamissonis*) Association (24052)

d. Dune scrub with coyote brush associating with mock heather (*Ericameria ericoides*) = *Baccharis* - *Ericameria* association (defined in accuracy assessment plots)

IIB. Scrubs dominated by other microphyllous (small leaved) shrubs with little - to - no Coyote brush

B1. California sagebrush (*Artemisia californica*) dominated scrub, *A. californica* generally 3x or greater cover than *Baccharis* and other shrub species = California Sagebrush (*Artemisia californica*) Alliance (24080), [insufficient plots for further description]

B2. Scrub dominated or co - dominated by shrub lupines and / or dune goldenbush (aka: mock heather) (*Ericameria ericoides*). Coyote brush and dune sagebrush may also be conspicuous (but not dominant) = Dune Lupine - Goldenbush (*Lupinus chamissonis* - *Ericameria ericoides*) Alliance: note : generally one species or the other is dominant, overall shrub cover is often low (down to 6%, or as low as cover class 3a). **Most plots fall into one association:**

Lupinus chamissonis - *Ericameria ericoides* Association (62063)

However some variation occurs including plots with *Ericameria ericoides* - *Lupinus arboreus / Abronia latifolia* , and a plot with *L. chamissonis* - *Toxicodendron diversilobum* but without *E. ericoides*

B3. Plots dominated by the noxious weedy shrub, gorse (*Ulex europaeus),* in this area usually in mesic coastal terrace locations, with a relatively open non - native grass understory = Gorse (*Ulex europaeus)* Alliance (**24999**)

B4. Plots dominated by either of at least two different species of non - native, noxious broom species (*Cytisus scoparius* and *Cytisus striatus)*= Broom (*Cytisus* spp.) Alliance (**24040**)

IIC. Coastal scrubs dominated by the broad - leaved evergreen yellow bush lupine, without any other major shrubby species present. Generally short - lived stands that may wax and wain over the period of 3 - 5 years. Often occupies sandy or disturbed areas (e.g., pastures, dunes) near the coast = Yellow bush lupine (*Lupinus arboreus*) Alliance (19010)

much variation due to short temporal nature of stands, no associations defined. *L. arboreus* may mix with dune species (- *Artemisia pycnocephala),* bluff scrub species *(Eriophyllum staechadifolium),* weedy forbs, annual grasses and native grasses and herbs *(Danthonia californica - Pteridium aquilinum)*

IID. Coastal dune and bluff vegetation dominated by perennial forbs that may be slightly woody at the base. Total cover is typically relatively low, with much open sand. Note these species may also be considered sub - shrubs and can be keyed in the shrub key, as well.

D1. Vegetation of coastal bluffs and sandy headlands dominated by Coast Buckwheat (*Eriogonum latifolium*) = **Coast Buckwheat (*Eriogonum latifolium*) Alliance** (**62051** in part) [insufficient plot data for association definition].

D2. Vegetation typically of stabilized dunes dominated by Dune Sagewort (*Artemisia pycnocephala*) with several other herbaceous species such as *Abronia* spp., *Camissonia* spp. and *Frageria chiloensis* present. Iceplant, if present, <50% relative cover.

= Dune Sagewort (*Artemisia pycnocephala*) Alliance (**62052** also **62051** in part) represented locally by:

Artemisia pycnocephala - *Cardioniema ramosissimum* Association

IIE. Scrubs dominated by Semi - sclerophyllous evergreen species largely restricted to mesic coastal scrubs undisturbed for long periods.

E1. Stands dominated by California Coffeeberry (*Rhamnus californicus*). Appear to represent late dynamic stage of coastal scrubs that were once dominated by coyote brush = Coffeeberry (*Rhamnus californica*) Alliance: (21460) all plots fall within one association:

Rhamnus californica - Baccharis .pilularis / Scrophularia californica Association

E2. Stands dominated by the tall California Wax Myrtle (*Myrica californica*). Stands usually small and associated with mesic conditions in sheltered swales and low areas near coast = California Wax Myrtle (*Myrica californica*) Alliance (20010) [No associations defined] Plots include species such as *Rhamnus californicus, Rubus spectabilis*, and *Holodiscus discolor*

E3. Stands dominated by Blue - blossom Ceanothus (*Ceanothus thyrsiflorus*). May occur as low coastal bluff scrub on serpentine as at the S.F. Presedio or as stands associated with forest, woodlands and chaparral at Pt. Reyes and in southern GGNRA units Many of the latter stands are the result of the Mt. Vision Fire in November 1995 = Blue - blossom (*Ceanothus thyrsiflorus*) Alliance (20020). Two associations defined:

Stands originating from burned forest of *Pinus muricata* or *Pseudotsuga menziesii* on Inverness Ridge:

Ceanothus thyrsiflorus - Vaccinium ovatum - Rubus parviflorus Shrubland

Stands associated with *Baccharis pilularis* alliance stands in coastal scrub:

Ceanothus thyrsiflorus - Baccharis pilularis - Toxicodendron diversilobum Shrubland

Group III: Scrubs dominated by Cold - deciduous shrubs. Includes a variety of types ranging from coastal bluffs to mesic openings in Douglas - fir forest = III Temperate Cold - deciduous Shrublands

IIIA. Scrubs dominated by poison oak (*Toxicodendron diversilobum*). Stands are closely associated with coastal scrub in the study area and exhibit relatively mesic conditions, often occurring on north slopes and on concave slopes. Most stands have *Baccharis pilularis* as a component, but *Toxicodendron* is from 2 - 10 times higher cover than *Baccharis pilularis* = Poison Oak (*Toxicodendron diversilobum*) Alliance: (30040) one association defined:

T. diversilobum - B. pilularis - Rubus parviflorus Association

Other plots remain undefined

IIIB. Mexican Elderberry dominates the stand. Represented by one sample in SF Game Reserve with open *Sambucus* over yerba santa (*Eriodictyon californica)* = Mexican Elderberry (*Sambucus mexicana*) Alliance (30020)

IIIC. The introduced rose species, sweet - brier *Rosa eglanteria*) dominates an area within non - native annual grassland at Marin Headlands = Sweet - brier (*Rosa eglanteria*) thickets **(30030)** (no alliance or association defined)

IIID. Salmonberry (*Rubus spectabilis*) dominates in mesic scrubs associated with gullys, swales, and other bottomlands, often adjacent to riparian forest or scrub in the coastal areas = Salmonberry (*Rubus spectabilis*) Alliance (30050) One association defined:

Rubus spectabilis association

IIIE. Hazel (*Corylus cornuta*) dominates in tall scrub on steep concave slopes in a few locations on southern Inverness Ridge, surrounded by Douglas - fir Alliance = Hazel (*Corylus cornuta*) Alliance: (30010) the two samples taken in this area are consistent enough to tentatively define an association:

Corylus cornuta / Polystichum munitum Association (30011)

Division C Tree Dominated Vegetation:

Group 1: Evergreen broad - leaved forests and woodlands dominated by one or more of several species including: Giant Chinquapin (*Chrysolepis chrysophylla*), Tanoak (*Lithocarpus densiflorus*), Pacific Madrone (*Arbutus menziesii*), California Bay (*Umbellularia californica*), *Eucalyptus* spp., and / or Coast Live Oak (*Quercus agrifolia*) = I, Winter - rain Evergreen Sclerophyllous Forest and Woodland:

IA. Generally short (5 - 10m) forests strongly dominated by dense, clonal stands of Giant Chinquapin (*Chrysolepis chrysophylla*), occurring on upper slopes and ridges adjacent to Douglas - fir forest, often transitional between forest and chaparral occurs in northern (Mt. Tamalpais - Bolinas Ridge) and southern (Montara Mountain area) higher portions of the mapping area=Giant Chinquapin (*Chrysolepis chrysophylla*) Alliance (01090) one association defined:

Chrysolepis chrysophylla / Vaccinium ovatum Association

IB. Forests strongly dominated by tanoak (*Lithocarpus densiflorus*) with less than 40% relative cover of canopy composed of other tree species. Seems to be relatively rare in the mapping area, but occurs both in northern and southern areas adjacent to redwood and Douglas - fir forests = Tanoak (*Lithocarpus densiflorus*) Alliance (01070) no associations defined

IC. Forests dominated or co - dominated by California bay (*Umbellularia californica*), may have other species (*Lithocarpus densiflorus, Quercus agrifolia, Q. wislizeni)* of broad - leaved trees up to 50% relative cover in the canopy. Canyon live oak if present may occasionally have slightly higher (up to 60% relative cover) than Bay = California bay (*Umbellularia californica*) Alliance (01010) three associations have been defined:

C1. Bay strongly dominant in the canopy with a relatively dense understory dominated by sword fern (*Polystichum munitum*), other small deciduous trees (*Sambucus racemosa, Aesculus californica*) may be common in sub - canopy. If *Quercus agrifolia* is > 30% relative cover in canopy stands key to the next association = *Umbellularia californica / Polystichum munitum* Association (1012)

C2. California Bay shares the canopy with Coast Live Oak. Either species may dominate (30 - 60% relative cover), but most stands are dominated by California bay. Poison oak (*Toxicodendron diversilobum*) and hazel (*Corylus cornuta*) are common understory species. This is the common "bay - oak" or "oak - bay" forest of the study area. Note: if bay is greater than 60% relative cover and sword fern is common in understory go to above association. If coast live oak is > 60% relative cover go to coast live oak alliance = *Umbellularia californica - Quercus agrifolia / Toxicodendron* Association (1014)

C3. California Bay shares the canopy with up to equal or slightly higher cover of Canyon live oak (*Quercus chrysolepis*). Occurs on rock upper slopes of Mt. Tamalpais = *Umbellularia californica - Quercus chrysolepis* Association (1013)

C4. Other types of *Umbellularia* stands occur in area, including those with *Lithocarpus densiflorus* as a co - dominant, those with *Corylus cornuta* as the major understory species, those *with Garrya elliptica* as a major understory component, stands that are

early seral with *Baccharis pilularis* and *Smilacina stellata* in understory, and those with Interior Live oak (*Quercus wislizeni*) as a canopy constituent. None of these types have sufficient samples to define associations.

ID. Stands strongly dominated by introduced *Eucalyptus* spp. These have been planted and are generally of one species (*Eucalyptus globulus*). They are scattered throughout the mapping area = *Eucalyptus* spp. Stands (01030) (no associations developed)

IE. Forests and Woodlands dominated by Coast Live Oak (*Quercus agrifolia*). Generally Coast Live Oak is the major canopy species, with California Bay, bay and other trees as minor components = Coast Live Oak (*Quercus agrifolia*) Alliance (12020)

Stands strongly dominated by *Q. agrifolia* with a relatively dense understory of poison oak, hazel, and other species = *Quercus agrifolia / Toxicodendron* Association (12022)

Certain other outlier plots in this alliance could not be classified including a disturbed semi - riparian plot with black willow (*Salix gooddingii*) as a canopy sub - dominant.

IF. Woodlands dominated by Pacific Madrone (*Arbutus menziesii*). Uncommon in the mapping area, only one stand sampled. This in the SFMWD lands near southern part of area had low scrubby madrones over a mixture of bush monkeyflower (*Mimulus aurantiacus*) and mixed chaparral species = Pacific Madrone (*Arbutus menziesii*) Alliance (12030)

<u>Group II.</u> Stands dominated by deciduous broad - leaved trees including riparian and upland forests and woodlands = II Winter - deciduous broad leaved forests and woodlands

IIA. Riparian (in or immediately adjacent to streams, swamps, ponds, lakes or other fresh water) tree dominated stands:

A1. Arroyo Willow (*Salix lasiolepis*) usually dominates the canopy, (typically 5 - 7m) may have emergent taller willows present in which case it may translate to "mixed willow stands". However, *S. lasiolepis* is always at least 50% relative cover = Arroyo Willow (*Salix lasiolepis*) Alliance (32080) includes two defined associations and several undefined variants:

Salix lasiolepis - Salix lucida Association (mixed willow type) (**07060**)

Salix lasiolepis / Rubus Association (**32080**)

Undefined variants include stands with *Salix lasiolepis - Salix gooddingii - Cornus glabra, stands with Salix lasiolepis / Oenanthe sarmentosa,* and mixed stands with *Salix lasiolepis - Salix scouleri - Salix exiguua*

A2. Stands strongly dominated by Yellow Willow (*Salix lucida*) . No associations defined. May include riparian stands with *Athyrium filix - femina* or *Artemisia douglasiana* as major understory components = Yellow willow (*Salix lucida*) Alliance (7030)

A3. Black Willow (*Salix gooddingii*) is major tree canopy species other understory willows or other riparian species (e.g., *Sambucus mexicana / Cornus sericea)* are of minor importance = Black Willow (*Salix gooddingii*) Alliance (7040)

A4. Red Willow (*Salix laevigata*) is major tree willow dominant in canopy. May include lesser amounts of yellow willow (*S. lasiandra) and have a variable understory with such species as Cornus sericea, Urtica dioica,* and *Oenanthe sarmentosa.* No associations defined =

Red Willow (*Salix laevigata*) Alliance (**7050**)

A5. Red alder (*Alnus rubra*) and not Willows (*Salix* spp.) is the principal overstory dominant = Red Alder (*Alnus rubra*) Alliance (**07070**)

Two associations have been defined from the data.

One is a mixture of *Alnus* and Arroyo Willow, with willow being lower in cover and always in the understory of mature stands = *Alnus rubra / Salix lasiolepis* Association (7072)

The other has regular presence of the winter deciduous shrubs *Rubus spectabilis* and *Sambucus racemosa = Alnus rubra / Rubus spectabilis - Sambucus racemosa* Association (7071)

IIB. Stands dominated by Non - riparian upland species of hills and slopes. No deciduous oak woodlands or other cold - deciduous upland woodlands exist in the mapping area except for the relatively small and local stands dominated by California Buckeye (*Aesculus californica*), which occur in the southern portion of the mapping area on the S.F. M.W.D. lands. The single sampled stand was strongly dominated by buckeye with *Prunus illicifolia - Heteromeles arbutifolia* = California Buckeye (*Aesculus californica*) Alliance (14020)

<u>Group III.</u> Stands dominated by coniferous evergreen trees including Bishop Pine (*Pinus muricata*), Douglas - fir (*Pseudotsuga menziesii*) , and Redwood (*Sequoia sempervirens*) = III, Needle - leaved Evergreen Forest

IIIA. Forests dominated by rounded - crowned Conifers:

A1. Pines, often with a significant proportion of broad - leaved evergreen species such as California bay, Coast Live oak, or Tanoak present. However, in mature stands pines are always taller than other broadleaved evergreens and compose at least 16% cover (cover class 3b or greater) evenly over the stand. = Bishop Pine (*Pinus muricata*) Alliance (03030)

Note: no Bishop Pine samples were taken in the recently burned (Fall 1995) Vision Fire zone. All but a few plots fall into one association, which may have any of the major broad - leaved evergreen tree species as significant sub - canopy, but which always has at least the presence of Madrone (*Arbutus menziesii)* and an understory with at least 1% (cover class 2 or greater) Black Huckleberry (*Vaccinium ovatum*)

Pinus muricata - Arbutus menziesii / Vaccinium ovatum Association: (**03031**)

Some variation is indicated in a plot that has only high cover of Salal (*Gaultheria shallon*) in the understory and no broadleaf evergreen subcanopy

A2. Monterey Cypress (*Cupressus macrocarpa*) dominates in planted Groves = Monterey Cypress (*Cupressus macrocarpa*) Groves (non - native) (03120)

A3. Monterey Pine (*Pinus radiata*) dominates in planted groves, somewhat invasive in Marine Headlands and other areas = Monterey Pine (*Pinus radiata*) Groves (non - native) (3120)

IIIB. Forests dominated by pointed crowned giant conifers with maximum height approaching 50 - 70 m = Giant Temperate or Subpolar Needle - leaved Evergreen Forest

B1. Stands dominated by Coast Redwood (*Sequoia sempervirens*) = Coast Redwood (*Sequoia sempervirens*) Alliance (02050) Two associations were defined from the mapping area. They are differentiated largely by the presence or absence of Douglas - fir in the canopy:

Sequoia sempervirens / Lithocarpus / Vaccinium ovatum Association: (**02051**)

Sequoia sempervirens - Pseudotsuga - Umbellularia Association: (**02052 and 02053**)

Some additional variation is expressed in certain sampled stands which may have strong dominance by Redwood with very little other tree cover, a plot with *Quercus chrysolepis* and *Umbellularia* as the major subcanopy species, a plot with the subcanopy composed of *Lithocarpus* and *Quercus wislizeni,* and a plot with *Lithocarpus* as the understory tree but with no *Vaccinium ovatum* in the understory.

B2. Stands dominated by Douglas - fir (*Pseudotsuga menziesii*). Generally *P. menziesii* strongly dominates the canopy. However, some stands have been assigned to this alliance with as little as 12% cover (cover class 3a or greater) of *P. menziesii*. In such cases *P. menziesii* is evenly dispersed in the canopy and is underlain by a species mix similar to other higher density stands placed in the same association = Douglas - fir (*Pseudotsuga menziesii*) Alliance (02010) This alliance has been divided into 5 local associations based on subcanopy tree and understory species composition. The following is a key to the associations and observed variants:

a. Douglas - fir and California Bay are the major tree species
    1. Sword fern (*Polystichum munitum*) is the major understory species:= *Pseudotsuga menziesii / Umbellularia californica / Polystichum munitum* Association (**2011**)
    2. Coffeeberry (*Rhamnus californicus*) is the major understory species with little or no sword fern = *Pseudotsuga menziesii / Umbellularia californica / Rhamnus californica* Association: (**2011**)

b. Douglas - fir and oaks or tanoak are the major subcanopy species
    1. Tanoak (*Lithocarpus*) is the principal subcanopy tree (insufficient plots to define association) = *Pseudotsuga menziesii / Lithocarpus densiflorus / Rhamnus californicus* plots: (**2020**)
    2. Coast live oak is the major subcanopy species = *Pseudotsuga menziesii / Quercus agrifolia* Association (2013)
    3. Interior live oak (*Quercus wislizeni*) is the major understory tree (this plot is seral to chaparral in SFMWD lands, dominated by *Arctostaphylos hookeri hookeri*) (insufficient plots to define association) = *Pseudotsuga menziesii / Quercus wislizeni - Arctostaphylos hookeri hookeri* plot
    4. Douglas - fir associated with Canyon live oak in sub - canopy. May have other broad - leaf trees such as Tanoak present. Occurs on higher slopes of Mt. Tamalpais = *Pseudotsuga menziesii - Quercus chrysolepis* Association (2014)

c. Douglas - fir occurs over a scrub canopy, usually young trees apparently invading a coastal scrub site
    1. *Baccharis pilularis* is major understory shrub = *Pseudotsuga menziesii / Baccharis pilularis* Association: (**02012**) [dwarf Douglas - fir]
    2. California wax myrtle (*Myrica californica*) is the major understory species (insufficient data for association definition)

d. Douglas - fir occurs over a winter - deciduous subcanopy of California Buckeye (*Aesculus californica*) (insufficient plots for association)

PHOTO INTERPRETATION (PI), MAPPING EFFORT, AND PI CODES

The following section is a short outline, listed in chronological order, of the vegetation mapping effort at PRNS / GGNRA. For a detailed description of the tasks listed below, refer to sections IV, V, and VI.

August 8, 1995
- Aerial photography for the southern portions of the study flown

December 5, 1995
- Initial costs and contract drawn up

March 12, 1996
- Aerial photography for the northern portions of the study flown

September 1996
- Preliminary efforts by Todd Keeler - Wolf and Laura Nelson in developing a list of possible vegetation communities occurring within the study

October 24, 1996
- Preliminary Vegetation Scoping Meeting (ESRI - TNC - GGNRA - NPS)

January 20, 1997
- AIS receives photography and meta - data from NPS

March 1997
- Field reconnaissance effort

March 31, 1997
- Preliminary mapping classification for the study area developed

April - June 1997
- Preliminary line work and initial polygon labels interpreted and sent to Todd Keeler - Wolf in 3 shipments.

October 1998
- Plot sampling effort complete for study a total of 360 plots
- Copies of field overlays delivered to AIS for review against initial PI calls
- Updates and corrections made to the photo overlays

February 1999
- The PRNS Classification Supported by Plots completed
- Three - day field verification effort completed

March 1999
- Updates and corrections made to the photo overlays based on the three - day field verification trip

June 9, 1999
- Geo - referencing (rectification) of the first twelve modules in the grassland areas around Drakes Bay delivered to NPS

June 17, 1999
- AA list developed by Todd Keeler - Wolf for most of the grassland types for the Drakes Bay grassland area

June 1999
- AA points selected by Michael Schindel and delivered to NPS
- AA verification efforts begins

October 1999

- Second set of modules delivered to NPS, AA points selected and delivered to NPS - copy sent to Todd Keeler - Wolf

November 1999

- Third set of modules delivered to NPS (All regions except the San Francisco Presidio and Angel Island)

January 2000

- Final delivery of modules delivered to NPS both with and without quad boundaries
- Completion of fire attribute assignment to shrub and tree polygons in the Vision Fire area

VEGETATION MAPPING AT PRNS / GGNRA

One of the most important mandates of the Vegetation Mapping Program is the consistent capture and classification of vegetation types through photo interpretation and field sampling methodologies. Mapping criteria and procedures developed during the prototype parks are currently being tested and revised.

The first two parks mapped - Assateague Island National Seashore and Tuzigoot National Monument utilized 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 are interpreted for each layer of vegetation. These data layers are then aggregated up into the appropriate alliance or community as defined by TNC. Subsequent parks, including the Nebraska grassland parks, Isle Royale National Park, Congaree Swamp National Monument and Rock Creek Park involved mapping an initial photo signature type describing multiple vegetation canopies. These photo signature types were then translated into a TNC community type or alliance. Height, density and pattern attributes are additionally assigned to each polygon. Photo interpretation signature types are retained to further describe at a more detailed level the attributes visible on the aerial photography for each polygon.

PRNS & GGNRA - Initial Meeting

A one - day meeting was held on October 24, 1996 to bring together project team members from the National Park Service, ESRI, TNC, and GGNRA. This meeting focused primarily on discussing the Vegetation Inventory and Mapping Program, existing park data, and specific interests and issues of the park.

During the meeting, imagery, basemaps, and other pertinent collateral materials were reviewed and evaluated. Included in this inventory were the following data:

- Fire management plots
- Earthwatch plots (450 total) conducted from 1990 - 1996
- Range management data
- Wildlife surveys and habitat monitoring efforts (Tule Elk, Monarch Butterfly and 180 points with vegetation data showing neotropical migratory bird sites)

- Habitat restoration plots in alien species habitat
- Rare plant plots (300 sites total)
- Digital Ortho - photo Quads

Park specific issues were also discussed. These issues are addressed in the General Mapping Criteria.

Development of Photo interpretation Mapping Procedures

The normal process in vegetation mapping is to conduct an initial field reconnaissance, map the vegetation units through photo interpretation (PI), and then conduct a final field verification. 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 communities and local ecology that occur in the study area. Park and / or TNC field biologists that 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.

Upon completion of the field reconnaissance, photo interpreters delineate vegetation units on mylar sheets that overlay the 9x9 aerial photos. This effort is conducted in accordance with the TNC vegetation classification and criteria for defining each community or alliance. The initial mapping is then followed by a field verification session. The purpose of the field verification trip is to verify that the vegetation units were mapped correctly. Any PI related questions are also addressed during the visit.

The vegetation mapping at PRNS / GGNRA in general followed the normal mapping procedure as described in the above paragraphs with one major exception:

> The photo interpretation team performed two revision efforts to the initial delineations and PI calls. The first set of changes reflected notes taken from field ecologists onto hard copies of the photo overlays during their sampling effort. The second set of changes reflected information gathered during the subsequent field verification effort.

Development of Photo interpretation Mapping Criteria

From the onset of the Vegetation Inventory and Mapping Program, a standardized program - wide mapping criteria has been used. The mapping criteria contains a set of documented working decision rules used to facilitate the maintenance of accuracy and consistency of the photo interpretation. This criteria assists the user in understanding the characteristics, definition and context for each vegetation community.

The mapping criteria for PRNS / GGNRA was composed of four parts:

- The standardized program - wide general mapping criteria
- A park specific mapping criteria
- A working photo signature key (see Appendix B)

- The TNC classification, key and descriptions

The following sections detail the mapping criterion used during the photo interpretation of PRNS / GGNRA.

General Mapping Criteria / Aerial Photography

The mapping criterion at PRNS / GGNRA conforms to the standards set for parks greater than 100,000 acres. Minimum mapping units are ½ hectare. Photo interpreters interpret to the highest level possible. This is normally to the association level in the TNC classification. Interpretation is done to a series or multiple - series mapping unit when association level mapping is not possible. Upon completion of Accuracy Assessment, photo interpreters will scale back to a more general level if it is found that the particular association cannot be mapped with an acceptable accuracy.

Difficulties were incurred mainly due to the scale of available aerial photography. The photos used for this project had a smaller scale (1:24,000) than previously mapped parks. Large parks currently in progress have acquired photography at larger scales. For example, Joshua Tree National Park with over 800,000 acres is currently using 1:12,000 natural color photography. Yosemite National Park and environs with over 1,000,000 acres is using photography at 1:15,800. Both parks also have a set of diapositives provide contain a higher resolution than the prints used for the PRNS / GGNRA effort.

Alliance / Community Associations

The assignment of alliance and community association to the vegetation is based on criteria formulated by TNC. In the case of PRNS / GGNRA, TNC provided AIS with a tentative community classification in March 1997. A final vegetation classification, supported by plots was delivered in February of 1999. Associated keys and descriptions of each alliance and association have not been completed to this date.

Park Specific Mapping Criteria

The Vision Fire

The Vision Fire burned approximately 12,500 acres of federal, state and private land in October of 1995. Over 90% of the burned area was within the Point Reyes National Seashore boundaries. Aerial photography was subsequently flown 8 months after the fire for use in post burn mapping and analysis. A burn modifier has been added to the vegetation map, which addresses polygons that were affected by the fire. There are several limitations to the burn modifier that are primarily a result of the date of the post burn photography. These limitations are noted below:

- The photography was flown too late (8 months later) to reliably determine which herbaceous polygons were affected by the Vision Fire. The subsequent rainy season and resultant herbaceous growth masks out any reliable burn signature to herbaceous polygons.
- Shrub type communities that are dominated by herbaceous growth (native and non - native grasses) have been assigned burn modifiers, but the vegetation map units are not split based on portions of polygons being affected by fire. The aerial

photography does not yield a reliable enough signature to enable splitting of these polygons.

- Forested and woodland polygons are split in cases where only portions of that polygon are affected. Minimum mapping however (approximately 5 - 10 hectares) in splitting the polygon is greater than the standard set for the original vegetation map.
- The aerial photography was flown too soon after the burn to detect the extensive regeneration of blue blossom (*Ceanothus thyrsiflorus*).

Since it was not possible to accurately delineate the burn within herbaceous and shrub type polygons with a strong herbaceous component, a fire boundary should not be construed from the burn modifiers to this vegetation map. The burn modifiers are however, especially useful in depicting forested and wooded areas within the Vision Fire burn that were not killed at the time the photography was flown. Many of these unburned areas were riparian areas, consisting of red alder (*Alnus rubra*).

Non Native Vegetation

Invasive exotics are of particular concern in the study area. Every effort was made to map many of these types including broom, European beach grass, and blue gum below the minimum mapping unit.

Native California Grasslands

Sensitive stands of native California grasslands for the most part cannot be mapped to the alliance level. Generally, it is not possible to detect the different native grasses apart on the photography, and tying these different species to unique environmental constraints proves difficult at best. Therefore, a mapping unit which uses environmental parameters to detect grasslands with a significant native component has been created to aid field ecologists in further studying the distribution of native grasses in the region.

Zero Value Data

Several polygons within the San Francisco Presidio, Alcatraz and Angel Island have values of zero. These three areas were not visited during either the reconnaissance or verification efforts, nor were any plot samples taken. Additional efforts to label these areas by field crews will be added to the polygon labels at a later time.

Working Photo Signature Key

A photo signature key is an important tool for maintaining consistency in interpretation. It correlates the physical descriptions of the photo signature with the appropriate vegetation community. A key may also describe other useful information that would be helpful in the interpretation.

For PRNS / GGNRA, a preliminary or working photo signature key (see Appendix B) was developed during the initial mapping phase. The key was used to label the mapped units with a preliminary PI call, which guided the field crews in their sampling strategies. Field data collected during the reconnaissance effort were analyzed and compared with the aerial photos and a consistent correlation between the photo signatures and vegetation types were noted. Each photo signature was then assigned a generalized vegetation type. This signature key was

later modified to accommodate the final classification and further knowledge gained on the field verification trip and TNC / AIS follow - up meeting.

The final signature key is in a table format, and contains the photo signature characteristics, geographic settings, specific park example locations and the associated TNC community.

TNC Classification, Key, and Descriptions
In February 1999, TNC delivered to AIS the PRNS / GGNRA classification supported by plots, which conforms to the National Vegetation Classification System developed in conjunction with the Federal Geographic Data Committee and the Ecological Society of American Vegetation Subcommittee. The Nature Conservancy, in partnership with the network of Natural Heritage Programs, developed this classification of vegetation of the United States as the national vegetation classification standard.

This classification, in addition to the field ecologists notes and the working photo signature key enables the photo interpreter to delineate, refine and label the vegetation units interpreted off the aerial photography.

Project Set - Up
Several sets of aerial photography were provided for the project. The specifications for the aerial photography are listed below:

- NOAA 1:24,000 March 1994 Natural Color Prints (Leaf Off) covering Point Reyes National Seashore, the northern portion and southern coastal portions of GGNRA, and the western two thirds of Mt. Tamalpais State Park
- Pacific Aerial Survey 1:24,000 August 1995 Natural Color Prints (Leaf On) covering the southern portions of GGNRA and the San Francisco Watershed district
- Pacific Aerial Survey 1:24,000 November 1995 Natural Color Prints (Leaf Change) covering Samuel P. Taylor State Park and portions of the GGNRA
- 1:36,000 August 1991 Natural Color Prints (Leaf On) covering the eastern portion of Mt. Tamalpais State Park
- 1:12,000 August 1990 Natural Color Prints (Leaf On) covering Samuel P. Taylor State Park. (Supplemental data set - not interpreted off of)
- 1:12,000 June 1993 Natural Color Prints (Leaf On) covering coastal portions of Mt. Tamalpais State Park (Supplemental data set - not interpreted off of)
- Hammon - Jensen - Wallen 1:12,000 August 1996 CIR Prints and Diapositives (Leaf On) covering the Vision Fire Burn Area
- 1:12,000 April 1984 CIR Prints were provided to fill in small gaps in the Drakes Bay area
- Radman Aerial Surveys 1:12,000 April 1993 Natural Color Prints covering Angel Island
- Only the Black and White DOQQ (San Francisco NE) was available for Alcatraz Island

Every effort was made to delineate beyond the study area boundary. A comprehensive administrative boundary map was not provided to use as a clip data set, therefore, the vegetation map should not be used to determine administrative units.

Photo interpretation of non-vegetated inter tidal zones which include but are not limited to sandy beaches, rocky shorelines, and mudflats, have not been conducted for this study effort. A best approximation of the interface between the mean high water line and upland vegetation types denotes the boundary used in this study. This boundary was originally interpreted off the 1:24,000 base photography and later refined by using the DOQQ's during the rectification process of the polygons.

A general flight line index (see figure 1.2) was created on an 8 ½" by 11" sheet of paper to show the principle sets of aerial photos used in the project. This index was used for quick reference to photo locations and as a status tool showing work completed on various portions of the project.

Preliminary Photo Signature Delineations

A total of 80 aerial photographs were needed to provide full photo coverage of the study area. Because of adequate control and sufficient overlap between flight lines and photos, it was determined that interpretation would be done on every other photograph.

Each photo was prepared with a 9" x 9" frosted mylar overlay for the photo signature delineations. Photo overlays were then pin - registered to the photos; project labels were affixed to each overlay identifying the photo number, status of work (Initial PI, QC), and photo interpreters responsible for that task. Study area boundaries were drafted onto each photo overlay, defining the area within the photograph to be interpreted. The study area boundaries were edge matched to adjacent photos to ensure full coverage.

Using a mirror stereoscope, with a 3X0 lens, photo signature units were delineated onto the mylar overlays. These initial photo delineations were based on a number of signature characteristics including color, tone, texture, relative height and density. The signature units were then edge matched to the adjoining photo before it was to be interpreted.

Initial attribute codes (photo interpretation signatures) were assigned to the polygons with the height and density values denoted usually below the PI code.

Photo interpretation did not begin until the initial field reconnaissance visit. Photo interpreters must use the reconnaissance trip as a tool to train on the signatures that are pertinent either to the special interests of the Park, or to differentiating the TNC communities and alliances. Without this fundamental knowledge, photo interpreters will either miss what is suppose to be a meaningful distinction between two communities, or delineate areas which may be of no significant ecological interest, but may yield a difference in signature on the photos. One obvious example is a signature difference reflecting the varying health (greenness) of vegetation within the same community.

Field Reconnaissance Effort
A five - day photo interpretation field reconnaissance effort was conducted in March 1997 (see section III). Initial descriptions of the units were soon after formulated into a working interim signature key to be used in labeling the polygons. The field crew consisted of Todd Keeler - Wolf - Vegetation Ecologist (CDFG), Sarah Allen - Science Advisor - Project Manager NPS, Randy Vaughn - ESRI Project Manager, Michael Schindel - TNC ecologist, Laura Nelson and Marcia Semenoff - Irving - GGNRA, Kim Cooper - field ecologist, Dennis Odion - Marin County Water District, Lisa Cotterman and John Menke - AIS photo interpreters.

Prior to the field reconnaissance, several in - house preparations were performed in order to facilitate a more organized trip. Each photo was prepared with a separate field overlay. Registration and navigation features (roads, buildings, etc) were drafted onto the overlays. Each photo was reviewed and field transect sites were chosen representing different signatures types, geographic variables (% slope, aspect, shape of the slope, elevation), and other abiotic variables noted on the photography. These sites were drafted onto the field overlays with notations to each site as needed. Multiple sites were chosen to provide alternatives if one or more sites proved inaccessible.

The field crew conducted on - site investigations over the five - day period. During the field visit, the photo interpreters worked with the field biologists to identify the plant species, preliminary vegetation communities, and their photo signature throughout the park. Field site numbers were annotated directly onto the photo field overlay, thereby correlating the field site to a specific location and photo signature. A field notebook was used to record pertinent information (canopy dominance, understory species present, abiotic features, disturbance history) for each site visited. Numerous ground photos were taken at selected locations that were later tied back to the aerial photographs and the field sites. Sites not previously identified on the aerial photos were also visited. These sites included areas between initially selected sites, areas of noteworthy or unusual significance as determined by park personnel, and areas the photo interpreter deemed important in transit from site to site.

Photo interpretation 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 they represent 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. Additional collateral sources (existing vegetation maps, supplemental photography, soil data, etc.) can be of great utility to the photo interpreter. Understanding the relationship between the vegetation and the context in which they appear is useful in the interpretation process. Familiarity with regional differences also aids interpretation by establishing a context for a specific area.

Initial photo interpretation of vegetation normally takes place after an interim classification has been developed. After the draft linework is complete, a second field effort is undertaken in order to verify the accuracy of the preliminary linework and to verify initial PI signature

calls. Since a comprehensive study including plot sites did not exist at the time for Point Reyes National Seashore or GGNRA, a rudimentary mapping classification was not in place at the time the photo interpretation was to start. A working mapping classification was completed soon after the reconnaissance visit and copies were sent to the Park and TNC ecologists. Each polygon was then labeled with a preliminary photo interpretation (PI) signature code that reflected the preliminary mapping classification. Photos were edge matched to assure consistency of linework and labels across photo boundaries.

At PRNS / GGNRA, the initial vegetation map unit delineations along with their preliminary photo interpretation calls were used by the field ecologists to guide the sampling strategy. The delineations proved extremely useful in the plot sampling effort. In addition, field ecologists were able to comment on polygons that were both sampled and visited for a number of areas. Cross - walking the data points and field comments from the southern portions of the GGNRA proved extremely difficult however, since there were no field ID numbers on the working photocopies.

Collateral Source Vegetation Maps
Several collateral vegetation maps existed for various studies within the mapping area and are noted below:

- Angel Island vegetation map on 8½ by 11 sheet based on 1978 aerial photography.
- 1993 vegetation map of Tomales Point based on June 1974 aerial photography
- GAP vegetation map of the central coastal region
- UC Berkeley vegetation map of Muir Woods National Monument
- Marin Municipal Watershed vegetation map

Unfortunately, a vegetation map, which was believed to exist for the San Francisco Watershed District, was not made available for use in this project. This map would have been especially useful, since plot sampling did not occur within this region.

Photo Interpretation Field Verification
A three - day photo interpretation field verification trip was held in February 1999 (see Section III). This effort focused primarily on verifying and / or refining photo signature units and substantiating the associations attached to each polygon.

Preparation for the field verification involved three steps: 1) Locating the TNC sample plots on the photo overlays, 2) Choosing representative areas for each community type to review in the field, and 3) Compiling photo interpretation question forms in order to plan a strategy for the three - day effort. Although AIS chose specific areas of focus, other portions of the study were checked for both line and label accuracy.

While in the field, notes were made directly onto the PI overlays using a red Pentel. This helped in establishing which polygons were actually visited during field verification and assisted in refinements of the codes and line - work back at the office.

For the most part, a satisfactory correlation between the photo interpretation calls and visits were established in the field. Important limitations to the mapping project were noted however, several important examples are listed below. Refer to the *Point Reyes Classification Supported by Plots - Mapping Codes* and the photo interpretation key for a complete set of comments regarding mapping limitations by type.

- Aerial Photography used was flown after the Vision Fire.
- Environmental parameters that were assumed to differentiate native grassland alliances or associations were not in all cases reliable.
- A significant reduction in the total area of yellow bush lupine (*Lupinus arboreus*) has occurred since the time the photography was flown.
- A reliable photo signature could not be established for several plants previously thought possible to separate out. They include:
    1. Canyon live oak
    2. Several broom types (Spanish & French)
    3. Manzanita species other than sensitive manzanita (A. nummularia)
- Several associations and or alliances needed to be combined based on complexing issues or small size. They include:
    1. Coast Buckwheat alliance - Polygon units were too small and will be included in with a coyote brush - California sagebrush association.
    2. Dune sagebrush alliance and Dune Lupine - Goldenbush alliance both occur on coastal dunes too small to separate out on the photography. Individual communities of each type are often only a few square meters in size.

Photo interpretation is performed to the highest level deemed possible at the time. Subsequent accuracy assessment (AA) efforts may result in dissolving some line - work and community labeling up to a more general level. For example, if AA results in sampling the coyote brush - lizard tail association are not acceptable, this type will be lumped to a multiple association mapping unit including this association along with the coyote brush - California sagebrush association. It is always desirable to map at the most detail level possible in that it is much easier to dissolve out erroneous line - work than to split existing polygons in the database based on too general a mapping classification.

Final Photo Interpretation

After the field verification effort, AIS proceeded with the final revisions to the photo interpretation linework and community calls. Each polygon was reviewed in conjunction with the notes taken during the field reconnaissance effort and data from the plot sampling effort.

Photo overlays were then edge matched to the adjacent photo to ensure a seamless coverage in the database. Delineations and codes were compared and discrepancies between photos were resolved and corrected on mylar overlays. Any uncertain interpretations were flagged on the mylar overlays for review during the quality control task.

Quality Control of the Photo Interpretation

A separate quality control step was performed for each photo upon completion of the photo interpretation. A senior photo interpreter on staff reviewed each photo for linework accuracy

and accuracy regarding the PI signature and TNC community codes. The photo overlays were also checked for completeness, consistency, and adherence to the mapping criteria and guidelines. For those polygons flagged by the photo interpreter, the quality control reviewer either assigned the appropriate vegetation code and / or discussed the change with the interpreter.

DATA CONVERSION

Converting the vegetation delineations to a digital format involved several steps that fall within four main procedures:

- Geo - referencing (rectifying) photo overlay linework to the Digital Ortho
- Photography (DOQQ's).
- Creating manuscript (digital quality) overlays and related attribute files.
- Input of spatial data into digital format (scanning).
- Linking the spatial data with the fields from the attribute files.

Basemap Production

In order to begin the data conversion process, a hardcopy version of the base was needed. The designated base was the USGS digital orthophoto quarter quads (DOQQ's) series for all or portions of fourteen USGS 1:24,000 topographic quads. (See figure 1.1).

Creation of the DOQQ hardcopy base required having the image plotted onto clear mylar at the mapping input scale, approximately 1:24,000. To facilitate the geo referencing of the polygons, it was determined that the average (nominal) scale of the aerial photography was also approximately 1:24,000. 43 plots were generated at the normal scale on mylar overlays to cover the entire study and its environs.

Manual Rectification - Heads Up Digitizing

The first step in geo - referencing the vegetation polygons delineated on the photo overlays involves manually fitting the linework to hard copies of the DOQQ's. This is a highly labor intensive procedure that must account for distortion in the aerial photography caused mainly by elevation changes and distance from the photo nadir.

Manual rectification is conducted by attaching a new mylar overlay to the hard copy DOQQ. The photo signature delineations were transferred to the overlays through local registration of the photos with the attached photo signature delineation overlay. A small area of the photo was registered to the base at a time. By matching photo image to orthophoto image, the delineations were transferred to the base overlay. Because the parallax of the photo differs from that of the orthophoto base, care was required in transfer. Inconsistent stretching or shortening of the images was common from the photo to the base. When one area was completed, the photo was shifted to register to another small area. The process continued until the manual rectification and transfer of polygons was complete. Three code attributes were placed on the overlays: 1) Values containing alliance (series) / association codes, 2) Height, and 3) Density attributes. These codes were transferred from the corresponding photo overlays.

A quality control step was performed in order to assure accuracy of the rectification and delineation, and transfer of the codes. A senior interpreter reviewed the overlays for accuracy and completeness of transfer and made the appropriate changes where needed.

This procedure was performed for approximately half of the more complicated portions of the study. The remaining modules had line - work directly transferred from the photo overlays to the DOQQ's in an ArcView environment. This heads up digitizing procedure eliminated several interim steps including attribute assignments, manuscript map preparation, sequence number assignments, polygon encoding and scanning.

DOQQ Edge Problems
Several minor inconsistencies were noted between DOQQ's. These problems were evident along some of the quad boundary edges, however all discrepancies were below 10 meters.

Manuscript Map Preparation
Approximately twenty manuscript maps (roughly half the study area), were created to input the spatial component of the vegetation mapping units. The manuscripts were produced by pin - registering a clean sheet of mylar to the base. The vegetation delineations from the manually rectified overlays were transferred to the new overlays using black P2 Pentel lead suitable for scanning. The manuscript maps were carefully edited to ensure completeness and correctness. The editing included comparing the manuscripts with the original delineations on the aerial photos.

Quality Assurance of the Manuscript Maps
The final manuscript maps underwent a quality assurance review. The manuscript maps were compared to geo referenced (rectified) overlays to ensure that all line - work was transferred correctly. Particular attention was given to the quality of the line delineations with respect to gaps and other irregularities.

Sequence Number Assignment
Sequential identification number overlays were produced for the manuscript maps. A clean sheet of mylar was pin - registered to each manuscript, and each polygon was labeled with a unique sequence number. These sequence numbers were used to tie the spatial files to the keypunched attribute files.

Polygon Attribute Encoding
To expedite the encoding of the vegetation attributes for each polygon, a Quattro Pro spreadsheet file was created for each sheet. A separate field was created for the polygon sequence number, PI code, height code, density code, land use code and Vision Fire burn attributes. The manuscript maps, sequence number overlays and attribute overlays were pin - registered together on a light table. The coder, following the numbers on the sequence number overlays, entered the vegetation attributes for each polygon. During this task, the coder verified the accuracy of the sequence number labels. Any errors found on the sequence number overlay were corrected to ensure that each polygon had a unique identifier.

Spatial Data Input / Scanning

The manuscript maps were scanned and converted into ARC / INFO coverages at ESRI. Prior to any production scanning, test scans of small areas of the data map were conducted to determine the optimum raster to vector conversion settings. The critical settings that determine the output resolution and completeness are the TOLERANCE and THRESHOLD. The TOLERANCE, which governs the output resolution and is comparable to fuzzy tolerance, would be set to .01 inches (10 feet at 1:12,000 scale). The THRESHOLD is a reflectance measure. It is dependent on the physical characteristics of the data maps and their contents and is determined through testing. Once the THRESHOLD was derived, production scanning of manuscript maps began.

Assigning Polygon Identifiers

In an earlier step, the vegetation polygons were assigned a unique identifier. The numbers were sequenced 1 through "n" (4 - digit item width) and were drawn on the sequence number overlays. The manuscript maps and the sequence number overlays were registered together on the digitizing board. The polygon identifiers were sequentially input as label points. To ensure that all labels points were entered, the processor marked off each label as it was digitized.

Creation of Topology

Topology is the mathematical procedure for explicitly defining spatial relationships. In the case of maps, topology defines connections between features, identifies adjacent polygons, and can define one feature such as an area, as a set of other feature types (i.e., lines). A topological database has several advantages: efficient data storage, faster processing, and the ability to perform analysis, such as modeling transportation networks or overlaying geographic features on one another.

Once the manuscript map's polygon boundaries and label points had been input into the computer, the ARC / INFO software CLEAN command was used to create the "coverage topology." The CLEAN fuzzy tolerance was set to .002 inches to preserve the required data resolution. When other coordinate edits were made to a coverage after the CLEAN command was run, topology was recreated utilizing the BUILD command.

Label Entry Error Processing

Label errors were identified by using the LABELERRORS command in ARC. Using ARCEDIT, any label errors identified were corrected by entering the missing label number and placing it within the correct polygon. Once all the errors were corrected, the coverages were joined with the attribute files.

Joining of Attribute and Spatial Data

The Quattro Pro code file was converted into an INFO file. Once converted it was related to the feature attribute table by the sequence number found in both files. An INFO item, named "SEQNO" was added to the feature attribute table. The sequence number for each polygon was calculated to equal its coverage I.D. number. The ARC / INFO command JOINITEM was used to join the code file to the feature attribute table. The spreadsheet file was joined with its corresponding coverage. Each variable interpreted from the aerial photography was assigned a unique item (field).

Code Verification and Edit Plot Quality Assurance
Code verification involved running each coverage attribute file through a series of ARC / INFO commands that checked for invalid codes. These commands produced listings that aided in identifying abnormal codes. The errors were checked against the vegetation delineation and attribute overlays. Corrections were made to the listings and input into the database.

ESRI produced a plot of the converted spatial data and sequence numbers (label I.D.s) for each manuscript. The plot was checked by AIS for cartographic quality of the arcs defining the polygon features and the accuracy of the label I.D. assignments. The plots was overlaid to the manuscript maps to verify that the scanned data was not distorted beyond .02 map inches. Other problems were noted on the plots, including line overshoots and undershoots, missing lines, premature convergence of polygon boundary lines that intersected arcs at acute angles, and incorrect sequence number assignments.

ESRI also produced code verification plots of the PI codes, height codes, density codes, and land use code attributes. The plots were checked by AIS for coding errors that may have occurred during the polygon attribute encoding step. The plots were overlaid on the corresponding manual rectification code attribute overlay. Code changes were noted on the plot.

Final Quality Assurance of the Vegetation Map
Once the rectifying of the polygon data was completed and the attribute items populated, a final on screen review of line - work and community designations was performed in an ArcView session. Any final corrections to the community association assignments were then made to the database. Revised coverages were mapjoined to create a single coverage. The final coverage of the vegetation database was delivered to ESRI for input into the final project database structure.

Photo Interpretation Notes on Accuracy Assessment

General Observations

- Aerial Photo Scale: The photo interpreters worked with 1:24000 scale photography. This is slightly coarser than aerial photography used by the USFS in their efforts to establish dominant and co - dominant tree species in forest mapping. In general, this scale is adequate to distinguish most tree species that form dominant stands over areas greater than 1 hectare. Where more than one species co - dominate over an area, it becomes difficult to establish a reliable signature as to which species has a higher relative cover. 1:24000 photography is adequate to distinguish several species of shrubs only if they form extensive stands yielding an overall signature pattern. Individual species at the shrub layer cannot for the most part be distinguished on 1:24000 photography. Separation of species below the shrub layer (sub - shrubs and herbaceous) is possible only where the species or co - dominance of species covers extensive areas that form an overall tone and texture identifiable to the photo interpreter.

- Aerial Photo Media: Photos were produced on print media - Negative images were not available for interpretation. In general, print media yields a coarser and somewhat grainier resolution although it is hard to quantify the difference.
- Temporal Change: Several areas have undergone a type - change from when the aerial photography was flown in 1994 and when the accuracy assessment was performed five years later. Most noticeable is the decrease in yellow bush lupine and increase in Douglas - fir.
- Seasonality: As a rule, flying during different seasons yields differing results depending on the growth characteristics of the vegetation that is being interpreted. The NPS photography was flown in early spring in conditions where growth of the herbaceous layer is in flush conditions between 20 and 50% of the total "biomass". Unfortunately, this is the least desirable time to identify out low shrub layers that at the time would not stand out from the adjacent grasslands. Other herbaceous species; especially non - native perennials which often form nearly pure stands are more noticeable in the summer die - off period than in early spring. Note examples on the following page:

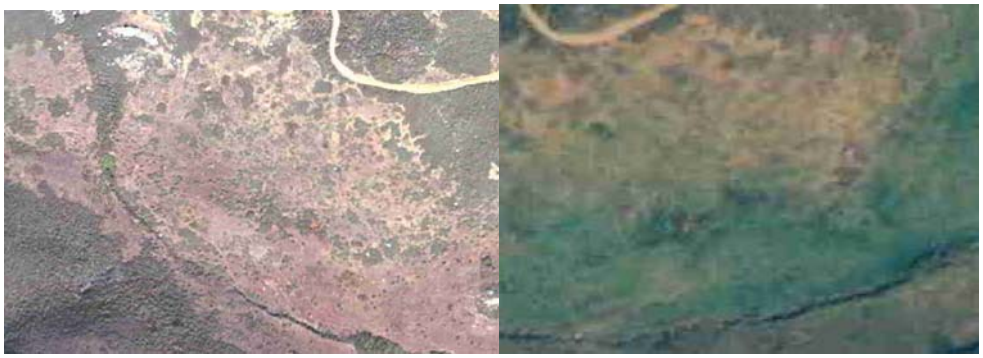
Harding Grass (September Imagery 1 meter resolution Natural Color)

Harding Grass (March 1:24000 Natural Color Photography)

Below is an example showing difficulties with the existing aerial photography flown in early spring in distinguishing sparse coyote brush from the adjacent annual grasslands.

Sparse Coyotebrush (Fall Imagery 1 meter resolution Natural Color)

Sparse Coyotebrush (March 1:24000 Natural Color)



Although the sparse coyotebrush is visible on the March aerial photography, relative shrub cover is generally estimated lower than actually exists; therefore many coyotebrush stands were misinterpreted as grasslands resulting in a “life - form” level error.

Specific Observations at the Superalliance Level

Several vegetation units listed below depict vegetation interpreted at an alliance level or sub - alliance level. Problem types (mapped below 80% accuracy) are noted below

Note: * Denotes Alliance Level Mapping, * Denotes Sub - alliance Level Mapping

- California Bay - Coast Live Oak - Highest error emanating from stands where a sparse emergent canopy of Douglas - fir of around 10% relative cover was incorrectly mapped into the hardwood community
- *Red Alder - Confusion with other riparian type (Mixed Willow) especially when tree - form willows dominate
- **Open Grassy Coyotebrush - Yellow Bush Lupine - Confusion with the more coastal type of dune - lupine - dune sagewort - dunegrass - Coyotebrush is often a component in both types
- Wax Myrtle - Salmonberry - Stands generally too small to extrapolate an adequate signature from the 1:24000 aerial photography
- Coyotebrush - Blueblossom - Confusion with other dense coyotebrush especially ones containing California coffeeberry which is easily confused with blueblossom
- Holly - leaf Cherry - Coyotebrush - Confusion with coyotebrush with coffeeberry - a very similar signature. This type was not extensive enough to establish a PI signature although it appears to be more common south of the study area
- **Mature Coyotebrush - Coffeeberry - Poison Oak - General confusion with other coyotebrush stands which are drier and more open
- *Sensitive Manzanita - Confusion with other species of manzanita normally occupying more xeric settings
- Coyotebrush - California Sagebrush - Confusion with other dry open coyotebrush especially open grassy coyotebrush - lupine.
- Pacific Reedgrass - carex - juncos - Some confusion with introduced perennial grasses and open coyotebrush; an especially difficult type to separate out using early spring photography
- Introduced Perennial Grasses - Early spring photography yields substantial confusion with open sparse coyotebrush stands and wet meadow types.
- *Cordgrass - Sample size is small, but later established that this type was not visible on the photography.
- Native Weedy Grassy - Early spring photography yields substantial confusion with open sparse coyotebrush.

Preliminary Data Dictionary - PRNS / GGNRA

I. Data Format Outline:

Variable Structure:

Coverage related variables:

Area	8	18	F
Perimeter	8	18	F
Poreveg#	4	5	B
Poreveg - id	4	5	B

Defined variables:

PI	4	5	B
Height	4	2	B
Density 4	2	B	
Burn	1	1	B

II. Preliminary Data Dictionary:

PI (Defines the TNC Alliance (Series), Association or Mapping Unit)

(See the following Preliminary Classification of Vegetation Types for numeric values)

HEIGHT - Defines average height of the alliance or association type (Tree - Shrub - Herbaceous)

1 = <0.5 meters
2 = 0.5 - 2 meters
3 = 2 - 5 meters
4 = 5 - 15 meters
5 = 15 - 35 meters
6 = 35 - 50 meters
7 = >50 meters
9 = Not Applicable

ABSOLUTE CROWN DENSITY - Defines average density of the life form of the alliance or association type (Tree - Shrub - Herbaceous)

1 = Closed / Continuous: >60%
2 = Discontinuous: 40% - 60%
3 = Dispersed: 25% - 40%
4 = Sparse: 10% - 25%
5 = Rare: 2% - 10%
9 = Not Applicable

BURN MODIFIER - Defines polygons (shrub and tree types) that were burned in the Vision fire area.

1 = Burned
2 = Not Burned
3 = Not Known (Herbaceous and & 9000 code polygons)

FILE SPECIFICATIONS:

Coordinate system: NAD83 UTM projection - Meters

Preliminary Classification of Vegetation Types (CNPS Series Level)
PRNS / GGNRA

CLASS

Formation

Series (Alliance) - Stands - Mapping Units

Association - Multiple Association Mapping Units

UNKNOWN

00000 - Polygons not known (Mostly Angel Island & San Francisco Presidio)

FORESTS

01000 - Lowland or Submontane Winter - rain Evergreen Sclerophyllous Forests

01010 - California Bay Alliance
- 01011 - *Umbellularia californica / Lithocarpus densiflorus* Association
- 01012 - *Umbellularia californica / Polystichum munitum* Association
- 01014 - *Umbellularia californica / Quercus agrifolia / Toxicodendron* Association

01030 - Eucalyptus Alliance
01070 - Tanoak Alliance
01090 - Giant Chinquapin Alliance

02000 - Giant Temperate or Subpolar Needle - leaved Evergreen Forests

02010 - Douglas - fir Alliance
- 02011 - *Pseudotsuga menziesii / Umbellularia californica / Polystichum munitum* Association
- 02012 - *Pseudotsuga menziesii / Baccharis pilularis* Association
- 02013 - *Pseudotsuga menziesii / Quercus agrifolia* Association
- 02015 - *Pseudotsuga menziesii / Umbellularia californica / Rhamnus californica* Association
- 02020 - *Pseudotsuga menziesii / Lithocarpus densiflorus / Rhamnus California* Association

02050 - Coast Redwood Alliance
- 02051 - *Sequoia sempervirens / Lithocarpus / Vaccinium ovatum* Association
- 02052 - *Sequoia sempervirens - Pseudotsuga - Umbellularia* Association

03000 - Rounded - Crowned temperate or Subpolar Needle - leaved Evergreen Forests

03030 - Bishop Pine Alliance
- 03031 - *Pinus muricata - Arbutus menziesii / Vaccinium ovatum* Association

03120 - Monterey Pine or Monterey Cypress Alliance
03150 - Sergeant Cypress Alliance

07000 - Temporarily Flooded Cold - deciduous Forest

07060 - Mixed Willow “Super Alliance” Mapping Unit
07070 - Red Alder Alliance
- 07071 - *Alnus rubra / Rubus spectabilis - Sambucus racemosa* Association
- 07072 - *Alnus rubra / Salix lasiolepis* Association

WOODLANDS

12000 - Sclerophyllous Evergreen Woodland

12020 - Coast Live Oak Alliance
12021 - *Quercus agrifolia - (Arbutus menziesii) - Umbellularia californica* Association
12022 - *Quercus agrifolia - Toxicodendron* Association

14000 - Cold Deciduous Woodland

14020 - California Buckeye Alliance

SHRUBLANDS

19000 - Temperate Broad - leaved Evergreen Shrubland

19010 - Yellowbush Lupine Alliance

20000 - Hemi - sclerophyllous Temperate Broad - leaved Evergreen Shrubland

20010 - California Wax Myrtle Alliance
20020 - Blue Blossom Alliance
20050 - Hazel Alliance

21000 - Sclerophyllous Temperate Broad - leaved Shrubland

21110 - Chamise Alliance
21140 - *Adenostoma fasciculatum - Arctostaphylos glandulosa - Q. wislizeni* Association
21210 - Eastwood Manzanita Alliance
21260 - *Arctostaphylos glandulosa - Quercus wislizeni* Association
21250 - Holly - leaf Cherry Alliance
21460 - Coffeeberry Alliance
21470 - Mixed Manzanita Mapping Unit
21480 - Sensitive Manzanita Alliance

24000 - Microphyllous Evergreen Shrubland

24040 - Mixed Broom Alliance
24050 - Coyote Brush Alliance
24051 - *Baccharis pilularis - Artemisia californica - Toxicodendron / Monardella villosa* Association
24052 - *Baccharis pilularis - Lupinus arboreus / Lupinus chamissonis* Association
24053 - *Baccharis pilularis - Polystichum munitum* Association
24054 - *Baccharis pilularis - Ceanothus thyrsiflorus / Nassella pulchra* Association
24055 - *Baccharis pilularis - Rhamnus Californicus - Rubus parviflorus* Association
24056 - *Baccharis pilularis - Nassella pulchra* Association
24057 - *Baccharis pilularis - Avena barbata* Association
24058 - *Baccharis pilularis* - Native Grassland Association
24059 - *Baccharis pilularis - Toxicodendron diversilobum* Association
24060 - *Baccharis pilularis - Eriophyllum staechadifolium* Association
24063 - *Baccharis pilularis - Carex obnupta - Juncus patens* Association
24064 - *Baccharis pilularis - Rubus ursinus / Weedy* Association
24065 - *Baccharis pilularis* - Non - native Grasslands Association

24066 - *Baccharis pilularis - Corylus cornuta* Association
24067 - *Baccharis pilularis - Prunus illicifolia* Association
24080 - California Sagebrush Alliance
24999 - Gorse Alliance

30000 - Temperate Cold - deciduous Shrubland
30010 - Hazel Alliance
30040 - Poison Oak Alliance
30050 - Salmonberry Alliance

32000 - Temporarily Flooded Cold - deciduous Shrubland

32080 - Arroyo Willow Alliance

HERBACEOUS

46000 - Tall Bunch Temperate Grassland

46020 - Pacific Reedgrass Alliance
46021 - *Calamagrostis nutkaensis - Baccharis pilularis* Association
46022 - *Calamagrostis nutkaensis - Carex spp. - Juncus spp.* Association

47000 - medium - tall Sod Temperate or Subpolar Grassland

47010 - European Dunegrass Alliance
47030 - Introduced Perennial Grasslands Mapping Unit

51000 - Intermittently Flooded Temperate or Subpolar Grassland

51010 - Saltgrass Alliance

52000 - Temporarily Flooded Temperate or Subpolar Grassland

52030 - Rush Alliance
52040 - Tufted Hairgrass Alliance

55000 - Saturated Temperate or Subpolar Grassland

55020 - Bulrush - Cattail - Spikerush Marsh Mapping Unit

56000 - Tidally Flooded Temperate or Subpolar Grassland

56010 - Cordgrass Alliance

62000 - Low Temperate or Subpolar Perennial Forb Vegetation

62040 - Iceplant Alliance
62060 - Dune Sagebrush - Goldenbush Alliance Complex Mapping Unit

64000 - Saturated Temperate Perennial Forb Vegetation

64030 - Pickleweed Alliance
64032 - *Salicornia virginica - Distichlis spicata - Jaumea carnosa* Association

67000 - Tall Temperate or Subpolar Grasslands

67010 - California Annual Grassland Mapping Unit
67020 - California Annual Grasslands with a Native Component Mapping Unit
67030 - Purple Needlegrass Alliance

MISCELLANEOUS CLASSES

90000 - Land Use / Non - vegetated

90200 - Active Pasture or Agriculture
90210 - Heather Fields
90300 - Built - up / Urban Disturbance
90400 - Non - vegetated
90401 - Dunes, Bluffs, Cliffs, or Outcrops
90402 - Beaches or Mudflats
90403 - Disturbed
98000 - Water

SUPERALLIANCE LEVEL MAPPING UNITS AS COMBINED

California Bay - Coast Live Oak Superalliance

01010 - California Bay Alliance
- 01011 - *Umbellularia californica/Lithocarpus densiflorus* Association
- 01012 - *Umbellularia californica/Polystichum munitum* Association
- 01013 - *Umbellularia/Quercus chrysolepis Association*
- 01014 - *Umbellularia californica/Quercus agrifolia/Toxicodendron* Association

12020 - Coast Live Oak Alliance
- 12021 - *Quercus agrifolia (Arbutus menziesii)-Umbellularia californica* Association
- 12022 - *Quercus agrifolia-Toxicodendron (corylus cornuta)* Association

12030 - Pacific Madrone Alliance

14020 - California Buckeye Alliance

Eucalyptus Superalliance

01030 - Eucalyptus Alliance

Redwood-Tanoak Superalliance

01070 -Tanoak Alliance

02050 - Coast Redwood Alliance
- 02051 - *Sequoia sempervirens / Lithocarpus/Vaccinium ovatum* Association
- 02052 - *Sequoia sempervirens-Pseudotsuga-Umbellularia* Association

Bishop Pine-Chinquapin Superalliance

01090-Giant Chinquapin Alliance
- 01091-*Chrysolepus chrysophylla / Vaccinium ovatum* Association

03030-Bishop Pine Alliance
- 03031 - *Pinus muricata-Arbutus menziesii/Vaccinium ovatum* Association

Douglas-fir Superalliance

02010 - Douglas-fir Alliance
- 02011 - Pseudotsuga menziesii/Umbellularia californica / Polystichum munitum Association
- 02012 - *Pseudotsuga menziesii / Baccharis pilularis* Association
- 02013 - *Pseudotsuga menziesii/Quercus agrifolia* Association
- 02014 - *Pseudotsuga menziesii/Quercus chrysolepis* Association
- 02015 - Pseudotsuga menziesii/Umbellularia californica/Rhamnus californica Association
- 02020 - *Pseudotsuga menziesii/Lithocarpus densiflorus/Rhamnus californica* Association

30010 - Hazel Alliance
- 30011 - *Corylus cornuta/Polystichum munitum* Association

Monterey Pine - Monterey Cypress Superalliance

03120 - Monterey Pine or Monterey Cypress Alliance

Arroyo, Red, Black, and Yellow Willow Superalliance

07030-Yellow Willow Alliance

07040 - Black Willow Alliance

07050 - Red Willow Alliance

07060 - Mixed Willow Mapping Unit
- 07061-*Salix lasiolepis - Salix Lucida* Association
- 07062-*Salix lasiolepis - Salix Rubus* Association

32080 - Arroyo Willow Alliance

Red Alder Superalliance

07070 - Red Alder Alliance

07071- *Alnus rubra/Rubus spectabilis - Sambucus racemosa* Association
07072-*Alnus rubra/Salix lasiolepis* Association

Open Grassy Coyotebrush-Yellowbush Lupine Superalliance
19010-Yellow Bush Lupine Alliance
24040-Mixed Broom Alliance
24056 - *Baccharis pilularis - Nassella pulchra* Association
24057 - *Baccharis pilularis - Avena barbata* Association
24058 -*Baccharis pilularis* - Native Grassland Component Mapping Unit
24061- *Baccharis pilularis - Danthonia californica* Association
24064 - *Baccharis pilularis - Rubus ursinus* - Weedy Association
24065 - *Baccharis pilularis* - Non - native Grassland Mapping Unit
24068 - *Baccharis pilularis - Deschampsia cespitosa* Association
24999-Gorse Alliance
30030-Sweet-brier (Rosa eglanteria) Alliance
90210-Heather Fields Alliance

Wax Myrtle - Salmonberry Superalliance
20010 - California Wax Myrtle Alliance
30020 - Mexican Elderberry (Sambucus mexicana) Alliance
30050 - Salmonberry Alliance

Coyotebrush - Blue Blossom Superalliance
20020 - Blue Blossom Alliance
24054 - *Baccharis pilularis / Ceanothus thyrsiflorus (Nassella pulchra deleted)* Association

Chamise - Manzanita Superalliance
21110 - Chamise Alliance
21140 - *Adenostoma fasciculatum/Arctostaphylos glandulosa/Quercus wislizenii* Association
21142 - *Adenostoma fasciculatum/Mimulus aurantiacus* Association
21143 - *Adenostoma fasciculatum/ Arctostaphylos glandulosa/Heteromeles arbutifolia* Association
21210 - Eastwood Manzanita Alliance
21260 - *Arctostaphylos glandulosa/Quercus wislizeni* Association
21270 - Leather Oak (Quercus durata) Alliance
21440 - Mt. Tamlpias Manzanita (Arctostaphylos hookeri ssp. Montana) Alliance
21450 - Woolly-leaf Manzanita (Arctostaphylos tomentosa) Alliance
21470- - Mixed Manzanita Mapping Unit

Holly-Leafed Cherry - Coyotebrush Superalliance
21250 - Holly-leafed Cherry Alliance
24067 - Baccharis pilularis */ Prunus illicifolia* Association

Sensitive Manzanita Superalliance
21480 - Sensitive Manzanita Alliance
21481 - *Arctostaphylos nummularia/Vaccinium ovatum/Chrysolepis chrysophylla* Association

Mature Coyotebrush - Coffeeberry - Poison Oak Superalliance
21460 - Coffeeberry Alliance
21461 - *Rhamnus californica/Baccharis pilularis/Scrophularia californica* Association
24050 - Coyotebrush Alliance
24053 - *Baccharis pilularis / Polystichum munitum* Association
24055 - *Baccharis pilularis/ / Rhamnus californicus / Rubus parviflorus* Association
24059 - *Baccharis pilularis/Toxicodendron diversilobum* Association
24062 - *Baccharis pilularis / Holodiscus discolor* Association

24066 - *Baccharis pilularis / Corylus cornuta* Association
30040 - Poison Oak Alliance
30041 - *Toxicodendron diversilobum / Baccharis pilularis / Rubus parviflorus* Association

Coyotebrush - California Sagebrush Superalliance
24080 - California Sagebrush Alliance
24051 - *Baccharis pilularis /Artemisia californica / Toxicodendron diversilobum / Monardella villosa* Association
24060 - Baccharis pilularis */ Eriophyllum staechadifolium* Association

Dune Lupine - Dune Sagewort - Dunegrass Superalliance
24052 - Baccharis pilularis*/ Lupinus arboreus / Lupinus chamissonis* Association
47010 - European Dunegrass Alliance
62040 - Iceplant (*Carpobrotus edulis*) Alliance
62050 - Coast Buckwheat (*Eriogonum latifolium*) Alliance
62060 - Dune Sagewort - Goldenbush Complex Mapping Unit
62063 - Dune Lupine - Goldenbush Alliance
62061 - *Lupinus chamissonis / Ericameria ericoides* Association
62064 - Dune Sagewort Alliance
62062 - *Dune Sagewort - Spiny Sandmat* Association

Pacific Reedgrass - Carex - Juncus Superalliance
24063 - *Baccharis pilularis / Carex obnupta / Juncus patens* Association
45020 - Pacific Reedgrass Alliance
46021 - *Calamagrostis nutkaensis / Baccharis pilularis* Association
46022 - *Calamagrostis nutkaensis / Carex spp. / Juncus spp.* Association
52030 - Rush Alliance
52031 - *Juncus effusus* Association
52032 - *Juncus patens* Association
52060 - Slough Sedge Alliance
52061 - *Carex obnupta / Juncus patens* Association
52070 - Small-fruited Bulrush (*Scirpus microcarpus*) Alliance

Coyotebrush Superalliance (unable to key)
24099 - Coyotebrush Alliance

Introduced Perennial Grassland - Deschampsia Mapping Unit Superalliance
47030 - Introduced Coastal Grassland Mapping Unit
52040 - Tufted Hairgrass Alliance
52050 - Red Fescue (*Festuca rubra*) Alliance

Pickleweed - Saltgrass Superalliance
51010 - Saltgrass Alliance
51011 - *Distichlis spicata / Frankinia salina / Jaumea carnosa* Association
64030 - Pickleweed Alliance
64031 - *Salicornia virginica / Triglochin concinea* Association
64032 - *Salicornia virginica / Distichlis spicata / Jaumea carnosa* Association

Bulrush - Cattail Superalliance
55020 - Bulrush - Cattail - Spikerush Marsh Mapping Unit
55030 - Bulrush (*Scirpus Californicus*) Alliance
55040 - Bulrush - Cattail *(Scirpus californicus - Typha latifolia*) Alliance
55050 - Spikerush (*Eleocharis spp.*) Alliance
55060 - Cattail Alliance

Cordgrass Superalliance

56010 - Cordgrass (*Spartina foliosa*) Alliance

Native - Weedy Grassland Superalliance

67010 - California Annual Grassland Weedy Alliance
67020 - California Annual Grassland with Native Component Mapping Unit
67030 - Purple Needlegrass Alliance
67040 - California Oatgrass (*Danthonia californica*) Alliance

Non-vegetated Alliance Level Features (not to be aggregated at Superalliance level)

90000 – Landuse / Non-vegetated
90200 - Active Pasture or Agriculture
90300 – Built - up Urban Disturbance
90400 – Non - vegetated
90401 - Dunes
90402 - Beaches and Mudflats
90403 - Disturbed
98000 - Water
99999 - Unable to label

VEGETATION DESCRIPTIONS FOR POINT REYES NATIONAL SEASHORE AND GOLDEN GATE NATIONAL RECREATION AREA

Each description is written in a standardized format used by NatureServe to induct newly defined vegetation types into the National Vegetation Classification System (see below for descriptive template).

INFORMATION IN VEGETATION DESCRIPTIONS

GLOBAL NAME
Association name based on Latin names of dominant or characteristic plant species. The association (or plant association) is the finest level of the classification system. It is the level at which community inventory and conservation action are aimed.

COMMON NAME
Association common name; same as the GLOBAL NAME but with common names instead of scientific names for the species. Common names are derived from the NRCS Plants database.

SYNONYMS
Other names by which the community may be more easily recognized or described.

PHYSIOGNOMIC CLASS
The second level of the National Vegetation Classification System that is a vegetation structural classification adapted from UNESCO in 1973 and Driscoll et al., 1984. This level is based on the structure of the vegetation. This is determined by the height and relative percentage of cover of the dominant life - forms: tree, shrub, dwarf - shrub, herbaceous, and nonvascular.

PHYSIOGNOMIC SUBCLASS
The third level of the National Vegetation Classification System. This level is determined by the predominant leaf phenology of classes defined by a tree, shrub, or dwarf - shrub stratum; the persistence and growth form of herbaceous and nonvascular vegetation; and particle size of the substrate for sparse vegetation (e.g., consolidated rocks, gravel / cobble).

PHYSIOGNOMIC GROUP
The fourth level of the National Vegetation Classification System. The group generally represents a grouping of vegetation units based on leaf characters such as broadleaf, needleleaf, microphyllous, and xeromorphic. These units are identified and named with broadly defined macroclimatic types to provide a structural - geographic orientation, but the ecological climate terms do not define the groups *per se*.

PHYSIOGNOMIC SUBGROUP
The fifth level of the National Vegetation Classification System represents a distinction between natural vegetation including natural, seminatural and some modified vegetation, and cultural vegetation (planted / cultivated).

FORMATION
The sixth level of the National Vegetation Classification System represents a grouping of community types that share a definite physiognomy or structure and broadly defined environmental factors such as elevation and hydrologic regime.

ALLIANCE: Level of the National Vegetation Classification System reflecting a physiognomically uniform group of plant associations sharing one or more diagnostic species (dominant, differential, indicator, or character) that (generally) are found in the uppermost stratum of the vegetation.

CLASSIFICATION CONFIDENCE LEVEL: The degree of confidence associated with the classification of the Element (association or alliance). This confidence is based on the quality and type of data used in the analysis as well as the extent to which the entire (or potential) range of the Element was considered.

1. STRONG
Classification based on recent field data. Information is based on Element Occurrences or other data based on occurrences that can be relocated. Classification considers information collected across the entire range or potential range of the Element. Classification may be based on quantitative or qualitative data.

2. MODERATE
Classification is based on data that is of questionable quality, limited numbers of sample points, or data from a limited range.

3. WEAK
Classification is based on secondary or anecdotal information or a new type for which data have only been collected at a small number of sites.

USFWS WETLAND SYSTEM:
USFWS Wetland Classification System, if applicable. (Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitats of the United States.* United States Fish and Wildlife Service. Washington, DC).

RANGE:
Globally
Description of the association's present range including states of occurrence.

PRNS - GGNRA
Description of where the community is found in the Park (if known).

ENVIRONMENTAL DESCRIPTION
Globally
Most important environmental determinants of the biological composition or structure of this association and / or its subtypes.

PRNS - GGNRA
Important environmental determinants of the biological composition or structure of this association within the study area (if known).

MOST ABUNDANT SPECIES
Globally
Stratum Species
Most abundant species by stratum.

PRNS - GGNRA
Stratum Species
Most abundant species by stratum.

CHARACTERISTIC SPECIES
Globally
Latin names of plant species not necessarily most abundant but that are characteristic or diagnostic of the association when taken singly or in combination with other species.

PRNS - GGNRA
Characteristic species for the association, if different from global species.

VEGETATION DESCRIPTION
Globally
Additional comments on vegetation attributes of the association including species richness, diversity, physiognomic structure, spatial distribution of vegetation, strata height, dominant life - forms, coverage of unvegetated substrate, and additional compositional comments.

PRNS - GGNRA
Vegetation description for the association, if different from global concept.

OTHER NOTEWORTHY SPECIES
High ranked species, animals, endemics, disjuncts, or exotics that are found within occurrences of this association.

CONSERVATION RANK
Global Element Rank that characterizes the relative rarity or endangerment of the association worldwide. The ranking system is based on the NatureServe national system of global and state rarity. This is a ordinal scale ranking from 1 (rarest) to 5 (most ubiquitous) both as the type occurs in a given state (the “S” rank) and globally (the “G” rank). Further description of the criteria may be found at the NatureServe website (www.natureserve.org)

RANK JUSTIFICATION
Reason for assigning the Global Element Rank, such as number of occurrences, number of hectares, total area reduction from original, threats, degradation, and so forth.

DATABASE CODE
Element Code from the National Community Database.

COMMENTS
Globally
Any other comments about this association not covered in the fields above such as landscape relationships, inclusion communities, and so forth.

PRNS - GGNRA
Any other comments about this association specific to the mapping area including notes about possible problems in photo interpretation.

PLOTS USED TO DESCRIBE THIS TYPE (association or alliance): Each of the sample relevé plots used to describe the vegetation are listed. They refer to the sample names given in the plots database for the vegetation sampling for this project.

TREE DOMINATED VEGETATION

EVERGREEN FORESTS AND WOODLANDS

Forests Dominated by California Bay, Douglas - fir, and Coast Live Oak (in part)

CALIFORNIA BAY ALLIANCE

California Bay (*Umbellularia californica)* Alliance - pi code 01011

This alliance is represented by three associations in the mapping area, all first described during this study. They are arranged bioclimatically from the coolest and most moist (*Umbellularia californica - Quercus chrysolepis* Association) to the warmest and driest (*Umbellularia californica - Quercus agrifolia / Toxicodendron* - (*Corylus cornuta*) Association). The most widespread association is the mesic *Umbellularia californica / Polystichum munitum* Association. In addition to these associations there were several other expressions of this alliance sampled during the study, suggesting further variation within the study area. These plots include stands characterized by the following species combinations:
***Umbellularia californica - Lithocarpus densiflorus* plot: (PRNS81)**
***Umbellularia californica - Garrya elliptica* plot: (PRNS073) tall scrub with equal or more *Garrya*)**
***Umbellularia californica - Quercus wislizeni* plots: (GGNRA253, PRNS187)**
The California Bay alliance ranges from Southwestern Oregon to San Diego County and includes stands in the California Coast ranges, Klamath Mountains and the lower western slopes of the Sierra - Cascade Ranges.

Umbellularia californica - Lithocarpus densiflorus Association (preliminary)
- pi code 01011 Insufficient relevé plots to describe this association, currently rolled into classification hierarchy with *Umbellularia californica / Polystichum munitum* Association - pi code 01012)

Umbellularia californica / Polystichum munitum Association
- pi code 01012

COMMON NAME	California Laurel / Pineland Sword Fern Forest
SYNONYM	None
PHYSIOGNOMIC CLASS	Forest
PHYSIOGNOMIC SUBCLASS	Evergreen forest
PHYSIOGNIMIC GROUP	Winter - rain broad - leaved evergreen sclerophyllous forest
PHYSIOGNOMIC SUB GROUP	Natural / Semi - natural
FORMATION	Lowland or submontane winter - rain broad - leaved evergreen sclerophyllous forest
ALLIANCE	*Umbellularia californica* Forest Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE

Globally
This association is known from the vicinity of the San Francisco Bay area including Alameda, Marin, Contra Costa, and San Mateo Counties (Keeler - Wolf personal observation 1998 - 2000). It is possible that this association continues farther north and south in the outer Coast Ranges of California.

PRNS / GGNRA
Stands of this association are primarily found throughout the Olema Valley and on the east side of the Bolinas Ridge.

ENVIRONMENTAL DESCRIPTION
Globally
This association is a relatively mesic type that occupies ravine bottoms or northerly or north - easterly facing slopes in the San Francisco Bay area. Stands may occupy slopes up to 45% steep and are usually found on marine sediments including soils derived from the Franciscan Formation.

PRNS / GGNRA
Stands of this association grow on moderate to steep slopes of all aspects. They can inhabit any slope position, and prefer fine sandy to coarse sandy loams. Most stands are in narrow, relatively deep canyons or valleys.

MOST ABUNDANT SPECIES
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Tree	*Umbellularia californica*
Shrub	*Polystichum munitum*

CHARACTERISTIC SPECIES
Globally
This association is only known in detail from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory. However, anecdotal observations (Keeler - Wolf personal observations) of this association in the Berkeley and Oakland Hills of Contra Costa County indicate *Polystichum munitum* as the principal understory species with *Umbellularia californica* as the principal canopy species.

PRNS / GGNRA

Tree	*Umbellularia californica*
Shrub	*Polystichum munitum*

VEGETATION DESCRIPTION
Globally
This association as seen in the Berkeley and Oakland Hills is composed of a dense canopy of up to 95% cover of single to multiple stemmed individuals of *Umbellularia californica* from 12 to 20 m tall with a sparse shrub and sapling layer of various species including *Corylus cornuta, Symphoricarpos mollis*, and *Ribes malvaceum.* The herbaceous layer is dominated by open to dense clumps of *Polystichum munitum* estimated as covering from 15 to 80% of the ground.

PRNS / GGNRA
This forest association is heavily dominated by *Umbellularia californica,* which forms an intermittent to continuous canopy between 10 - 20 meters in height. Some stands have other tree species present, but these seldom attain much cover. Some shrubs, such as *Toxicodendron diversilobum* or *Rhamnus californica* ssp. *californica,* occasionally attain small tree stature. *Polystichum munitum* dominates the shrub layer between 1 - 2 meters, contributing up to 80% cover. Other shrubs may include *Corylus cornuta, , Toxicodendron diversilobum*, and / or *Rubus ursinus,*. The herbaceous layer is fairly open, but can include such species as

Stachys ajugoides, Scrophularia californica, Erechtites minima (exotic), *Athyrium filix - femina, Pteridium aquilinum, Sanicula crassicaulis*, and / or *Heracleum maximum.*

OTHER NOTEWORTHY SPECIES None

CONSERVATION RANK G4S4

RANK JUSTIFICATION There are over 250 stands of this vegetation mapped within the Point Reyes National Seashore and the association occurs in many other parts of the San Francisco Bay Area. However, most stands are small and many are adjacent to development and have been affected by human mediated impacts.

DATABASE CODE To be determined

COMMENTS
Globally

PRNS / GGNRA
Exotics are impacting this vegetation.

Plots used to develop this description (n=13): PRNS34, PRNS121, PRNS062, PRNS087, PRNS096, PRNS133, PRNS166, PRNS203, marinsp01, marinsp04, marinsp13, PRNS144, ggnra290

Umbellularia californica - Quercus chrysolepis Association
- pi code 01013

COMMON NAME	California Bay - Canyon Live Oak Forest Association
SYNONYM	None
PHYSIOGNOMIC CLASS	Forest
PHYSIOGNOMIC SUBCLASS	Evergreen Forest
PHYSIOGNOMIC GROUP	Winter - rain broad - leaved evergreen sclerophyllous forest
	PHYSIOGNOMIC SUB GROUP Natural / Semi - Natural
FORMATION	Lowland or submontane winter - rain evergreen sclerophyllous forest
ALLIANCE	*Umbellularia californica* Forest Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

Mapping Unit Code:

RANGE
Globally
This association is only known from the Mount Tamalpais region including Mt. Tamalpais State Park and the Bolinas Ridge portion of Golden Gate National Recreation Area. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Stands of the *Umbellularia californica - Quercus chrysolepis* forest association are found on the Bolinas and San Rafael topographic quads within the mapping areas of PRNS / GGNRA.

ENVIRONMENTAL DESCRIPTION

Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Stands of the *Umbellularia californica* forest association are found at among the highest elevations (1920 - 2447ft) of vegetation plots sampled in the mapping area. They occur on the upper 1 / 3 of 13 - 34 degree, north facing slopes. Soil textures range from medium to very fine sandy loam to coarse loamy sand. . A high percentage (95 - 99%) of litter is found under the forest canopy and gravel makes up 20 - 65% of the topsoil. These stands generally occur on shallow rocky soil and may be immediately adjacent to the *Arctostaphylos glandulosa - Quercus wislizeni* chaparral on southerly - facing slopes on the opposite side of the ridges. Locally these *Umbellularia californica - Quercus chrysolepis* stands have probably the coolest average winter temperatures and are usually above the influence of the summer marine layer. They are thus probably the most interior and continental of any forest association in the study area.

MOST ABUNDANT SPECIES
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Tree: *Umbellularia californica, Quercus chrysolepis*

CHARACTERISTIC SPECIES
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Herbaceous: *Elymus glaucus, Iris sp.*
Tree: *Umbellularia californica, Quercus chrysolepis, Pseudotsuga menziesii*

VEGETATION DESCRIPTION
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Stands of the *Umbellularia californica - Quercus chrysolepis* forest association form an open herb layer, an open shrub layer and a continuous tree layer with 0 - 60% at 5 - 10 m tall and 25 - 100% cover at 10 - 20 m tall. This association is dominated by an intermittent to continuous layer of *Umbellularia californica*. *Quercus chrysolepis* is also present and sometimes may have a higher percent cover than *Umbellularia californica*. Elymus glaucus, Pseudotsuga menziesii, and Iris sp. are usually present and *Corylus cornuta, Rosa gymnocarpa, Toxicodendron diversilobum, Carex sp., Polystichum munitum, Quercus agrifolia* and a variety of other understory species may also be present. On slightly deeper soils, at lower slope positions, and on similar aspects this association often occurs adjacent to stands of *Pseudotsuga menziesii* alliance.

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK G3S3?

RANK JUSTIFICATION The distribution of this association is unknown beyond the confines of Mt Tamalpais. It is likely to be relatively widespread in the lower montane belt of California, but uncommon because the two characteristic tree species do not tend to overlap and form large stands.

DATABASE CODE

COMMENTS
Globally

PRNS / GGNRA
Relationships between this association and the *Pseudotsuga menziesii / Umbellularia californica - Quercus menziesii* association are close and further sampling in the area may show them to be one and the same.

Plots used to develop this description (n=2): GGNRA298, GGNRA387

Umbellularia californica - Quercus agrifolia / Toxicodendron diversilobum (Corylus cornuta) Association - pi code 01014

COMMON NAME	California Laurel - Coastal Live Oak / Pacific Poison Oak Forest
SYNONYM	None
PHYSIOGNOMIC CLASS	Forest
PHYSIOGNOMIC SUBCLASS	Evergreen forest
PHYSIOGNIMIC GROUP	Winter - rain broad - leaved evergreen sclerophyllous forest
PHYSIOGNOMIC SUB GROUP	Natural / Semi - natural
FORMATION	Lowland or submontane winter - rain broad - leaved evergreen sclerophyllous forest
ALLIANCE	Umbellularia californica Forest Alliance
CLASSIFICATION CONFIDENCE	LEVEL 2
USFWS WETLAND SYSTEM	Upland

RANGE
Globally
This association is known from the vicinity of the San Francisco Bay Area. It is also common in the East Bay Hills of Alameda and Contra Costa Counties (Keeler - Wolf personal observation 1998 - 2000). Upon further investigation, it may be found to be more widespread to the south and north in the California Coast Ranges.

PRNS / GGNRA
This association is found throughout the PRNS / GGNRA planning area.

ENVIRONMENTAL DESCRIPTION
Globally
This association is only known from the vicinity of the Point Reyes National Seashore and Golden Gate National Recreation Area. Stands presumably of this association occur on neutral slope exposures on marine sediments and volcanic rocks in the East May Hills. Additional information about its global characteristics is not available without inventory. Compared to the *Umbellularia / Polystichum munitum* association this is the more xeric.

PRNS / GGNRA
This association grows on moderate to steep slopes of all aspects. Stands are found on lower to upper slopes. Many stands are in small east - west-tending drainages where the overall influence of the sheltered drainage overrides the micro - scale effect of slope exposure. Soils are coarse loamy sands to moderately fine clay loams. Some stands occur on soils derived from Franciscan parent material.

MOST ABUNDANT SPECIES
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Tree	*Umbellularia californica, Quercus agrifolia*
Tall Shrub	*Corylus cornuta*
Shrub	*Toxicodendron diversilobum*

CHARACTERISTIC SPECIES

Globally

Tree	*Quercus agrifolia, Umbellularia californica, and Arbutus menziesii*

PRNS / GGNRA

Tree	*Umbellularia californica, Quercus agrifolia*
Shrub	*Toxicodendron diversilobum*

VEGETATION DESCRIPTION

Globally

This association is similar to the local description where it has been observed in the East Bay Hills. *Quercus agrifolia* and *Umbellularia californica* cover is variable, both species comprising at least 25% of the relative cover of trees. *Arbutus menziesii* is in most stands, but is usually substantially less cover than the other two trees.

PRNS / GGNRA

This forest is characterized by co - dominance of *Quercus agrifolia* and *Umbellularia californica*, either of which can dominate any specific stand. *Arbutus menziesii* is often present at low cover values. Other trees like *Pseudotsuga menziesii, Pinus muricata, Lithocarpus densiflora,* and / or *Aesculus californica* may also be present in small amounts. The tree canopy is continuous, and between usually 10 - 20 meters of height. *Corylus cornuta* is often the most common tall shrub, while *Toxicodendron diversilobum* dominates the shrub stratum between 1 - 2 meters. *Rubus parviflorus, Polystichum munitum, Heteromeles arbutifolia* and *Baccharis pilularis* may also occur in the shrub layer. The herbaceous layer is diverse, and may be intermittent to continuous. Typical herbaceous species include *Polystichum munitum, Clinopodium (Saturegia) douglasii, Stachys ajugoides, Pteridium aquilinum,* and / or *Athyrium filix - femina.*

OTHER NOTEWORTHY SPECIES None

CONSERVATION RANK G4S4

RANK JUSTIFICATION There are over 700 stands of this association mapped throughout the PRNS / GGNRA planning area. However, the association is only known from the San Francisco Bay Area currently.

DATABASE CODE To be determined

COMMENTS

Globally

PRNS / GGNRA

This association is intermediate between *Quercus agrifolia* alliance and *Umbellularia californica* alliance stands. During the early phases of analysis of plots we had originally split this association into a more xeric *Quercus agrifolia - Umbellularia californica* type and a more mesic *Umbellularia californica - Quercus agrifolia* type. Upon further analysis, this appears to be unwarranted. These stands are currently placed in the *Umbellularia californica* alliance because most of the local stands have a relatively high percentage of *Umbellularia*. However further investigation and analysis of samples from other parts of its range may suggest that the association is better placed within the *Quercus agrifolia* alliance.

Plots used to develop this description (n=4): PRNS081, PRNS074, PRNS100, ggnra354

DOUGLAS - FIR ALLIANCE

Douglas - fir (*Pseudotsuga menziesii)* Alliance - pi code 02010

This alliance is represented by five associations all defined first in this project. They are represented by one early seral association that represents increasing dominance of *P. menziesii* in coyotebrush coastal scrub (*Pseudotsuga menziesii / Baccharis pilularis* Association) and the others which are arranged along both moisture and temperature gradients from warm and dry (*Pseudotsuga menziesii / Quercus agrifolia* Association) to mesic (*Pseudotsuga menziesii / Umbellularia californica / Rhamnus californica* Association) to more moist (*Pseudotsuga menziesii / Umbellularia californica / Polystichum munitum* Association) to coolest and wettest (*Pseudotsuga menziesii / Quercus chrysolepis* Association). In addition to these associations several unclassified alliance - level samples were taken suggesting further variation. These include:
***Pseudotsuga menziesii / Lithocarpus densiflorus / Rhamnus californicus* plots: (PRNS150, PRNS149)**
***Pseudotsuga menziesii / Aesculus californicus* plot: (GGNRA336)**
***Pseudotsuga menziesii / Quercus wislizeni - Arctostaphylos hookeri montana* plot (GGNRA330 invading serpentine chaparral)**
***Pseudotsuga menziesii / Myrica californica* Plot*:* (GGNRA366)**

The range of this alliance is from Washington state to the central California Coast Ranges and the northern Sierra Nevada. Recent classification work in stands from California suggests that this alliance may be best described as a series of related alliances based on associated tree species (Bingham 2002 MS) If this proves to be correct the treatment of associations in the mapping area may include *Pseudotsuga menziesii / Lithocarpus densiflorus* alliance, and *P. menziesii - Quercus chrysolepis* alliance stands, as well as the *P. menziesii* alliance, the only one currently accepted by the national vegetation classification.

Pseudotsuga menziesii / Umbellularia californica / Polystichum munitum Association
- pi code 02011

COMMON NAME	Douglas - fir / California Laurel / Pineland Sword Fern Forest
SYNONYM	None
PHYSIOGNOMIC CLASS	Forest
PHYSIOGNOMIC SUBCLASS	Evergreen forest
PHYSIOGNIMIC GROUP	Temperate or subpolar needle - leaved evergreen forest
PHYSIOGNOMIC SUB GROUP	Natural / Semi - natural
FORMATION	Giant temperate or subpolar needle - leaved evergreen forest
ALLIANCE	*Pseudotsuga menziesii* Giant Forest Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE

Globally

This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global range is not available without additional inventory.

PRNS / GGNRA

Stands of this association are found throughout the inland portions of the PRNS / GGNRA planning area. The association is particularly common on the southern half of Inverness Ridge.

ENVIRONMENTAL DESCRIPTION

Globally

This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
This association grows on the middle to upper third of moderate slopes. Aspects are mostly north and east. Stands are found in the inland valleys and prefer medium to fine silt or sandy loams. Generally this is a more mesic forest than the *P menziesii / Umbellularia / Rhamnus californica* association. It occurs on concave slopes or on more northerly aspects than that association.

MOST ABUNDANT SPECIES
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Tall Tree	*Pseudotsuga menziesii*
Tree	*Umbellularia californica*
Shrub	*Polystichum munitum*

CHARACTERISTIC SPECIES
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Tall Tree	*Pseudotsuga menziesii*
Tree	*Umbellularia californica*
Shrub	*Polystichum munitum*

VEGETATION DESCRIPTION
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
This forest forms a two - tiered canopy with *Pseudotsuga menziesii* dominating the upper canopy. The top tier is intermittent, and generally less than 35 meters in height. The lower tree canopy is dominated by *Umbellularia californica,* though *Lithocarpus densiflorus, Quercus agrifolia* and / or *Aesculus californica* may provide minor cover. The shrub layer is open with only minor cover contributed by *Vaccinium ovatum, Rhamnus californica* ssp. *californica, Rubus ursinus,* and / or *Rubus parviflorus. Polystichum munitum* is the dominant understory species. Other common herbaceous associates may include *Pteridium aquilinum, Iris douglasiana,* and / or *Stachys ajugoides.*

OTHER NOTEWORTHY SPECIES None

CONSERVATION RANK G4S4?

RANK JUSTIFICATION There are hundreds of stands of this vegetation mapped throughout the PRNS / GGNRA planning area. However, it is unclear how widespread this association is beyond the mapping area.

DATABASE CODE To be determined

COMMENTS
Globally

PRNS / GGNRA
Most of the stands have been logged over the past 150 years. The Mt Vision fire of November 1995 affected numerous stands of this association in the central Inverness Ridge area of PRNS. Post fire monitoring in this area will provide useful information on the transition states of vegetation formerly of this association. This

association is the *Pseudotsuga menziesii* dominated analog to the *Umbellularia californica / Polystichum munitum* Association of the California Bay alliance. Disturbance ecology (fire history and logging history) may have a significant role to play in the determination of whether a stand is a member of the *Pseudotsuga menziesii* alliance or the *Umbellularia californica* alliance.

Plots used to describe this association (n=9): GGNRA257, PRNS148, marinsp07, PRNS095, marinsp20, GGNRA318, GGNRA338, GGNRA279, PRNS162

Pseudotsuga menziesii / Baccharis pilularis Association
- pi code 02012

COMMON NAME	Douglas Fir / Coyote Brush Forest Association
SYNONYM	None
PHYSIOGNOMIC CLASS	Forest
PHYSIOGNOMIC SUBCLASS	Evergreen Forest
PHYSIOGNOMIC GROUP	Temperate or Subpolar Needle - Leaved Evergreen Forest
PHYSIOGNOMIC SUB GROUP	Natural / Semi - Natural
FORMATION	Giant Temperate or Subpolar Needle - Leaved Evergreen Forest
ALLIANCE	*Pseudotsuga menziesii* Forest Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Stands of the *Pseudotsuga menziesii / Baccharis pilularis* forest association are found throughout the mapping areas of PRNS / GGNRA.

ENVIRONMENTAL DESCRIPTION
Globally
This association is only known from the Point Reyes National Seashore and Golden Gate National Recreation Area. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Stands of the *Pseudotsuga menziesii / Baccharis pilularis* association are found at low elevations on mid to upper sides of 8 - 25 degree slopes. Soil textures range from loam to coarse loamy sand of shale origin. This association is an early seral stage of the *Pseudotsuga menziesii* alliance where it is invading stands of *Baccharis pilularis*. The seral stage of the *Baccharis* stands being invaded seems to be variable. Some of the *Baccharis* stands are late seral (e.g., those with much *Rhamnus californica*, while others are rather early seral (e.g., those with *Ceanothus thyrsiflorus*). Certain areas such as the vicinity of Palomarin and the Point Reyes Bird Observatory (PRNS unit) seem to have been rapidly invaded by *Pseudotsuga menziesii*, while others are more slowly invaded. Local site conditions and stochastic and locally favorable dispersal and establishment events are likely responsible for the variation.

MOST ABUNDANT SPECIES
Globally
This association is only known from the Point Reyes National Seashore and Golden Gate National Recreation Area. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Shrub: *Baccharis pilularis, Ceanothus thyrsiflorus*
Tree: *Pseudotsuga menziesii*

CHARACTERISTIC SPECIES
Globally
This association is only known from the Point Reyes National Seashore and Golden Gate National Recreation Area. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Herbaceous: *Mimulus aurantiacus*
Shrub: *Baccharis pilularis, Rubus ursinus, Toxicodendron diversilobum, Ceanothus thyrsiflorus*
Tree: *Pseudotsuga menziesii*

VEGETATION DESCRIPTION
Globally
This association is only known from the Point Reyes National Seashore and Golden Gate National Recreation Area. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Stands of the *Pseudotsuga menziesii / Baccharis pilularis* forest association forms an open herb layer, an intermittent to continuous shrub layer with 2 - 10 % cover at 0.5 - 1 m tall, 10 - 30% cover at 1 - 2 m tall and 10 - 55% cover at 2 - 5 m tall, and an intermittent to continuous tree layer with 9 - 75% cover at 5 - 10 m tall, 0 - 55% cover at 10 - 20 m tall, and 0 - 30% cover at 20 - 30 m tall. It is dominated by *Pseudotsuga menziesii* and *Baccharis pilularis. Toxicodendron diversilobum, Rubus ursinus,* and *Mimulus aurantiacus* are also present. Other species that may be present include *Ceanothus thyrsiflorus, Quercus agrifolia, Pinus muricata, Heteromeles arbutifolia, Lonicera hispidula, L. involucrata, Marah fabaceus, M. oreganus, Plantago lanceolata, Ribes californicum, R. sanguineum, Sanicula sp., Scrophularia californica, Umbellularia californica, Rhamnus californica, Rhamnus purshiana, Quercus berberidifolia* and *Chlorogalum sp.* This association is found at low elevations on mid to upper sides of 8 - 25 degree slopes. Soil textures range from loam to coarse loamy sand of shale origin.

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK G4S4?

RANK JUSTIFICATION This appears to be largely a early seral association arising from the invasion of young *Pseudotsuga menziesii* into stands of *Baccharis pilularis*. This kind of setting occurs throughout much of the outer North Coast Ranges of California, but since the association has not been inventoried beyond the confines of the mapping area its abundance is speculative.

DATABASE CODE

COMMENTS
Globally

PRNS / GGNRA
Abies grandis has been planted in the San Francisco Municipal watershed lands and occurs in samples of this association locally.

Plots used to describe this association (n=3): GGNRA381,PRNS092, GGNRA378

Pseudotsuga menziesii / Quercus agrifolia Association
- pi code 02013

COMMON NAME	Douglas Fir / Coastal Live Oak Forest
SYNONYM	None
PHYSIOGNOMIC CLASS	Forest
PHYSIOGNOMIC SUBCLASS	Evergreen forest
PHYSIOGNIMIC GROUP	Temperate or subpolar needle - leaved evergreen forest
PHYSIOGNOMIC SUB GROUP	Natural / Semi - natural
FORMATION	Giant temperate or subpolar needle - leaved evergreen forest

ALLIANCE *Pseudotsuga menziesii* Giant Forest Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE

Globally

This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global range is not available without additional inventory.

PRNS / GGNRA

This forest is found throughout the PRNS / GGNRA planning area. Stands are more common in the central and southern portions, and tend to be more than a kilometer from the open coast.

ENVIRONMENTAL DESCRIPTION

Globally

This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

This forest grows on the lower to middle third of moderate to steep slopes. Aspects are generally south southeast. Soils are moderately fine sandy clay loams, sometimes derived from Franciscan Melange parent materials. This is the most xeric of the three *P. menziesii* associations in the study area. It is environmentally closely related to the *Umbellularia - Quercus agrifolia / Toxicodendron* association of the *Umbellularia californica* alliance.

MOST ABUNDANT SPECIES

Globally

This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Tall Tree	*Pseudotsuga menziesii*

CHARACTERISTIC SPECIES

Globally

This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Tall Tree	*Pseudotsuga menziesii*
Tree	*Quercus agrifolia*

VEGETATION DESCRIPTION

Globally

This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
This forest forms a two - tiered canopy with *Pseudotsuga menziesii* dominating the upper canopy. The upper canopy is intermittent to continuous and generally more than 30 meters in height. *Quercus agrifolia* or *Umbellularia californica* may dominate the lower tree canopy, though *Umbellularia californica* is not present in all stands. The shrub layer can be open to intermittent, and is highly variable. *Corylus cornuta* is often present, as are *Toxicodendron diversilobum, Rubus ursinus* and / or *Rubus parviflorus.* The herbaceous layer is open to continuous, and often contains *Clinopodium douglasiana, Stachys ajugoides, Maianthemum stellatum, Iris douglasiana, Sanicula crassicaulis,* and / or *Erechtites minima. Dryopteris arguta* is important in some stands.

OTHER NOTEWORTHY SPECIES None

CONSERVATION RANK G3?S3?

RANK JUSTIFICATION Over 150 stands of this vegetation are mapped within the PRNS / GGNRA planning area. However the association is not known beyond the study area.

DATABASE CODE To be determined

COMMENTS
Globally

PRNS / GGNRA
This association is the *Pseudotsuga menziesii* dominated analog to the *Umbellularia californica - Quercus agrifolia / Toxicodendron* - (*Corylus cornuta*) Association of the California Bay alliance. Disturbance ecology (fire history and logging history) may have a significant role to play in the determination of whether a stand is a member of the *Pseudotsuga menziesii* alliance or the *Umbellularia californica* alliance.

Plots used to describe this association (n=8): marinsp08, PRNS142, PRNS082, marinsp06, marinsp19, GGNRA280, GGNRA335, GGNRA362

Pseudotsuga menziesii / Quercus chrysolepis Association
- pi code 02014

COMMON NAME	Douglas Fir / Canyon Live Oak Forest
SYNONYM	None
PHYSIOGNOMIC CLASS	Forest
PHYSIOGNOMIC SUBCLASS	Evergreen forest
PHYSIOGNIMIC GROUP	Temperate or subpolar needle - leaved evergreen forest
PHYSIOGNOMIC SUB GROUP	Natural / Semi - natural
FORMATION	Giant temperate or subpolar needle - leaved evergreen forest

ALLIANCE Pseudotsuga menziesii Giant Forest Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE
Globally
This association is only known from the vicinity of the Golden Gate National Recreation Area and adjacent Mt Tamalpais State Park. Information about its global range is not available without additional inventory.

PRNS / GGNRA
This forest is found on Bolinas Ridge and Mt. Tamalpais in GOGA planning area. Stands are scattered in the upper elevations. This association is represented by 3 plots: GGNRA275, GGNRA283, GGNRA285.

ENVIRONMENTAL DESCRIPTION

Globally

This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

This forest grows on the upper third of moderate to steep slopes. Elevations range from 1627 - 1785 ft. Aspects are generally northerly (nw to ne). Slopes range from 8 to 28 degrees. Microtopography within the stands are generally linear or concave. Soils are moderately fine sandy loam to coarse loamy sand, derived from Franciscan Melange parent materials. Soils are typically moderately deep and well developed. This is the coldest and highest elevation of the four *P. menziesii* associations in the study area. It is environmentally closely related to the *Quercus chrysolepis - Umbellularia* association of the *Umbellularia californica* alliance, which is found on shallower rocky soils often adjacent to stands of this association.

MOST ABUNDANT SPECIES

Globally

This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Tall Tree	*Pseudotsuga menziesii*
Tree	*Quercus chrysolepis*

CHARACTERISTIC SPECIES

Globally

This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Tall Tree	*Pseudotsuga menziesii*
Tree	*Quercus chrysolepis*

VEGETATION DESCRIPTION

Globally

This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

This forest forms a two - tiered canopy with *Pseudotsuga menziesii* dominating the open to intermittent upper canopy from 15 to 30 m. The sub - canopy is intermittent to continuous and generally less than 15 meters in height. *Quercus chrysolepis* present in the lower tree canopy, ranging from 1 - 60% cover. *Umbellularia californica* may or may not be present in the tree layer but is always present at least in the shrub layer (average 8 %). The shrub layer can be open to intermittent, and is highly variable with the most consistent species including *Lonicera hispidula, Heteromeles arbutifolia,* and *Toxicodendron diversilobum.* The herbaceous layer is open to continuous, and often contains Melica californica, Elymus glaucus, Polystichum munitum, Osmorhiza chilensis, and / or *Iris douglasiana.* Some stands have non - native grasses and herbs such as *Brachypodium distachyon, Carduus pycnocephalus,* and *Briza maxima* in minor amounts.

OTHER NOTEWORTHY SPECIES None

CONSERVATION RANK G3?S3?

RANK JUSTIFICATION Over 150 stands of this vegetation are mapped within the PRNS / GGNRA planning area. However, the association is not known beyond the study area.

DATABASE CODE To be determined

COMMENTS
Globally
Note: this association may prove to be a part of the recently described P. menziesii / Quercus chrysolepis alliance (Bingham 1999). If so it may range further north into the middle and inner coast ranges of Northern California.

PRNS / GGNRA
Note this association was defined through re - analysis of plots following the final labeling of the vegetation map. All stands of this association were most accurately labeled *"02015 - Pseudotsuga menziesii / Umbellularia californica / Rhamnus californica"* Association in the original map.

Plots used to describe this association (n=4): GGNRA275,GGNRA285, GGNRA283, GGNRA386

Pseudotsuga menziesii / Umbellularia californica / Rhamnus californica Association
- pi code 02015

COMMON NAME	Douglas Fir / California Laurel / California False Buckthorn Forest
SYNONYM	None
PHYSIOGNOMIC CLASS	Forest
PHYSIOGNOMIC SUBCLASS	Evergreen forest
PHYSIOGNIMIC GROUP	Temperate or subpolar needle - leaved evergreen forest
PHYSIOGNOMIC SUB GROUP	Natural / Semi - natural
FORMATION	Giant temperate or subpolar needle - leaved evergreen forest
ALLIANCE	*Pseudotsuga menziesii* Giant Forest Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global range is not available without additional inventory.

PRNS / GGNRA
Stands of this association are found throughout the inland portions of the PRNS / GGNRA planning area.

ENVIRONMENTAL DESCRIPTION
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
This forest is found on moderate to steep slopes throughout the inland valleys of the PRNS / GGNRA planning area. Stands grow from the lower slope to ridge positions on any aspect, and prefer moderately fine to coarse sandy clay loams. Generally this is a slightly more xeric forest than the *P. menziesii - Umbellularia / Polystichum munitum* forest, with most stands occurring on convex or linear slopes or slopes with more southerly aspects.

MOST ABUNDANT SPECIES

Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Tall Tree *Pseudotsuga menziesii*
Tree *Umbellularia californica*
Shrub *Rhamnus californica* ssp. *californica*

CHARACTERISTIC SPECIES
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Tall Tree *Pseudotsuga menziesii*
Tree *Umbellularia californica*
Shrub *Rhamnus californica* ssp. *californica*

VEGETATION DESCRIPTION
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
This forest forms a two - tiered canopy with *Pseudotsuga menziesii* dominating the upper canopy. The top tier is intermittent and generally about 30 meters or greater in height. The lower tree canopy is usually dominated by *Umbellularia californica,* though this species' cover varies widely from stand to stand. *Rhamnus californica* ssp. *californica* dominates the shrub layer and sometimes completely replaces *Umbellularia californica* in the short tree stratum. Other shrubs commonly found in this forest include *Toxicodendron diversilobum, Sambucus racemosa, Polystichum munitum, Pteridium aquilinum, Baccharis pilularis, Artemisia californica, Rubus ursinus* and / or *Rubus parviflorus.* The herbaceous layer is open to intermittent and often includes *Stachys ajugoides, Erechtites minima,* and / or *Maianthemum stellatum.*

OTHER NOTEWORTHY SPECIES None

CONSERVATION RANK G4S4?

RANK JUSTIFICATION
There are hundreds of stands of this vegetation mapped throughout the PRNS / GGNRA planning area. However, it is unclear how widespread this association is beyond the mapping area.

DATABASE CODE To be determined

COMMENTS
Globally

PRNS / GGNRA
This is a somewhat drier community than the *Pseudotsuga menziesii / Umbellularia californica / Polystichum munitum* Forest. It occurs on more southerly or neutral exposures and on upper slopes, while the other association is more strongly tied to mesic northeast facing or concave slopes.

Plots used to describe this association (n=3): PRNS083, PRNS120, PRNS106

Pseudotsuga menziesii / Lithocarpus densiflorus / Rhamnus californica Association (preliminary)

- pi code 02020 Insufficient relevé plots to describe this association, currently rolled into classification hierarchy with *Pseudotsuga menziesii / Umbellularia californica / Rhamnus californica Association - pi code 02015*)

COAST LIVE OAK ALLIANCE

Coast Live Oak (*Quercus agrifolia)* Alliance - pi code 12020

The *Quercus agrifolia* alliance is represented by one variable association in the area. The treatment below encompasses all variation sampled except for a single riparian plot mixed with *Salix gooddingii* (GGNRA317). This alliance is limited to the California Floristic Province (Hickman 1993) and ranges from Mendocino Co. to Northern Baja California, Mexico.

Quercus agrifolia - (Arbutus menziesii) - Umbellularia californica Association (preliminary)
- pi code 12021 Insufficient relevé plots to describe this association, currently rolled into classification hierarchy with *Umbellularia californica - Quercus agrifolia / Toxicodendron diversilobum* Association - pi code 01014)

Quercus agrifolia / Toxicodendron diversilobum - (Corylus cornuta) Association
- pi code 12022

COMMON NAME	Coastal Live Oak / Pacific Poison Oak - (Beaked Hazelnut) Forest
SYNONYM	None
PHYSIOGNOMIC CLASS	Forest
PHYSIOGNOMIC SUBCLASS	Evergreen forest
PHYSIOGNIMIC GROUP	Winter - rain broad - leaved evergreen sclerophyllous forest
PHYSIOGNOMIC SUB GROUP	Natural / Semi - natural
FORMATION	Lowland or submontane winter - rain broad - leaved evergreen sclerophyllous forest
ALLIANCE	*Quercus agrifolia* Woodland Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE

Globally

This association is known from the vicinity of the San Francisco Bay Area. It has been observed in Alameda, Contra Costa, Marin, and Santa Cruz Counties (Keeler - Wolf personal observation). A similar and possibly analogous association; the *Quercus agrifolia / Toxicodendron diversilobum* association has been described throughout much of the central California Coast Ranges by Allen *et al.* (1991)

PRNS / GGNRA

This association is found throughout the PRNS / GGNRA planning area. In the Point Reyes portion, stands are clumped along the San Andreas Fault zone. Moving south the distribution broadens, but primarily remains along valley floor margins.

ENVIRONMENTAL DESCRIPTION

Globally

This association is a relatively xeric southerly - facing woodland or forest. Most stands in the East Bay Hills are on middle to upper thirds of slopes or on edges of grasslands on all slope positions. Most stands appear to be on marine sedimentary rocks in the East Bay Hills, but may occur on granitic substrates and on calcareous substrates in the Santa Cruz Mountains. These stands alternate between *Umbellularia - Quercus agrifolia / Toxicodendron* stands on more mesic neutral (northwest or southeast to east) exposures in many drainages in the East May Municipal Utility District and East Bay Regional Park lands.

PRNS / GGNRA
This vegetation grows along valley margins on moderate slopes. Locally, stands can be found on the lower to upper third of a slope on any aspect. Most of the stands are small. However the few large stands tend to occur on upper or mid slopes. Soils are coarse to fine sandy loams. This is a drier forest than the *Umbellularia - Q. agrifolia / Toxicodendron* association, with a more open xerophytic understory, usually missing mesophytic species such as *Polystichum munitum,* and *Vaccinium ovatum*.

MOST ABUNDANT SPECIES
Globally

Tree	Quercus agrifolia
Shrub	Toxicodendron diversilobum

PRNS / GGNRA

Tree	*Quercus agrifolia*

CHARACTERISTIC SPECIES
Globally

Tree	*Quercus agrifolia*
Shrub	*Toxicodendron diversilobum*

PRNS / GGNRA

Tree	*Quercus agrifolia*
Shrub	*Toxicodendron diversilobum*

VEGETATION DESCRIPTION
Globally
Throughout the San Francisco Bay area this structure and species composition of this association appears similar to the local description.

PRNS / GGNRA
Quercus agrifolia is the sole or dominant tree forming an intermittent to continuous canopy usually between 10 and 20 meters in height. *Umbellularia californica* maybe present, in low cover. The shrub layer is open to intermittent. *Toxicodendron diversilobum* is an important species. *Corylus cornuta* is present in some stands. Other shrub associates may include *Rubus ursinus, Rhamnus californica* ssp. *californica, Lonicera hispidula, Heracleum maximum,* and / or *Holcus lanatus.* The herbaceous layer is open but diverse. *Pteridium aquilinum, Clinopodium douglasiana, Heteromeles arbutifolia, Stachys ajugoides* and / or *Erechtites minima* are often present.

OTHER NOTEWORTHY SPECIES None

CONSERVATION RANK G4S4?

RANK JUSTIFICATION Over 250 stands of this association are mapped in the PRNS / GGNRA planning area. However, the association is known only from the San Francisco Bay area where relatively few large stands are protected.

DATABASE CODE To be determined

COMMENTS
Globally
Allen *et al.* (1991) reports on this or a similar association from Sonoma County to San Luis Obispo County.

PRNS / GGNRA
Exotics are impacting this vegetation.

Plots used to describe this association (n=4): PRNS158, PRNS175, GGNRA385, GGNRA376

CALIFORNIA BUCKEYE ALLIANCE

Aesculus californica Woodland Alliance Stands - pi code 14020

This alliance is poorly represented by samples in the study area and no associations have been described locally. The general account below describes the alliance in context of the study area.

COMMON NAME	California Buckeye Woodland
SYNONYM	Mainland cherry forest, Mixed north slope forest (Holland); California buckeye series (PSW - 45); Northern oak woodland (Thorne); Montane hardwood forest (WHR)
PHYSIOGNOMIC CLASS	Woodland
PHYSIOGNOMIC SUBCLASS	Deciduous woodland
PHYSIOGNOMIC GROUP	Cold - deciduous woodland
PHYSIOGNOMIC SUB GROUP	Natural / Semi - natural
FORMATION	Cold - deciduous woodland
ALLIANCE	*Aesculus californica* Woodland Alliance
CLASSIFICATION CONFIDENCE LEVEL	2
USFWS WETLAND SYSTEM	Upland

RANGE

Globally

This association occurs from the Northern California Interior Coast Ranges, through the Central California Coast Ranges into the Southern California Mountains and Valleys, and in the foothills of the Sierra Nevada.

PRNS / GGNRA

Relatively small and local stands dominated by California buckeye occur in the southern portion of the mapping area on the San Francisco Municipal Water District lands. Two plots were taken.

ENVIRONMENTAL DESCRIPTION

Globally

Stands of this association occur on steep, north - facing slopes. Soils are shallow and moderately to excessively drained.

PRNS / GGNRA

One plot on very gently sloping, southeast - facing wash on fine sandy loam, elevation 482 ft; second plot on east - southeast - facing slope on coarse loamy sand, elevation 1056 ft.

MOST ABUNDANT SPECIES

Globally

Tree	*Aesculus californica, Pinus sabiniana, Quercus wislizeni, and Umbellularia californica*
Shrub	*Prunus ilicifolia, Fraxinus dipetala, Heteromeles arbutifolia*

PRNS / GGNRA

Tree	*Aesculus californica, Pseudotsuga menziesii*
Shrub	*Prunus ilicifolia, Heteromeles arbutifolia*

CHARACTERISTIC SPECIES

Globally

Tree	*Aesculus californica*

PRNS / GGNRA
Tree Aesculus californica

VEGETATION DESCRIPTION
Globally
Aesculus californica is sole, dominant, or important with *Pinus sabiniana, Prunus ilicifolia, Quercus wislizeni,* or *Umbellularia californica* in the tree canopy; *Fraxinus dipetala* and *Heteromeles arbutifolia* may be present. Trees < 10 m; canopy continuous or intermittent, one or two - tiered. Shrubs infrequent. Ground layer sparse

PRNS / GGNRA
Stand strongly dominated by California buckeye in the tree layer, with *Prunus ilicifolia* and *Heteromeles arbutifolia* in the shrub layer. Trees <10m (one plot with emergent Douglas - fir); canopy continuous, two - tiered, shrub layer intermittent to open, ground layer continuous to intermittent. Small stands occur on slopes adjacent to *Quercus agrifolia* alliance stands in Marin Co.

OTHER NOTEWORTHY SPECIES None

CONSERVATION RANK G3 S3

RANK JUSTIFICATION Stands are typically small and localized in foothills of Cismontane northern and central California

DATABASE CODE

COMMENTS
Globally
Griffin (1977) suggests plants of this series are tree - sized because they grow in locations of low fire frequency. California buckeye - dominated stands in Sierra Nevada foothills lack *Prunus ilicifolia*; otherwise they are similar to those in the coast ranges that have hollyleaf cherry (Klyver 1931).

PRNS / GGNRA
Stands are generally associated with *Quercus agrifolia* alliance stands.

Plot defining the presence of this alliance (n=1): GGNRA323

PACIFIC MADRONE ALLIANCE

Arbutus menziesii Forest Alliance Stands - pi code 12030

This alliance is poorly represented by samples in the study area and no associations have been described locally. The general account below describes the alliance in context of the study area.

COMMON NAME	Pacific Madrone Woodland
SYNONYM	Mixed evergreen forest, Tanoak forest (Holland); Tanoak series (PSW - 45); Northern mixed evergreen forest (Thorne); Montane hardwood forest (WHR)
PHYSIOGNOMIC CLASS	Woodland
PHYSIOGNOMIC SUBCLASS	Evergreen Woodland
PHYSIOGNOMIC GROUP	Temperate Broad - leaved Evergreen Woodland
PHYSIOGNOMIC SUB GROUP	Natural / Semi - natural
FORMATION	Temperate Broad - leaved Evergreen Woodland

ALLIANCE *Arbutus menziesii* Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE

Globally

Occurs in California in the Central and Northern California Coast Ranges, and in the Klamath Mountains.

PRNS / GGNRA

Woodlands dominated by Pacific madrone are uncommon in the Pt. Reyes area. A single stand was sampled on the San Francisco Municipal Water District lands in the southern portion of the mapping project area. Other stands (unsampled) occur in the GGNRA adjacent to Samuel P. Taylor State Park.

ENVIRONMENTAL DESCRIPTION

Globally

Pacific madrone woodlands may occur on all slope aspects. Soils are well - drained and may be sandstone, volcanic, granitic, or marine sedimentary; elevations 100 - 1500m.

PRNS / GGNRA

Stands in the Point Reyes National Seashore and Golden Gate National Recreation Area in Marin and San Mateo Counties tend to occur on the inland sides of the "mixed evergreen" belt in settings that are mid - way in moisture relations between *Umbellularia californica* (mesic) and *Quercus agrifolia* (more xeric) alliance stands. The single plot taken occurs on north - northeast - facing gentle slope, on fine clay loam soils.

MOST ABUNDANT SPECIES

Globally

Tree: *Arbutus menziesii, Lithocarpus densiflorus, Pinus coulteri, P. lambertiana, P. ponderosa, Pseudotsuga menziesii, Quercus agrifolia, Q. chrysolepis, Q. kelloggii, Umbellularia californica*

PRNS / GGNRA

Tree: *Arbutus menziesii, Quercus wislizeni*
Shrub: *Mimulus aurantiacus*

CHARACTERISTIC SPECIES

Globally

Arbutus menziesii

PRNS / GGNRA

Arbutus menziesii

VEGETATION DESCRIPTION

Globally

Arbutus menziesii is sole or dominant in the tree canopy; *Lithocarpus densiflorus, Pinus coulteri, P. lambertiana, P. ponderosa, Pseudotsuga menziesii, Quercus agrifolia, Q. chrysolepis, Q. kelloggii,* and / or *Umbellularia californica* may be present. Trees < 75 m; canopy continuous, may be two - tiered. Shrubs infrequent or common. Ground layer sparse to abundant.

PRNS / GGNRA

Uncommon in the mapping area, only one stand sampled; had low scrubby madrones over a mixture of bush monkeyflower (*Mimulus aurantiacus*) and mixed chaparral species. Trees <10m; canopy open; Shrubs frequent; ground layer intermittent.

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK G3S3

RANK JUSTIFICATION *Arbutus menziesii* stands are locally distributed in Northern California and may occur in Oregon and Washington.

DATABASE CODE

COMMENTS

Globally

Arbutus menziesii is an important component in several alliances. The term "mixed evergreen forest" is most commonly associated with *Arbutus menziesii*, but stands called mixed evergreen forest vary in composition (Barbour 1988b, Sawyer et al. 1977). The original concept of mixed evergreen forests was created to describe hardwood stands in the Santa Lucia Mountains where *Arbutus menziesii, L. densiflorus*, live oaks, and *Umbellularia californica* grow in mixed stands. This is Cooper's (1922) broad sclerophyll formation.

Munz (1968) and Whittaker (1960) expanded the term mixed evergreen to include *Pseudotsuga menziesii - Lithocarpus densiflorus* stands. Azet et al. (1992) argue that *L. densiflorus* is the primary naturally regenerating species in southwestern Oregon, whereas *P. menziesii* importance is a result of past fires (Azet & Wheeler 1982). Jimerson (1993) comes to the same conclusion for western Klamath Mountains in California. *Arbutus menziesii* forms single species tree dominated stands in the western Klamath Mountains and in the North Coast Ranges.

Sawyer et al. (1977c) called stands in northwestern California of *Arbutus menziesii, L. densiflorus, and P. menziesii Pseudotsuga /* hardwood forests. Other authors (Keeler - Wolf 1990, Bingham & Sawyer 1991, 1993, Stuart 1993) refer to Douglas - fir / hardwood forests. [The slash indicates the two - tiered character of the old growth stands]. The *Arbutus menziesii* alliance stands are generally more xeric than *Lithocarpus densiflorus* or *Pseudotsuga menziesii* alliance stands and do not have significant cover of those other two species.

Arbutus menziesii is a vigorous sprouter following most fire events. Its thin smooth bark makes young and middle age stems susceptible to even light to moderate surface fires. Multiple trunks from the base suggest fire history. Small seeds are produced in the fleshy berry like fruits in the fall. Many species of birds including Varied thrushes, Robins, and Band - tailed pigeons commonly disperse the fruit. Seedlings require forest openings to germinate (FEIS 2002).

In Napa valley (263A), stands occupy slopes on the east side of the Valley adjacent to *Pseudotsuga menziesii* stands. Some of these may be related to thinning of individuals of *Pseudotsuga menziesii* .
Small stands do occur in the Santa Lucia Mountains of Monterey County (M262A). In Humboldt County (M261A) in the Trinity River drainage near Willow Creek, stands dominated by *A. menziesii* occupy southerly facing slopes while adjacent northerly facing slopes have Douglas - fir - tanoak alliance stands.
Currently no stands are known in the Sierra Nevada (M261E), however the species is widespread in the northwestern portion of the range.

This is probably the least common of the several broad - leaf sclerophyllous tree alliances of California. The conditions under which stands of this alliance grow are relatively poorly understood. Relatively droughty, well - drained soils and xeric exposures in relatively high rainfall areas seem to be preferred. Fire and logging history may have some influence on the distribution and maintenance of the stands. Further investigation of the ecology of this alliance is needed.

PRNS / GGNRA

The single stand sampled in the San Francisco Municipal Watershed could be augmented with other samples in Marin Co portion of the mapping area. Further description following sampling would be valuable to determine the relationships with other forest and woodland alliance stands in the area..

Plot used to define this alliance locally (n=1): GGNRA331

Forests Dominated by Coast Redwood and Tanoak

COAST REDWOOD ALLIANCE

Coast Redwood *(Sequoia sempervirens)* Forest Alliance - pi code 02050

This alliance is represented by two associations in the study area one mixed with *Pseudotsuga menziesii* and the other without this conifer, but with good representation of *Lithocarpus* in the tree layer and *Vaccinium ovatum* in the shrub layer. Some additional variation is expressed in certain sampled stands which may have strong dominance by Redwood with very little other tree cover (PRNS141), a plot with *Quercus chrysolepis* and *Umbellularia* as the major subcanopy species (GGNRA276), a plot with the subcanopy composed of *Lithocarpus* and *Quercus wislizeni* (GGNRA332), and a plot with *Lithocarpus* as the understory tree but with no *Vaccinium ovatum* in the understory (marinsp05).
This alliance is largely endemic to California ranging from SW Oregon near Brookings, south to Salmon Creek in Southern Monterey County, California.

Sequoia sempervirens / Lithocarpus densiflorus / Vaccinium ovatum Association
- pi code 02051

COMMON NAME	Redwood / Tanoak / Black Huckleberry Forest
SYNONYM	None
PHYSIOGNOMIC CLASS	Forest
PHYSIOGNOMIC SUBCLASS	Evergreen forest
PHYSIOGNIMIC GROUP	Temperate or subpolar needle - leaved evergreen forest
PHYSIOGNOMIC SUB GROUP	Natural / Semi - natural
FORMATION	Giant temperate or subpolar needle - leaved evergreen forest
ALLIANCE	*Sequoia sempervirens* Forest Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE
Globally
This association is only known from the vicinity of the Point Reyes National Seashore and Golden Gate National Recreation Area. Information about its global range is not available without additional inventory. It is likely that the majority of stands of redwood in the Muir Woods National Monument (Marin County) are also this association.

PRNS / GGNRA
Stands of this forest type are found in the Olema Creek vicinity of the Golden Gate National Recreation Area, and at scattered locations south to the southern end of the mapping area.

ENVIRONMENTAL DESCRIPTION
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
This forest type is found on gentle to moderate slopes of all aspects. Stands grow on the middle to upper third of the slope, on moderately fine to medium sandy clay loams. Some soils are derived from Franciscan Melange. Stands are variable in structure not only because of past logging, but also because of environmental effects. Extremely low stature stands exist on the upper slopes of west facing canyons coming off of Bolinas Ridge. The S sempervirens individuals may only be 10 - 15 m tall, and appear stunted due to restriction by fine grained

mudstone substrate. These stands , adjacent to various chaparral stands are in contrast to those stands in the canyon bottoms where trees may be up to 80 m tall.

MOST ABUNDANT SPECIES
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Tall Tree	*Sequoia sempervirens*
Tree	*Lithocarpus densiflorus*
Shrub	*Vaccinium ovatum*

CHARACTERISTIC SPECIES
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Tall Tree	*Sequoia sempervirens*
Tree	*Lithocarpus densiflorus*
Shrub	*Vaccinium ovatum*

VEGETATION DESCRIPTION
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
This vegetation often forms a two - tiered canopy, with *Sequoia sempervirens* forming an intermittent to continuous tall tree canopy between 20 - 80 meters, and *Lithocarpus densiflorus* important in the lower tree layer. In some stands *Umbellularia californica* may be equally important. *Vaccinium ovatum* is the dominant shrub in the open to intermittent shrub layer. *Corylus cornuta* is often present. The herbaceous layer is open, with *Polystichum munitum* and *Pteridium aquilinum* the most common species.

OTHER NOTEWORTHY SPECIES None

CONSERVATION RANK G3S3?

RANK JUSTIFICATION This association is only known from a limited number of stands within the GOGA planning area. Its historical extent has been severely reduced by logging.

DATABASE CODE To be determined

COMMENTS
Globally

PRNS / GGNRA
Most stands show signs of past logging. Some additional variation is expressed in certain sampled stands which may have strong dominance by Redwood with very little other tree cover, a plot with *Quercus chrysolepis* and *Umbellularia* as the major subcanopy species, a plot with the subcanopy composed of *Lithocarpus* and *Quercus wislizeni*, and a plot with *Lithocarpus* as the understory tree but with no *Vaccinium ovatum* in the understory.

Plots used to define this association (n=10): PRNS139, PRNS001, PRNS146, PRNS145, GGNRA295, GGNRA294, GGNRA291, GGNRA289, GGNRA278, Marinsp15

Sequoia sempervirens - Pseudotsuga menziesii - Umbellularia californica Association
- pi code 02052

COMMON NAME	Coast Redwood - Douglas Fir Forest Association
SYNONYM	None
PHYSIOGNOMIC CLASS	Forest
PHYSIOGNOMIC SUBCLASS	Evergreen Forest
PHYSIOGNOMIC GROUP	Temperate or Subpolar Needle - Leaved Evergreen Forest
PHYSIOGNOMIC SUB GROUP	Natural / Semi - Natural
FORMATION	Giant Temperate or Subpolar Needle - Leaved Evergreen Forest
ALLIANCE	Sequoia sempervirens Forest Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Stands of the *Sequoia sempervirens - Pseudotsuga menziesii* forest association are found throughout the mapping areas of PRNS / GGNRA,. east of the Point Reyes Peninsula.

ENVIRONMENTAL DESCRIPTION
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Stands of the *Sequoia sempervirens - Pseudotsuga menziesii* forest association are found at low elevations on the mid 1 / 3 to entire side of 14 - 34 degree slopes. Aspects are southeast to southwest.

MOST ABUNDANT SPECIES
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory. Soil textures range from moderately fine sandy clay loam to medium to very fine sandy loam of Franciscan Melange.

PRNS / GGNRA
Tree: *Sequoia sempervirens, Pseudotsuga menziesii, Umbellularia californica*

CHARACTERISTIC SPECIES
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Tree: *Sequoia sempervirens, Pseudotsuga menziesii, Umbellularia californica, Lithocarpus densiflorus*

VEGETATION DESCRIPTION

Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Stands of the *Sequoia sempervirens - Pseudotsuga menziesii* forest association form an open ground layer with 2 - 18% cover at 0 - 25 cm tall and 25 - 1 cm tall, an open to intermittent shrub layer with 2 - 12% cover at 0.5 - 1 m tall, 10% cover t 1 - 2 m tall, 2 - 45% cover at 2 - 5 m tall, and an intermittent to continuous tree layer with 16 - 21% cover at 5 - 10 tall, 30 - 37% cover at 10 - 20 m tall, 25 - 40% cover at 20 - 30 m tall, and 0 - 40% cover greater than 30 m tall. This association is dominated by *Sequoia sempervirens* and *Pseudotsuga menziesii*, and *Umbellularia californica, Lithocarpus densiflorus* are also present. Understory species may include *Corylus cornuta, Polystichum munitum, Iris douglasiana, Lonicera hispidula, Smilacina sp., Galium sp., Pteridium aquilinum, Stachys ajugoides, Toxicodendron diversilobum, Quercus sp.* and a variety of other understory species. This association may be differentiated from the *S. sempervirens / Lithocarpus densiflora / Vaccinium ovatum* association by the presence of tree - size *Pseudotsuga menziesii* and the general absence of *Vaccinium ovatum* in the understory.

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK G4S3?

RANK JUSTIFICATION This association is only known locally, but likely extends further north and south in the Central and northern Coast Ranges of California.

DATABASE CODE

COMMENTS
Globally
PRNS / GGNRA

Plots used to define this association (n=3): Marinsp02, GGNRA286, PRNS143

TANOAK ALLIANCE

Lithocarpus densiflorus Forest Alliance - pi code 01070

This alliance is poorly represented in the study area and the general description below treats the stands observed in the study area.

COMMON NAME	Tanoak Forest
SYNONYM	Mixed Evergreen Forest, Tanoak Forest (Holland); Tanoak Series (PSW - 45); Northern Mixed Evergreen Forest (Thorne); Montane Hardwood Forest (WHR)
PHYSIOGNOMIC CLASS	Woodland
PHYSIOGNOMIC SUBCLASS	Evergreen woodland
PHYSIOGNOMIC GROUP	Temperate broad - leaved evergreen woodland
PHYSIOGNOMIC SUB GROUP	Natural / semi - natural
FORMATION	Temperate broad - leaved evergreen woodland

ALLIANCE *Lithocarpus densiflorus* Alliance

CLASSIFICATION CONFIDENCE LEVEL

USFWS WETLAND SYSTEM Upland

RANGE

Globally
In California occurs along Northern California Coast, Central California Coast Ranges, Klamath Mountains and in the Sierra Nevada.

PRNS / GGNRA
A single plot in the study area was located on the northeast side of Bolinas Ridge.

ENVIRONMENTAL DESCRIPTION
Globally
All slope aspects; soils well - drained, mostly sandstone, schist - derived; elevation 100 - 1500m.

PRNS / GGNRA
Northeast slope aspect on sandy clay loam soil; evidence of prior logging; many downed tanoaks.

MOST ABUNDANT SPECIES
Globally
Tree: *Lithocarpus densiflorus, Arbutus menziesii, Pinus coulteri, Pinus lambertiana, Pseudotsuga menziesii, Quercus agrifolia, Q. chrysolepis, Q. kelloggii, Umbellularia californica.*

PRNS / GGNRA
Tree: *Lithocarpus densiflorus*
Shrub: *Vaccinium ovatum*

CHARACTERISTIC SPECIES
Globally
Tree: *Lithocarpus densiflorus*

PRNS / GGNRA
Tree: *Lithocarpus densiflorus*

VEGETATION DESCRIPTION
Globally
Lithocarpus densiflorus is sole or dominant in the tree canopy**;** *Arbutus menziesii, Pinus coulteri, P. lambertiana, Pseudotsuga menziesii, Quercus agrifolia, Q. chrysolepis, Q. kelloggii, and / or Umbellularia californica* may be present. Trees < 75 m; canopy continuous, may be two - tiered. Shrubs infrequent or common. Ground layer sparse to abundant.

PRNS / GGNRA
Lithocarpus densiflorus strongly dominant in the tree layer; trees < 20 m; canopy continuous; Shrubs intermittent; ground layer vegetation intermittent.

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK G4S4

RANK JUSTIFICATION Generally wide - spread in coastal northern California, but nowhere extensive. Some stands are the result of selective logging and other disturbance removing original conifer overstory.

DATABASE CODE

COMMENTS
Globally
Lithocarpus densiflorus is an important component in several alliances. The term "mixed evergreen forest" is most commonly associated with *L. densiflorus*, but stands called mixed evergreen forest vary in composition (Barbour 1988b, Sawyer et al. 1977). The original concept of mixed evergreen forests was created to describe

hardwood stands in the Santa Lucia Mountains where *Arbutus menziesii, L. densiflorus*, live oaks, and *Umbellularia californica* grow in mixed stands. This is Cooper's (1922) broad sclerophyll formation.

Munz (1968) and Whittaker (1960) expanded the term mixed evergreen to include *Pseudotsuga menziesii - Lithocarpus densiflorus* stands. Azet et al. (1992) argue that *L. densiflorus* is the primary naturally regenerating species in southwestern Oregon, whereas *P. menziesii* importance is a result of past fires (Azet & Wheeler 1982). Jimerson (1993) comes to the same conclusion for western Klamath Mountains in California. The low elevation associations are called *Lithocarpus densiflorus* series even though *P. menziesii* is an important component.

Sawyer et al. (1977c) called stands in northwestern California of *Arbutus menziesii, L. densiflorus, and P. menziesii Pseudotsuga* / hardwood forests. Other authors (Keeler - Wolf 1990, Bingham & Sawyer 1991, 1993, Stuart 1993) refer to Douglas - fir / hardwood forests. [The slash indicates the two tiered character of the old stands].

The reason for not following Forest Service terminology (Jimerson 1993) is to be able to recognize associations with tanoak dominance [*Lithocarpus densiflorus* alliance] as different from stands where *L. densiflorus* shares the canopy with *P. menziesii* (*Pseudotsuga menziesii - Lithocarpus densiflorus* alliance). Differences in interpretation can be accommodated by remembering that an association can be placed in different categories by following the conventions of each classification.

PRNS / GGNRA
Further sampling in the southern portion of the GGNRA on the San Francisco Peninsula should result in sufficient stands sampled to identify the association(s) present in the mapping area.

Plot used to define this alliance locally (n=1): PRNS140

Forests And Scrubs Dominated by Bishop Pine, Introduced Pines and Cypresses and Chinquapin, or Mesic Chaparral (in part)

BISHOP PINE ALLIANCE

Bishop Pine (*Pinus muricata*) Forest Alliance - pi code 03030

This alliance is represented by one association in the area. Some additional variation is expressed by a plot sampled including a stand with a strong *Gaultheria shallon* shrub understory. The range of the alliance is From Humboldt County, northern California to Guadalupe Island off Central Baja California.

Pinus muricata - *Arbutus menziesii / Vaccinium ovatum* Association
- pi code 03031

COMMON NAME	Bishop Pine - Pacific Madrone / Evergreen Blueberry Forest
SYNONYM	None
PHYSIOGNOMIC CLASS	Forest
PHYSIOGNOMIC SUBCLASS	Evergreen forest
PHYSIOGNIMIC GROUP	Temperate or subpolar needle - leaved evergreen forest
PHYSIOGNOMIC SUB GROUP	Natural / Semi - natural
FORMATION	Rounded - crowned temperate or subpolar needle - leaved Evergreen forest
ALLIANCE	*Pinus muricata* Forest Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE

Globally

This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory. Because Pinus muricata alliance stands are spotty and restricted to California, it is likely that only a few other localities for this association may exist. One possible location is the vicinity of Salt Point State park in Sonoma County.

PRNS / GGNRA

This association is only found on the Point Reyes Peninsula, on the west shore of Tomales Bay near Tomales Bay State Park and on the northern portion of Inverness Ridge.

ENVIRONMENTAL DESCRIPTION

Globally

This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

This association grows on gentle to moderate slopes on northern and eastern exposures. Stands are typically found on the middle third of the slope. Soils are moderately fine to coarse sandy clay loams.

MOST ABUNDANT SPECIES

Globally

This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Tree	*Pinus muricata*
Shrub	*Vaccinium ovatum*

CHARACTERISTIC SPECIES

Globally

This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Tree	*Pinus muricata*
Shrub	*Vaccinium ovatum*

VEGETATION DESCRIPTION

Globally

This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Pinus muricata is the dominant tree in the canopy, usually with small amounts of *Arbutus menziesii*. Individuals of *Quercus agrifolia, Umbellularia californica,* and / or *Chrysolepis chrysophylla* var. *chrysophylla* may be present. The canopy is intermittent to continuous and is typically less than 20 but occasionally up to 30 meters in height. *Vaccinium ovatum* is important to dominant in the shrub canopy. The shrub layer is sparse to intermittent. *Corylus cornuta* or *Rhamnus californica* ssp. *californica* are often present and sometimes dominate the shrub layer. *Lithocarpus densiflora* may also be important. The herbaceous layer is sparse but may contain *Polystichum munitum, Pteridium aquilinum, Rubus ursinus, Gaultheria shallon, Clinopodium douglasiana,* and / or *Lonicera hispidula.*

OTHER NOTEWORTHY SPECIES None

CONSERVATION RANK G2S2

RANK JUSTIFICATION This association is only known from Point Reyes National Seashore, and is confined to a very small area.

DATABASE CODE To be determined

COMMENTS

Globally

Stands of *Pinus muricata* tend to be even aged, usually originating after stand destroying fires.

PRNS / GGNRA

A good portion of the 12,500 acre Mt Vision Fire of November 1995 burned *Pinus muricata* forest, presumably this association. Regeneration by *P muricata* in this fire has generally been excellent. Monitoring efforts are underway by NPS to follow the transition states of vegetation in the burned *Pinus muricata* forest, as well as in other vegetation types within the fire perimeter.

Plots used to define this association (n=6): PRNS179, PRNS093, PRNS066, PRNS 205, PRNS180, marinsp09

MONTEREY PINE - MONTEREY CYPRESS ALLIANCE

Monterey Cypress *(Cupressus macrocarpa)* Alliance - pi code 03120

All stands of this alliance were locally initiated by introduced individuals. No associations have been described. The following general account is descriptive of the stands in the area.

COMMON NAME	Monterey Cypress Stands
SYNONYM	Monterey Cypress Forest (Cheatham & Haller); Cypress Series (PSW - 45); Coastal Closed - cone Coniferous Woodland (Thorne); Closed - cone Pine - cypress (WHR)
PHYSIOGNOMIC CLASS	Woodland
PHYSIOGNOMIC SUBCLASS	Evergreen Woodland
PHYSIOGNOMIC GROUP	Temperate or Subpolar Needle - leaved Evergreen Woodland
PHYSIOGNOMIC SUB GROUP	Natural / Semi - natural
FORMATION	Rounded - crowned Temperate or Subpolar Needle - leaved Evergreen Woodland
ALLIANCE	*Cupressus macrocarpa* stands

CLASSIFICATION CONFIDENCE LEVEL

USFWS WETLAND SYSTEM Upland

RANGE
Globally
This association occurs on the Central California Coast.

PRNS / GGNRA
A single plot in project area located near Spring Valley Ridge, Montara Mountain Quad.. Numerous non - native stands have been planted. Most are small. Some of the largest and oldest are on the Presidio of GGNRA.

ENVIRONMENTAL DESCRIPTION
Globally
Native California stands occur on headlands on granitic - derived soils from sea - level to 20 meters elevation. Planted stands occur up and down the California coast, but are most common from central to northern CA within a few miles of the coast.

PRNS / GGNRA
No native stands locally. The single plot occurs in a planted grove on sandy loam soils at nearly 800 ft. elevation, adjacent to Coast Live Oak Alliance.

MOST ABUNDANT SPECIES
Globally
Tree: *Cupressus macrocarpa*

PRNS / GGNRA
Tree: *Cupressus macrocarpa*
Shrub: *Rhamnus purshiana, Toxicodendron diversilobum*
Herb: *Galium aparine*

CHARACTERISTIC SPECIES
Globally
Tree: *Cupressus macrocarpa*

PRNS / GGNRA
Tree: *Cupressus macrocarpa*

VEGETATION DESCRIPTION
Globally
Cupressus macrocarpa Monterey cypress sole tree in canopy. Trees < 25 m; canopy open. Shrubs infrequent. Ground layer sparse.

PRNS / GGNRA
Cupressus macrocarpa strongly dominates the tree canopy with some emergent *Arbutus menziesii* and *Quercus agrifolia*; Trees <20m, canopy intermittent; Shrubs infrequent; ground layer intermittent.

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK
C. macrocarpa is a rare, CNPS List 1B plant (CNPS 2001). However the stands are planted in PRNS / GGNRA and are considered exotic

RANK JUSTIFICATION Although plantations exist in the state and worldwide, only two natural populations occur in Monterey Co. Green (1929) reported that 10,000 trees grew in these populations at that time; three - fourths in the Cypress Point grove, and the rest near Seventeen Mile Drive at Pebble Beach.
DATABASE CODE

COMMENTS
Globally
A description by Vogel et al. (1977) suggests that *C. macrocarpa* associates with alliances rather than forming one.

Disturbance Effects and Vegetation Dynamics
General: Easily killed by fire, trees may regenerate from seed in closed (serotonous) cones, as with other California *Cupressus.* However, the natural fire return rate is too slow to perpetuate most stands in nature. The tree has been seen to open cones on warm days and shed seed without the aid of fire.

Status Regionally
Central California Coast (261Aj). Noted above native to north western Monterey County, Point Lobos, and Monterey Peninsula

PRNS / GGNRA
Northern California Coast (263A) Planted along roads and as hedgerows and specimen ornamentals throughout the coastal areas. In Point Reyes National Seashore and Golden Gate National Recreation area (263Ak, Al) trees are commonly planted around ranch houses and in groves providing shelter from strong coastal winds. Some groves have natural regeneration. For example groves at Fort Cronkhite at Marin Headlands, GGNRA are invading well developed *Baccharis - Artemisia* association stands.

Plot used to define the alliance locally (n=1): GGNRA367

Monterey Pine *(Pinus radiata)* Forest Alliance Stands - pi code 03120

All stands of this alliance were initiated from introduced plantings and do not constitute natural associations. The following general description serves to describe stands in the study area.

COMMON NAME	Monterey Pine Forest
SYNONYMS	Monterey Pine Forest (Holland), (Cheatham & Haller); Monterey Pine Series ((PSW - 45); Coastal Closed - cone Coniferous Forest (Thorne); Closed - cone Pine - Cypress (WHR)
PHYSIOGNOMIC CLASS	Forest
PHYSIOGNOMIC SUBCLASS	Evergreen forest
PHYSIOGNOMIC GROUP	Temperate or subpolar needle - leaved evergreen forest
PHYSIOGNOMIC SUB GROUP	Natural / semi - natural
FORMATION	Rounded - crowned temperate or subpolar needle - leaved evergreen forest

ALLIANCE *Pinus radiata* Forest Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE
Globally
Native stands limited to Central California Coast

PRNS / GGNRA
No plots were sampled, however *Pinus radiata* has been planted widely throughout the study area as windbreaks and "groves." In some cases individual plantings have expanded and become locally invasive.

ENVIRONMENTAL DESCRIPTION
Globally
Maritime terraces and headlands at sea - level to 300 meters; soils excessively drained.

PRNS / GGNRA
Maritime terraces and headlands at sea - level to 300 meters; soils excessively drained.

MOST ABUNDANT SPECIES
Globally
Pinus radiata

PRNS / GGNRA
Pinus radiata

CHARACTERISTIC SPECIES
Globally
Pinus radiata

PRNS / GGNRA
Pinus radiata

VEGETATION DESCRIPTION
Globally
Pinus radiata sole or dominant tree or important with *Quercus agrifolia* in the tree canopy; *Arbutus menziesii, Pinus attenuata, P. muricata, P. ponderosa, Pseudotsuga menziesii,* and / *or Sequoia sempervirens* may be present. Trees < 30 m; canopy continuous or intermittent. Shrubs absent, infrequent, or common. Ground layer sparse or abundant.

PRNS / GGNRA
Pinus radiata sole or dominant tree or important with *Quercus agrifolia* in the tree canopy; *Arbutus menziesii, Cupressus macrocarpa, Eucalyptus globulus, Pinus attenuata, P. muricata, P. ponderosa, Pseudotsuga menziesii,* and / or *Sequoia sempervirens* may be present. Trees < 30 m; canopy continuous or intermittent. Shrubs absent, infrequent, or common. Ground layer sparse or abundant.

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK Native stands G1S1, locally exotic

RANK JUSTIFICATION For native stands the introduced pine pitch canker (*Fusarium subglutans pini*) is currently a serious disease in the Monterey stands. Possibly as a result of the advanced age of many of the stands, making them more susceptible to disease. Most remains in private ownership in an area of continued

development. Genetic contamination from nursery stock from non - native sources is another problem. Non - native plantations are numerous up and down Coastal California.

DATABASE CODE

COMMENTS
Globally
Plantations exist in the state and worldwide, but only three natural areas exist in California near Año Nuevo in Santa Cruz and San Mateo Cos., on the Monterey peninsula in Monterey Co., and at Cambria in San Luis Obispo Co.

Qualitative descriptions (Jones & Stokes 1994) point out the high level of variation in species composition among the three areas where *Pinus radiata* grows. At the Año Nuevo area, *P. radiata* associates with *Arbutus menziesii, P. attenuata, P. ponderosa, Pseudotsuga menziesii, Quercus agrifolia,* and / or *Sequoia sempervirens*. In the other areas, the *Pinus radiata* grows with *P. muricata,* and *Q. agrifolia*.
Cylinder (1995) describes links between marine terrace conditions and *P. radiata* success. His eight proposed types indicate that *P. radiata* dominates in stands of distinct species composition on different terraces, and that *P. radiata* it is also a secondary species in other alliances.

PRNS / GGNRA
Although native to three stands in CA, there are many planted stands including several in the Point Reyes National Seashore and Golden Gate National Recreation Area. Most of these are exhibiting some evidence of natural regeneration from seed.

No plots sampled locally (n=0).

SARGENT CYPRESS ALLIANCE - pi code 03150 (preliminary) (CUPRESSUS SARGENTII WOODLAND ALLIANCE)

GIANT CHINQUAPIN ALLIANCE

Giant Chinquapin (*Chrysolepis chrysophylla)* Forest Alliance - pi code 01090

All stands of this alliance fall under a single association described below. This new alliance has been defined from these local stands. The range of the alliance as is currently known is only anecdotally known from beyond the study area, but probably is restricted to California and includes the Santa Cruz Mountains and the outer north Coast Ranges north to Mendocino County.

Chrysolepis chrysophylla var. *minor / Vaccinium ovatum* Association
- pi code 01091

COMMON NAME	Dwarf Golden Chinquapin / Evergreen Blueberry Forest
SYNONYM	None
PHYSIOGNOMIC CLASS	Forest
PHYSIOGNOMIC SUBCLASS	Evergreen Forest
PHYSIOGNIMIC GROUP	Temperate broad - leaved evergreen forest
PHYSIOGNOMIC SUB GROUP	Natural / Semi - natural
FORMATION	Hemi - sclerophyllous temperate broad - leaved evergreen forest
PHYSIOGNOMIC SUB GROUP	Natural
ALLIANCE	Dwarf Golden Chinquapin

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE

Globally

This association is only known from the vicinity of the Point Reyes National Seashore and Golden Gate National Recreation Area. Information about its global range is not available without additional inventory. Similar *Chrysolepis chrysophylla* var. *minor* stands have been noted in the Santa Cruz Mountains (Hecht *et al.* 1973). However, any vegetation similar to this association appears to be limited to the outer coast Ranges of California in the vicinity of San Francisco Bay (Keeler - Wolf personal observations 1973 - 1999).

PRNS / GGNRA

Stands of this association are mapped in the southern portion of PRNS including Bolinas Ridge, Mt Tamalpais State Park and southward, scattered throughout GGNRA and San Francisco Water District lands (San Mateo County).

ENVIRONMENTAL DESCRIPTION

Globally

This association is only known from the vicinity of the Point Reyes National Seashore and Golden Gate National Recreation Area. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

This association is found on gentle to moderate slopes on all aspects. Stands are found on upper slopes and ridges. Soils recorded are fine, sandy loams. Most stands appear to occupy relatively fine - grained substrates derived from marine sedimentary rocks. Stands are relatively small and occupy upper thirds of ridges and ridge tops where soils are shallow and rocky. Adjacent vegetation includes *Arctostaphylos nummularia* association, *Pseudotsuga menziesii* alliance stands, *Sequoia sempervirens* alliance stands, and *Adenostoma fasciculatum* alliance stands. The associated shrubby alliance stands occupy the poorest soils while the tree alliances occupy the better developed soils of the adjacent north facing slopes and ravines. Most of the *Chrysolepis chrysophylla* stands are near the upper level of average summer fog and are intermediate in soil development between chaparral and forest. They appear to occupy a narrow interface between forest and chaparral usually forming small stands less than 2 ha in size.

MOST ABUNDANT SPECIES

Globally

This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global species composition is not available without additional inventory.

PRNS / GGNRA

Tall Shrub	*Chrysolepis chrysophylla var. chrysophylla*
Shrub	*Vaccinium ovatum, Chrysolepis chrysophylla var. minor*
Herbaceous	*Pteridium aquilinum*

CHARACTERISTIC SPECIES

Globally

This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global species composition is not available without additional inventory.

PRNS / GGNRA

Tall Shrub	*Chrysolepis chrysophylla* var. *minor*
Shrub	*Vaccinium ovatum, Chrysolepis chrysophylla* var. *minor*

VEGETATION DESCRIPTION

Chrysolepis chrysophylla var. *minor* forms an open to continuous tall shrub or short tree canopy 5 - 10 meters in height. Scattered individuals of other evergreen tree species may be present including *Sequoia sempervirens* and / or *Pseudotsuga menziesii. Vaccinium ovatum* is conspicuous in the shrub layer with 35% to 90% cover.

Toxicodendron diversilobum, Baccharis pilularis, Arctostaphylos glandulosa, Quercus wislizeni, and / or *Quercus berberidifolia* may also be present. The herbaceous layer is fairly sparse, but usually contains *Pteridium aquilinum. Xerophyllum tenax* and *Pickeringia montana* are occasional associates.

OTHER NOTEWORTHY SPECIES None

CONSERVATION RANK G3S3?

RANK JUSTIFICATION See above discussion of range, likely to be small size stands of limited geographic extent

DATABASE CODE To be determined

COMMENTS
Globally

PRNS / GGNRA
There is some uncertainty about the identity of the subspecific taxon of *Chrysolepis chrysophylla* in the mapping area. Both *C. chrysophylla* var. *chrysophylla* (typically a tall single - trunked tree) and *C.C.* var. *minor* (typically a multistemmed shrub or short tree) are reported from the mapping area (Hickman 1993, Munz 1998). Most of the individuals in this association are tall shrubs that have the habit of clonal, multiple stemmed individuals. However, many of these individuals may be up to 10 m tall (small tree size). These individuals do not resemble the "Giant Chinquapins" (*C.c.* var. *chrysophylla*) of the North Coast Ranges (Keeler - Wolf 1988) and the Klamath
Province further north in California, and are thus considered the "shrub form" (var. *minor*).

Plots used to define this association and alliance (n=4): PRNS190, PRNS117, GGNRA371, GGNRA329, GGNRA292

EUCALYPTUS ALLIANCE

Eucalyptus spp. Alliance Stands - pi code 01030

This alliance is represented by numerous introduced stands in the study area. The following description provides a general profile of the alliance in California with reference to the stands in the local mapping area. No plots were sampled in this alliance.

COMMON NAME	Eucalyptus stands
SYNONYM	Eucalyptus series (PSW - 45)
PHYSIOGNOMIC CLASS	Forest
PHYSIOGNOMIC SUBCLASS	Evergreen forest
PHYSIOGNOMIC GROUP	Winter - rain broad - leaved evergreen sclerophyllous forest
PHYSIOGNOMIC SUB GROUP	Natural / semi - natural
FORMATION	Lowland or submontane winter - rain evergreen sclerophyllous forest

ALLIANCE *Eucalyptus* Woodland Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE

Globally
Eucalyptus stands occur on the Northern, Central, and Southern California Coasts, the Southern Mountains and Valleys, and on the Channel Islands.

PRNS / GGNRA
No *Eucalyptus* plots sampled in study area, however *E. globulus* has been widely planted throughout as windbreaks and groves. Some of the largest stands occur near Bolinas, Dogtown, and on the ranches on the northern Point Reyes Peninsula.

ENVIRONMENTAL DESCRIPTION
Globally
Occurs on all slopes at elevations from sea - level to 300 meters.

PRNS / GGNRA
Occurs on all slopes at elevations from sea - level to 300 meters.

MOST ABUNDANT SPECIES
Globally
Eucalyptus spp.

PRNS / GGNRA
Eucalyptus spp.

CHARACTERISTIC SPECIES
Globally
Eucalyptus spp.

PRNS / GGNRA
Eucalyptus spp.

VEGETATION DESCRIPTION
Globally
Eucalyptus is the sole or dominant tree in the canopy; few other species present. Trees < 50 m; canopy continuous. Shrubs infrequent. Ground layer sparse.

PRNS / GGNRA
Eucalyptus is the sole or dominant tree in the canopy; few other species present. Trees < 50 m; canopy continuous. Shrubs infrequent. Ground layer sparse.

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK Exotic

RANK JUSTIFICATION Exotic

DATABASE CODE

COMMENTS
Globally
Most *Eucalyptus* species in CA are vigorous resprouters following fire and other stem disturbance. Several species are frost - sensitive and stem dieback has been a regular feature of *E. globulus* stands in the Great Valley and in the Central and Northern Coast Ranges following major freezes (e.g., 1990, 1973). Most *E. globulus* stands have originated by plantings, however many stands appear to be self - perpetuating now that they are established. Certain Eucalyptus species are being attacked by Australian insect bersts that have been inadvertently introduced along with their hosts. Planted *Eucalyptus camaldulensis* and *E. rudis* stands are

currently plagued by the Red Gum Lerp Psyllid, *(Glycaspis brimblecombei)*in southern and central California. The insects may or may not kill the trees, but they regularly defoliate them and reduce their vigor

PRNS / GGNRA
Local groves, especially along fence rows and roads. They are more common in the southern subsections. Many groves in the PRNS and GOGA study area were planted in the late 1800's and early 1900's as windbreaks in what was naturally coastal shrubby or herbaceous alliance stands.

Plots used to define this association (n=0): no plots sampled

WINTER DECIDUOUS FOREST / SCRUB

Riparian Forests and Scrub

RED ALDER ALLIANCE

Red Alder *(Alnus rubra)* Forest Alliance - pi code 07070

This alliance is represented by two associations in the study area, both defined with data collected in this project. Both associations occur in permanently saturated soils associated with streams and other permanent bodies of water. The range of this alliance is from Central Coastal California to Southern coastal Alaska.

Alnus rubra / Rubus spectabilis - Sambucus racemosa Association
- pi code 07071

COMMON NAME	Red Alder / Salmon raspberry - Red Alder Forest
SYNONYM	None
PHYSIOGNOMIC CLASS	Forest
PHYSIOGNOMIC SUBCLASS	Deciduous forest
PHYSIOGNIMIC GROUP	Cold - deciduous forest
PHYSIOGNOMIC SUB GROUP	Natural Semi - natural
FORMATION	Seasonally flooded cold - deciduous forest
ALLIANCE	Red Alder / Salmon Raspberry Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Palustrine

RANGE

Globally

This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global range is not available without additional inventory. It is likely that this association occurs throughout the outer coast ranges of Northern California.

PRNS / GGNRA

This forest is found throughout the PRNS / GGNRA planning area, though it is more common in the northern sections.

ENVIRONMENTAL DESCRIPTION

Globally

This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Stands of this forest are found in draws, streamsides, and gullies, which have permanent or semi - permanent surface water. Slopes are gentle to moderate, and aspects are generally north and east. Soils are coarse sandy loams to moderately fine sandy clay loams.

MOST ABUNDANT SPECIES

Globally

This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Tree *Alnus rubra*
Shrub *Rubus (spectabilis, ursinus, parviflorus)*

CHARACTERISTIC SPECIES
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Tree *Alnus rubra*
Shrub *Rubus spectabilis*

VEGETATION DESCRIPTION
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
This forest is dominated by *Alnus rubra*, which forms an intermittent to continuous canopy usually less than 20 meters in height. *Umbellularia californica* and / or *Salix lasiolepis* may be present in small amounts. The shrub layer is generally co - dominated by *Sambucus racemosa* and *Rubus* species, generally *Rubus spectabilis*, though *Rubus parviflorus* and / or *Rubus ursinus* are sometimes more common. The herbaceous layer is sparse to open, and often includes *Urtica dioica, Stachys ajugoides, Erechtites minima, Polystichum munitum, Scrophularia californica,* and / or *Athyrium filix - femina.*

OTHER NOTEWORTHY SPECIES None

CONSERVATION RANK G3G4?

RANK JUSTIFICATION There are approximately 70 stands of this vegetation mapped in the PRNS / GGNRA planning area. No other stands are known. However, this is likely to be a more widespread type in northern coastal California and perhaps to Oregon and Washington.

DATABASE CODE To be determined

COMMENTS
Globally

PRNS / GGNRA
The selection of *Rubus* spp. as characteristic species for this association is based upon a study by Sawyer (2000) which shows that in the outer North Coast Ranges of California, *Rubus ursinus, R. parviflorus*, and *R. spectabilis* may act as ecological analogs and replace one another in several vegetation types . Channelization, exotics and erosion are impacting this association.

Plots used to define this association (n=6): PRNS35, PRNS64, PRNS111, PRNS009, PRNS 204, Marinsp10

Alnus rubra / Salix lasiolepis Association
- pi code 07072

COMMON NAME Red Alder / Arroyo Willow Forest Association
SYNONYM None
PHYSIOGNOMIC CLASS Forest
PHYSIOGNOMIC SUBCLASS Deciduous Forest
PHYSIOGNOMIC GROUP Cold - Deciduous Forest

PHYSIOGNOMIC SUB GROUP Natural / Semi - Natural
FORMATION Temporarily Flooded Cold - Deciduous Forest

ALLIANCE *Alnus rubra* Forest Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland or Wetland: Palustrine Forested Wetland.

RANGE
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory. However, it is likely that this type occurs along the central and north coast of California and perhaps further north into Oregon and Washington.

PRNS / GGNRA
Stands of the *Alnus rubra / Salix lasiolepis* forest association occur throughout the Point Reyes Peninsula and along several creeks in Samuel P. Taylor State Park.

ENVIRONMENTAL DESCRIPTION
Globally
This association is only known from along permanent streams in the Point Reyes National Seashore and vicinity. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Stands of the *Alnus rubra / Salix lasiolepis* forest association are found on low gradient streams and their banks, including upper terraces. Soil textures range from moderately fine sandy clay loam to medium sand of gravelly alluvium. All stands inventoried occurred along permanent streams.

MOST ABUNDANT SPECIES
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Tree: *Alnus rubra / Salix lasiolepis*
Shrub: *Rubus ursinus*

CHARACTERISTIC SPECIES
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Herb: *Urtica dioica*
Shrub: *Alnus rubra, Salix lasiolepis, Rubus ursinus*
Tree: *Alnus rubra, Salix lasiolepis*

VEGETATION DESCRIPTION
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Stands of the *Alnus rubra / Salix lasiolepis* forest forms an open herb layer with 2 - 10% cover at 0 - 25 cm and 3 - 31% cover at 25 - 50cm tall, an open to continuous shrub layer with 6 - 22% cover at 0.5 - 1 m tall, 5 - 30% cover at 1 - 2 m tall, and 2 - 50% cover at 2 - 5 m tall, and an open to continuous tree layer 4 - 40% cover at 5 - 10 tall, 4 - 45% cover at 10 - 20m tall, and 0 - 60% cover at 20 - 30 m tall. It is dominated by either *Alnus rubra* or *Salix lasiolepis.* However, either species must be at least 25% relative cover. *Rubus ursinus* and *Urtica dioica* are also present. A variety of other species may include *Artemisia douglasiana, Carex sp., Ribes sp., Equisetum sp., Rumex crispus, Veronica americana, Lonicera involucrate, Acer negundo, Rubus discolor, Scirpus microcarpus, Polugonum sp.,* and *Vinca major*.

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK G4 S3

RANK JUSTIFICATION It is likely that this association is largely restricted to small riparian stands along coastal streams and rivers in central and northern California.

DATABASE CODE

COMMENTS
Globally

PRNS / GGNRA
Several stands of this association are heavily invaded by exotics such as *Vinca minor, Rubus discolor, and Conium maculatum.*

Plots used to define this association (n=3): marinsp03, PRNS112, PRNS132

CALIFORNIA WAX MYRTAL ALLIANCE

California Wax Myrtle (*Morilla californica*) Shrub Alliance - pi code 20010

This alliance is defined for the first time using data from this study. Its range is conjectural at this point, but probably includes the outer California Coast Ranges from central California to southwestern Oregon.

Morilla californica Association
- pi code 20010

COMMON NAME	Pacific Bayberry Shrubland
SYNONYM	None
PHYSIOGNOMIC CLASS	Shrubland
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland
PHYSIOGNIMIC GROUP	Temperate broad - leaved evergreen shrubland
PHYSIOGNOMIC SUB GROUP	Natural / Semi - natural
FORMATION	Temperate broad - leaved evergreen shrubland with a sparse Evergreen tree layer
ALLIANCE	Putatively *Morella californica* (newly defined)

CLASSIFICATION CONFIDENCE LEVEL 3

USFWS WETLAND SYSTEM Upland

RANGE
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global range is not available without additional inventory. Other stands have been sampled in San Mateo County

at Montara Mountain (CNDDB 2001). These stands are within a few miles of the southwestern portion of the mapping area. It is likely that this association is more widespread in Northern California.

PRNS / GGNRA

ENVIRONMENTAL DESCRIPTION
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
This association is found in permanently moist soils adjacent to brackish and freshwater lagoons and along small seeps and streams within the coastal strip usually less than 1 mile from the coast. Occasionally stands occur on the upper third of moderate slopes with northern to eastern aspects. Stands grow on moderately coarse sandy loams. The stands are associated with *Rubus spectabilis* alliance stands, *Carex obnupta* alliance stands, *Scirpus microcarpus* alliance stands, *Calamagrostis nutkaensis* alliance stands, and *Baccharis pilularis / Carex obnupta* stands.

MOST ABUNDANT SPECIES
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Tall shrub *Morella californica*

CHARACTERISTIC SPECIES
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Tall shrub *Morella californica*

VEGETATION DESCRIPTION
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
This vegetation includes stands dominated by *Morella californica,* which forms a fairly closed canopy between 2 - 5 meters in height. Other shrubs may include *Toxicodendron diversilobum, Baccharis pilularis, Rubus ursinus, Ribes sanguineum, Holodiscus discolor, Garrya elliptica,* and *Vaccinium ovatum.* Herbs include*: Erechtites minima* (exotic), *Urtica dioica, Pteridium aquilinum, Polystichum munitum, Marah fabaceus*, *Phacelia malvifolia,* and *Marah fabaceus.* Stands are generally small (<1ha).

OTHER NOTEWORTHY SPECIES None

CONSERVATION RANK G4S3?

RANK JUSTIFICATION Stands are small and located in coastal zone in Northern California.

DATABASE CODE To be determined

COMMENTS

Globally

PRNS / GGNRA
Exotic species are impacting this association.

Plots used to define this association and alliance (n=4): PRNS058, PRNS171, PRNS159, PRNS169

SALMONBERRY ALLIANCE

Coastal Bramble *(Rubus spectabilis - R. parviflorus - R. ursinus)* Alliance - pi code 30050

This alliance has been recently described from work done in northern coastal California (Belsher 1999). The phases of this alliance are variable and may or may not include all species mentioned in the alliance name. Most stands defined locally in the study area are dominated and characterized by Rubus spectabilis and constitute a single association, described below.

Rubus spectabilis Association
- pi code 30050

COMMON NAME	Salmonberry - Bulrush Scrub - Shrub Wetland
SYNONYM	None
PHYSIOGNOMIC CLASS	Shrubland
PHYSIOGNOMIC SUBCLASS	Deciduous shrubland
PHYSIOGNIMIC GROUP	Cold - deciduous shrubland
PHYSIOGNOMIC SUB GROUP	Natural / Semi - natural
FORMATION	Semi - permanently flooded cold - deciduous shrubland
ALLIANCE	To be determined, Putatively *Rubus spectabilis* Shrubland Alliance

CLASSIFICATION CONFIDENCE LEVEL 3

USFWS WETLAND SYSTEM

RANGE
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global range is not available without additional inventory. *Rubus spectabilis* is widespread in the Pacific Northwest from San Francisco Bay area to Alaska. However, no alliance has been defined for it elsewhere.

PRNS / GGNRA

ENVIRONMENTAL DESCRIPTION
Globally
This association is only known from the vicinity of the Point Reyes National Seashore and Golden Gate National Recreation Area. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
This association occurs on gentle slopes on the margins of wetlands. Soils range from coarse, loamy sands derived from granite to medium clay loam derived from marine sediments. Stands occur on the Point Reyes Peninsula along low drainages, seeps, and swales usually within 1 - 2 km from the coast. Stands are most often adjacent to *Salix lasiolepis, Carex obnupta, Scirpus microcarpus,* and *Juncus effuses* var. *brunneus* alliance stands

MOST ABUNDANT SPECIES

Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global species composition is not available without additional inventory.

PRNS / GGNRA
Shrub *Rubus spectabilis, Rubus parviflorus, Lonicera involucrata, Sambucus racemosa*
Herbaceous *Scirpus microcarpus, Stachys ajugoides, Heracleum maximum*

CHARACTERISTIC SPECIES
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global species composition is not available without additional inventory.

PRNS / GGNRA
Shrub *Rubus spectabilis*

VEGETATION DESCRIPTION
This association includes stands dominated by *Rubus spectabilis* with *Stachys ajugoides Heracleum maximum*, and a variety of other mesophilic to hydrophilic herbs dominating the understory. The herbaceous layer is typically open, while the shrub canopy is continuous. Other species may include *Urtica dioica, Juncus effuses var. brunneus and Oenanthe sarmentosa. Rubus spectabilis* forms dense clonal thickets along seeps, ponds, lagoons, and creeks in the foggy coastal strip of the mapping area. Species composition may vary with some species such as *Scirpus microcarpus* and *Lonicera involucrata codominate* in certain areas. Stands are usually small, but may range up to 2.5 ha.

OTHER NOTEWORTHY SPECIES None

CONSERVATION RANK G4 S2.2?

RANK JUSTIFICATION Rubus spectabilis stands are relatively uncommon in Northern California along the coast from Marin to Del Norte Counties.

DATABASE CODE To be determined

COMMENTS
Globally

PRNS / GGNRA
Grazing and competition from exotics are impacts in this association.

Plots used to define this association (n=4): PRNS088, PRNS 063, PRNS157, PRNS172

YELLOW WILLOW ALLIANCE

Yellow Willow *(Salix lucida)* Alliance stands - pi code 07030

Stands of this alliance are not currently well enough represented to define associations within the study area. The following description will serve to define the general characteristics of the alliance as it occurs locally.

COMMON NAME Pacific Willow Thickets
SYNONYMS Central Coast Cottonwood - sycamore Riparian Forest, Central Coast Riparian Scrub, Freshwater Swamp, Great Valley Mixed Riparian Forest, Great Valley Willow Scrub, Red Alder Riparian Forest, Southern Cottonwood - Willow Riparian Forest, Southern Willow Scrub (Holland); Willow Series (PSW - 45);

	Riparian Woodland (Thorne); Freshwater Emergent Wetland (WHR)
PHYSIOGNOMIC CLASS	Forest, Woodland, Shrubland
PHYSIOGNOMIC SUBCLASS	Deciduous Forest, Deciduous Woodland, Deciduous Shrubland
PHYSIOGNOMIC GROUP	Cold - deciduous Forest, Cold - deciduous Woodland, Cold - Deciduous Shrubland
PHYSIOGNOMIC SUB GROUP	Natural / Semi - natural
FORMATION	Seasonally flooded cold - deciduous forest; Temporarily flooded woodland; Temporarily flooded cold - deciduous woodland; Temporarily flooded shrubland; Temporarily flooded cold - deciduous shrubland.
ALLIANCE	*Salix lucida* ssp. *lasiandra* seasonally, Temporarily Flooded Forest, Woodland, Shrubland Alliance Complex

CLASSIFICATION CONFIDENCE LEVEL

USFWS WETLAND SYSTEM Palustrine shrub - scrub

RANGE
Globally
California Floristic Province

PRNS / GGNRA
Two plots in the study area located near Nicasio Ridge and the Coast Guard Housing.

ENVIRONMENTAL DESCRIPTION
Globally
Habitats seasonally flooded, saturated. Water chemistry: fresh. Floodplains; low - gradient depositions along rivers, streams. The national inventory of wetland plants (Reed 1988) lists *Salix lucida* ssp. *lasiandra* as a OBL. Elevation: sea level - 2700 m.

PRNS / GGNRA
The two plots in the study area located on terraces on soils from fine clay to medium sand.

MOST ABUNDANT SPECIES
Globally

Tree:	*Salix lucida ssp lasiandra, Acer macrophyllum, Alnus rhombi folia, Cornus sericea, Platanus racemosa, Populus balsamifera, P, fremontii*
Shrub:	*Sambucus mexicana*

PRNS / GGNRA

Tree:	*Salix lucida* ssp *lasiandra, Alnus rubra, S. lasiolepis*
Shrub:	*Rubus ursinus, Artemisia douglasiana, Athyrium filix - femina, Lonicera involucrata*

CHARACTERISTIC SPECIES
Globally
Salix lucida ssp lasiandra

PRNS / GGNRA
Salix lucida ssp *lasiandra*

VEGETATION DESCRIPTION

Globally
Salix lucida ssp. lasiandra is sole or dominant in the shrub or tree canopy**;** *Acer macrophyllum, Alnus rhombi folia, Cornus sericea, Platanus racemosa, Populus balsamifera, P. fremontii, Salix spp.*, and / or *Sambucus mexicana* may be present. If shrubland, emergent trees may be present. Shrubs < 15 m; canopy continuous. Shrubs sparse under tree canopy. Ground layer variable; may include *Athyrium filix - femina, Artemisia douglasiana.*

PRNS / GGNRA
Salix lucida ssp. *Lasiandra* dominant to strongly dominant in the tree canopy; *Alnus rubra* present in one plot, *S. lasiolepis* in the other; trees <20m, canopy continuous. Shrubs intermittent to continuous under the tree canopy. Ground layer sparse.

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK G4 S3

RANK JUSTIFICATION Usually found in small stands adjacent to permanent moisture. In California tends to occur along coastal rivers and creeks with little non - natural disturbance.

DATABASE CODE

COMMENTS
Globally
Willow stands may or may not be dominated by a single species. If no dominant willow is present at low elevations, then place the stands in the Mixed willow alliance. Montane and subalpine willow stands are placed in separate classes since different willow species are restricted to those elevations. Stands of the *Salix lucida* ssp. *lasiandra* alliance have environment conditions similar to alder, cottonwood, and other willow alliances.
Status Regionally
Central California Coast Ranges (M262A): Small stands occur along the upper reaches of the San Antonio River, Monterey Co.
Southern California Mountains and Valleys (M262A): small stands line several permanent rivers and streams including the Santa Margarita and the Santa Ana Rivers.

PRNS / GGNRA
Northern California Coast Ranges (263A): Stands, though typically small are common near Olema and Pt Reyes Station (261Al) insufficient samples exist to define associations. Stands may have herbaceous understory.

Plots used to define the alliance locally (n=2): PRNS68, GGNRA384

BLACK WILLOW ALLIANCE
Salix gooddingii Alliance Stands - pi code 07040
This alliance is represented locally by a single plot. The following general description will serve to define the alliance.

Salix gooddingii Alliance

COMMON NAME	Black willow thicket
SYNONYM	Central Coast Riparian Scrub, Great Valley Cottonwood Forest, Great Valley Mixed riparian Forest, Mojave Riparian Forest, Sonoran Cottonwood - willow Riparian Forest, Southern Cottonwood - willow Riparian Forest, Southern Willow Scrub (Holland); Willow Series (PSW - 45); Riparian Woodland (Thorne); Desert Riparian, Freshwater Emergent Wetland (WHR).
PHYSIOGNOMIC CLASS	Woodland

PHYSIOGNOMIC SUBCLASS	Deciduous Woodland
PHYSIOGNOMIC GROUP	Cold - deciduous Woodland
PHYSIOGNOMIC SUB GROUP	Natural / Semi - natural
FORMATION	Temporarily Flooded Cold - deciduous Woodland
ALLIANCE	*Salix gooddingii* Temporarily Flooded Alliance

CLASSIFICATION CONFIDENCE LEVEL

USFWS WETLAND SYSTEM Palustrine forested or shrub - scrub

RANGE

Globally

In California occurs across the Northern California Interior Coast Ranges, Great Valley, Sierra Nevada Foothills, Southern California Coast, Southern California Mountains and Valleys, Mojave and Sonoran Deserts. Also occurs in New Mexico, Texas and throughout the southwestern U.S.

PRNS / GGNRA

Single plot in study area located near Spring Valley Ridge.

ENVIRONMENTAL DESCRIPTION

Globally

Habitats temporarily flooded, saturated. Water chemistry: fresh. Floodplains; low - gradient depositions along rivers, streams; meadow edges. The national inventory of wetland plants (Reed 1988) lists *Salix gooddingii* as a OBL. In California most stands are in inland or southern coastal riparian settings which have warm to hot summers. Stands in northern coastal California are less common.

PRNS / GGNRA

Plot located along dry creek in sandy loam soils at 716 ft. elevation.

MOST ABUNDANT SPECIES

Globally

Salix gooddingii

PRNS / GGNRA

Salix gooddingii, Sambucus mexicana

CHARACTERISTIC SPECIES

Globally

Salix gooddingii

PRNS / GGNRA

Salix gooddingii

VEGETATION DESCRIPTION

Globally

Salix gooddingii is dominant in the shrub or tree canopy; *Alnus rhombifolia, Baccharis pilularis, B. salicifolia, Platanus racemosa, Populus balsamifera, P. fremontii, Salix hookeriana, S. laevigata, S. lasiolepis, S. lucida* ssp. *lasiandra, S. sitchensis, Sambucus mexicana, Cornus sericea* and / or *Washingtonia filifera* may be present. If shrubland, emergent trees may be present. Shrubs < 3 m; canopy continuous. Shrubs sparse under tree canopy. Ground layer variable.

PRNS / GGNRA

Salix gooddingii dominant in the shrub canopy; *Sambucus mexicana* also present; Shrubs < 5 m, canopy continuous. Some emergent *Quercus agrifolia* and *Pseudotsuga menziesii*. Ground layer open.

OTHER NOTEWORTHY SPECIES *Cornus sericea, Pseudotsuga menziesii, Quercus agrifolia*

CONSERVATION RANK G4 S3

RANK JUSTIFICATION Stands are widespread, but not usually extensive and subject to riverbank erosion control and channel modification.

DATABASE CODE

COMMENTS

Globally

Willow stands may or may not be dominated by a single species. Montane and subalpine willow stands are placed in separate classes since different willow species are restricted to those elevations. Stands of *S. gooddingii* have environmental conditions similar to alder, cottonwood, and other willow alliances, however, S gooddingii stands are typically most prevalent at low elevations in CA, rarely ranging up above the foothill belt. Most *S. gooddingii* stands are arborescent.

Salix gooddingii is an important riparian tree or shrub in the West. Its ecology is tied to stand modify and creating disturbances, especially winter floods. It blooms and fruits in early spring. The wind - dispersed seed is viable for a few days. Germination is best on fine - grained, moist, bare soil. Established plants tolerate seasonal inundation. *S. gooddingii* resprouts from a root crown in lighted conditions. Plants are top - killed by low and moderate fire, but reprouts vigorously. Seedling establishment after fire may be high if seasonal and moisture requirements are met.

Status Regionally

Northern California Interior Coast Ranges (M261C). Occurs occasionally at lower elevations along major streams and rivers

Central California Coast Ranges (M262A): Small stands occur along the upper reaches of the San Antonio River, Monterey Co. Stands are apparently rare on the San Francisco Peninsula, Only one plot was sampled in the San Francisco Municipal Watershed adjacent to Golden Gate National Recreation Area.

Northern California Coast Ranges (263A): stands are scattered along major lowland streams and rivers

Great Valley (262A). Small stands common along Sacramento River and other major tributaries, common as small stands along drainage ditches and in Wildlife Refuges in Sacramento and San Joaquin Valleys.

Sierra Nevada Foothills (M261F).

Southern California Coast (261B). Common in flood control basins and along perennial streams in lowlands

Southern California Mountains and Valleys (M262B).

Mojave Desert (322A) common along Mojave River and Owens River and Colorado Desert (322C) stands are small and local, common along main Colorado River, in some cases only a few plants that mixes with *Populus fremontii* and *Washingtonia filifera*.

PRNS / GGNRA

Stands appear to be rare locally.

Plot used to define alliance locally (n=1): GGNRA358

RED WILLOW ALLIANCE

Red Willow (*Salix laevigata)* Alliance Stands - pi code 07050

Locally red willow alliance stands are scattered in riparian settings. Currently insufficient samples exist to define associations. The following account will serve to distinguish the local expression of the alliance.

COMMON NAME Red willow thickets

SYNONYMS Central Coast Cottonwood - sycamore Riparian Forest, Central Coast Riparian Scrub, Great Valley Mixed Riparian Forest, Modoc - Great Basin Cottonwood - willow Riparian Forest, Mojave Riparian

	Forest, Southern Willow Scrub (Holland); Willow Series (PSW - 45); Riparian Woodland (Thorne); Fresh Emergent Woodland (WHR).
PHYSIOGNOMIC CLASS	Woodland
PHYSIOGNOMIC SUBCLASS	Deciduous Woodland
PHYSIOGNOMIC GROUP	Cold - deciduous Woodland
PHYSIOGNOMIC SUB GROUP	Natural / Semi - natural
FORMATION	Temporarily Flooded Cold - deciduous Woodland
ALLIANCE	*Salix laevigata* Temporarily Flooded Woodland Alliance

CLASSIFICATION CONFIDENCE LEVEL

USFWS WETLAND SYSTEM Palustrine forested or shrub - scrub

RANGE
Globally
Throughout California, intermountain West.

PRNS / GGNRA

ENVIRONMENTAL DESCRIPTION
Globally
Habitats seasonally flooded, saturated. Water chemistry: fresh. Ditches; floodplains; lake edges; low - gradient depositions along rivers, streams. Elevation sea - level to 1700 m.

PRNS / GGNRA
Three plots in study area occurring on bottoms or washes on coarse to fine sandy loams at elevations below 800 ft.

MOST ABUNDANT SPECIES
Globally

Tree:	*Salix laevigata, Alnus rhombifolia, Platanus racemosa, Populus fremontii*
Shrub:	*Baccharis pilularis, B. salicifolia, Salix spp., Sambucus mexicana*
Herb:	*Urtica dioica, Oenanthe sarmentosa*

PRNS / GGNRA

Tree:	*Salix laevigata, Quercus agrifolia, Salix lasiandra, Myrica californica*
Shrub:	*Ribes sanguineum, Toxicodendron diversilobum, Rubus ursinus, Cornus sericea, Rubus parviflorus*
Herb:	*Urtica dioica, Stachys ajugoides, Dryopteris arguta, Carex nudata, Oenanthe sarmentosa*

CHARACTERISTIC SPECIES
Globally
Tree: *Salix laevigata*

PRNS / GGNRA
Tree: *Salix laevigata*

VEGETATION DESCRIPTION
Globally
Salix laevigata is sole or dominant shrub or tree in the canopy**;** *Alnus rhombifolia, Baccharis pilularis, B. salicifolia, Platanus racemosa, Populus fremontii, Salix spp.,* and / or *Sambucus mexicana* may be present. If shrubland, emergent trees may be present. Shrubs < 15 m; canopy continuous. Shrubs sparse under tree canopy. Ground layer variable may include high cover of large forbs such as *Urtica dioica,* and *Oenanthe sarmentosa*.

PRNS / GGNRA
Salix laevigata important in the tree layer*; S. lasiandra, Quercus agrifolia, Myrica californica* also present. Trees <20m. Shrub layer open to continuous. Ground layer continuous to intermittent. The three plots sampled suggest variation and include *a Salix laevigata a - S. lucida / Cornus sericea* plot: (GGNRA341), Salix laevigata / Urtica dioica plot: (GGNRA 361), and Salix laevigata / Oenanthe sarmentosa plot: (GGNRA365).

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK G5S4

RANK JUSTIFICATION Widespread in western U.S. in riparian situations.

DATABASE CODE

COMMENTS
Globally
Salix laevigata is a fast growing tree willow adapted to many riparian settings in the Western US. It requires permanent moisture and is widely dispersed throughout the area by its copious small seeds attached to cottony filamentous hairs. It will resprout after physical stem damage and individuals live for at least 90 years. Most natural flooding regimes maintain a matrix of young to medium aged stands, however in flood controlled situations stabilized flooding regimes may enable dense stands of large mature trees to develop, sometimes crowding riverbanks and forming arching canopies over the main watercourse.

Status Regionally
Northern California Interior Coast Ranges (M261C). Occurs occasionally at lower elevations along major streams and rivers
Central California Coast Ranges (M262A): Small stands occur along the Salinas River, Monterey Co. three stands were sampled in the Golden Gate National Recreation Area in San Mateo County
Northern California Coast Ranges (263A): stands are scattered along major lowland streams and rivers
Great Valley (262A). Small stands common along Sacramento River and other major tributaries
Sierra Nevada Foothills (M261F). occasional along major rivers and streams. Common along the Kern River near Lake Isabella.
Southern California Coast (261B). occasional in flood control basins and along perennial streams in lowlands
Southern California Mountains and Valleys (M262B).
Mojave Desert (322A) occasional along Mojave River and Owens River and adjacent to springs and seeps throughout the region.

PRNS / GGNRA
Stands are locally distributed in swampy areas such as the Olema Marsh. Other stands occur in riparian areas adjacent to Red Alder (*Alnus rubra*), Pacific shining willow (*Salix lucida* ssp. *pacifica*) or Arroyo willow (*Salix lasiolepis*) stands.

Plots used to define the alliance locally (n=4): GGNRA341, GGNRA 361,GGNRA365

MIXED WILLOW ALLIANCE
Arroyo Willow (*Salix lasiolepis*) Temporarily Flooded Shrubland Alliance - pi code 07060

This alliance is represented by at least two associations locally. Both occupy permanently moist riparian settings along creeks, streams, seeps and swamps. The National Vegetation Classification considers this alliance to be a scrub alliance, however the local associations are considered to be forest due to the preponderence of tall *S. lasiolepis* growing in relatively dense stands. In addition to the two defined associations additional variation in the alliance is shown by individual plots with the following distinctions:
***Salix lasiolepis - Salix gooddingii - Cornus glabra:* (GGNRA345) (mixed willow plot)**

***Salix lasiolepis / Oenanthe sarmentosa* plot: (PRNS67)**
***Salix lasiolepis - Salix scouleri - Salix exiguua*: mixed willow plot (GGNRA328**

Salix lasiolepis - *Salix lucida* Association
- pi code 07061

COMMON NAME	Arroyo Willow - Shining Willow Forest
SYNONYM	None
PHYSIOGNOMIC CLASS	Forest
PHYSIOGNOMIC SUBCLASS	Deciduous forest
PHYSIOGNIMIC GROUP	Cold - deciduous forest
PHYSIOGNOMIC SUB GROUP	Natural / Semi - natural
FORMATION	Seasonally flooded cold - deciduous forest
ALLIANCE	To be determined

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Palustrine

RANGE
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global range is not available without additional inventory.

PRNS / GGNRA
This forest is found throughout the PRNS / GGNRA planning area.

ENVIRONMENTAL DESCRIPTION
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
This vegetation grows along the margins or on depositions within low - gradient, freshwater streams. Stands are subjected to seasonal flooding. Soils are fine to coarse loamy sand deposited by flooding.

MOST ABUNDANT SPECIES
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Tree	*Salix lasiolepis, Salix lucida*
Shrub	*Salix lasiolepis*

CHARACTERISTIC SPECIES
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Tree	*Salix lasiolepis, Salix lucida*

VEGETATION DESCRIPTION

Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
This forest forms an intermittent to continuous tree canopy between 5 - 10 meters in height. *Salix lasiolepis* and *Salix lucida* co - dominate. The shrub layer is open to intermittent and *Salix lasiolepis* is important. *Rubus ursinus, Toxicodendron diversilobum, Heracleum maximum, Sambucus racemosa,* and / or *Scrophularia californica* may also be present. The herbaceous layer is open to intermittent, and may include *Equisetum arvense, Urtica dioica, Conium maculatum* (exotic), *Juncus patens* and / or *Juncus effusus*.

OTHER NOTEWORTHY SPECIES None

CONSERVATION RANK G3S3?

RANK JUSTIFICATION Uncertain distribution beyond the mapping area, but likely to be relatively uncommon except on the north coast of California

DATABASE CODE To be determined

COMMENTS
Globally

PRNS / GGNRA
This is considered a forest type because the tall shrub *Salix lasiolepis* is mixed with the taller *Salix lucida* which does attain tree stature. Exotics, dumping and erosion impact stands of this forest.

Plots used to define this association (n=4): PRNS192, PRNS 161 GGNRA316, PRNS90

Salix lasiolepis / Rubus Association
- pi code 07062

COMMON NAME	Arroyo Willow / California Dewberry Forest
SYNONYM	None
PHYSIOGNOMIC CLASS	Forest
PHYSIOGNOMIC SUBCLASS	Deciduous forest
PHYSIOGNIMIC GROUP	Cold - deciduous forest
PHYSIOGNOMIC SUB GROUP	Natural / Semi - natural
FORMATION	Seasonally flooded cold - deciduous forest

ALLIANCE To be determined

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Palustrine

RANGE
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. However, it is likely to occur throughout the coastal areas of Central California.

PRNS / GGNRA
This forest is found throughout the PRNS / GGNRA planning area.

ENVIRONMENTAL DESCRIPTION

Globally
This association is only known from the vicinity of the Point Reyes National Seashore and Golden Gate National Recreation Area. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
This association grows on the margins of low - gradient streams and on seasonally saturated draws and basins. Slopes are gentle, and stands are found on all aspects.

MOST ABUNDANT SPECIES
Globally
This association is only known from the vicinity of the Point Reyes National Seashore and Golden Gate National Recreation Area . Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Tree *Salix lasiolepis*
Shrub *Rubus* sp.

CHARACTERISTIC SPECIES
Globally
This association is only known from the vicinity of the Point Reyes National Seashore and Golden Gate National Recreation Area. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Tree *Salix lasiolepis*
Shrub *Rubus* sp.

VEGETATION DESCRIPTION
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
This vegetation is structurally variable; some stands are forests, others tall shrublands. *Salix lasiolepis* dominates the tree and tall shrub layers. The upper canopy is less than 20 meters in height, and can be intermittent to continuous. *Rubus ursinus* and / or *Rubus discolor* may be present in the shrub layer. *Rubus* sp. may dominate the shrub canopy, or contribute only minor coverage. Other shrubs present may include *Toxicodendron diversilobum, Baccharis pilularis,* and / or *Lonicera involucrata.* The herbaceous layer is open to intermittent. *Polystichum munitum, Scrophularia californica, Plantago lanceolata* (exotic), *Stachys ajugoides, Urtica dioica* and / or *Erechtites minima* may be present.

OTHER NOTEWORTHY SPECIES None

CONSERVATION RANK G4S4?

RANK JUSTIFICATION Likely to be relatively common in coastal California. However, distribution is speculative at this time.

DATABASE CODE To be determined

COMMENTS
Globally

PRNS / GGNRA
Exotics, grazing and water diversions effect stands of this vegetation.

Plots used to describe this association (n=5): PRNS076, PRNS168, PRNS38, GGNRA 342, GGNRA379

Forests Dominated by California Bay, Douglas - fir, and Coast Live Oak (in part)

HAZEL ALLIANCE

Hazel (*Corylus cornuta)* Alliance - pi code 30010

This alliance is apparently narrowly distributed in central coastal California. It has been reported by M. Vasey (pers comm. 2002) from the San Francisco Peninsula and is otherwise known only from the Point Reyes Peninsula within the study area. It is currently represented by one association, described below.

Corylus cornuta / Polystichum munitum Association
- pi code 30011

COMMON NAME	Beaked Hazelnut / Pineland Sword Fern Shrubland
SYNONYM	None
PHYSIOGNOMIC CLASS	Shrubland
PHYSIOGNOMIC SUBCLASS	Mixed evergreen - deciduous shrubland
PHYSIOGNIMIC GROUP	Mixed evergreen - cold - deciduous shrubland
PHYSIOGNOMIC SUB GROUP	Natural / Semi - natural
FORMATION	Mixed evergreen - cold - deciduous shrubland
ALLIANCE	To be determined (putatively, *Corylus cornuta*)

CLASSIFICATION CONFIDENCE LEVEL 3

USFWS WETLAND SYSTEM Upland

RANGE

Globally

This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global range is not available without additional inventory. Although *Corylus cornuta* is widespread throughout the Pacific States no alliance has heretofore been defined for it.

PRNS / GGNRA

ENVIRONMENTAL DESCRIPTION

Globally

This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Stands of this association are found on moderate slopes with a northern to eastern exposure. This vegetation grows in the middle third of the slope on moderately coarse to fine sandy loams. Stands are typically in concave areas surrounded by *Pseudotsuga menziesii* alliance stands. Stands are small, usually under 3 ha. There are 14 stands mapped in the area, all on the southern portion of Inverness Ridge.

MOST ABUNDANT SPECIES

Globally

This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

CHARACTERISTIC SPECIES

Globally

This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global species composition is not available without additional inventory.

PRNS / GGNRA

Tall Shrub	*Corylus cornuta*
Herbaceous	*Polystichum munitum*

VEGETATION DESCRIPTION

Globally

This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

This vegetation is heavily dominated by *Corylus cornuta* forming a closed shrub canopy between 2 - 5 meters in height, with individual emergent tall shrubs. *Marah fabaceus* and *Rubus ursinus* are common shrub associates. *Polystichum munitum* is present in the herbaceous and short shrub layers at low cover values. Other common associates may include *Rubus parviflorus, Stachys ajugoides, Urtica dioica,* and / or *Elymus glaucus.*

OTHER NOTEWORTHY SPECIES None

CONSERVATION RANK G2S2?

RANK JUSTIFICATION Presumably rare, not reported elsewhere throughout the broad range of *Corylus cornuta.*

DATABASE CODE To be determined

COMMENTS

Globally

This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Plots used to define this association and alliance (n=2): PRNS138, PRNS137

SHRUB - DOMINATED VEGETATION

CHAPARRAL

Xeric chaparral

CHAMISE ALLIANCE

Chamise (*Adenostoma fasciculatum)* Alliance - pi code 21110

This alliance is represented by a single association in the study area. It is a non - serpentine chaparral, found on marine sedimentary and metamorphic rocks. Additional variation is expressed in individual plots with the following characteristics: *Adenostoma fasciculatum - Ceanothus thyrsiflorus - Prunus ilicifolia* (GGNRA343) from the San Francisco Watershed lands on the San Francisco Peninsula. Chamise alliance is the most widespread chaparral vegetation in California and ranges from Shasta Co. in the north to northwestern Baja California, Mexico.

Adenostoma fasciculatum - Arctostaphylos glandulosa - Quercus wislizeni Association
- pi code 21140

COMMON NAME	Common Chamise - Eastwood's Manzanita - Interior Live Oak Shrubland
SYNONYM	None
PHYSIOGNOMIC CLASS	Shrubland
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland
PHYSIOGNIMIC GROUP	Temperate broad - leaved evergreen shrubland
PHYSIOGNOMIC SUB GROUP	Natural / Semi - natural
FORMATION	Sclerophyllous temperate broad - leaved evergreen shrubland
ALLIANCE	*Adenostoma fasciculatum* Evergreen Shrubland Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE

Globally

Although the three characteristic species of this association are widespread in California and an association known as the *Adenostoma fasciculatum - Arctostaphylos glandulosa* occurs in Southern Coastal California (Gordon and White, 1994), this association is only known from the vicinity of the Point Reyes National Seashore. Information about its global range is not available without additional inventory. It is likely that this association occurs throughout the central California Coast Ranges.

PRNS / GGNRA

This association is found in the Mount Tamalpais region of the mapping area. It is the common non - serpentine chaparral on the southerly facing slopes near the summit ridge of the mountain.

ENVIRONMENTAL DESCRIPTION

Globally

This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
This association grows on ridges and the upper third of moderate to steep south / southwest facing slopes. Stands are confined to inland valleys out of the coastal fog belt. Soils are medium to fine sandy loams.

MOST ABUNDANT SPECIES
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Tall shrub *Quercus wislizeni*
Shrub *Adenostoma fasciculatum, Arctostaphylos glandulosa*

CHARACTERISTIC SPECIES
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Tall shrub *Quercus wislizeni*
Shrub *Adenostoma fasciculatum, Arctostaphylos glandulosa*

VEGETATION DESCRIPTION
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
This highly variable shrubland forms an intermittent to continuous canopy between 1 - 2 meters in height dominated by *Adenostoma fasciculatum*. Other shrubs present may include *Arctostaphylos glandulosa, Baccharis pilularis,* and / or *Diplacus aurantiacus.* Tall shrubs to 5 meters may contribute up to 23% cover. These may include *Umbellularia californica, Quercus wislizeni, Quercus chrysolepis* and / or *Quercus parvula.* Emergent trees like *Quercus wislizeni* or *Pseudotsuga menziesii* are sometimes present. The herbaceous layer is sparse.

OTHER NOTEWORTHY SPECIES None

CONSERVATION RANK G3S3?

RANK JUSTIFICATION This association is likely to be found to be relatively widespread in central California

DATABASE CODE To be determined

COMMENTS
Globally

PRNS / GGNRA
Some of the plots used to define this association contain *Quercus parvula.* Kartesz lists a variety, var. *tamalpaiensis,* which is probably the type found in those plots. *Quercus parvula* and *Q. wislizeni* var. *frutescens* are morphologically similar and may be easily mistaken for one another. It is possible that most of the shrubby *Quercus* occurring in this association is actually *Q. parvula.* Exotics occur in this association.

Plots used to describe this association (n=0): no plots sampled

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Adenostoma fasciculatum - Mimulus aurantiacus Association

- pi code 21142

COMMON NAME	Chamise - Bush Monkey Flower Shrubland Association
SYNONYM	None
PHYSIOGNOMIC CLASS	Shrubland
PHYSIOGNOMIC SUBCLASS	Evergreen Shrubland
PHYSIOGNOMIC GROUP	Temperate Broad - leaved Evergreen Shrubland
PHYSIOGNOMIC SUB GROUP	Natural / Semi - Natural
FORMATION	Sclerophyllous temperate broad - leaved evergreen shrubland

ALLIANCE *Adenostoma fasciculatum* Shrubland Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE

Globally

This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory. Similar stands with these two characteristic species occur in Alameda and Contra Costa counties of Central Coastal California. It is likely that this association is more widespread in central coastal California.

PRNS / GGNRA

Stands of the *Adenostoma fasciculatum - Mimulus aurantiacus* shrubland association are locally limited to the upper slopes of Bolinas Ridge and Mount Tamalpais in the mapping area of PRNS / GGNRA.

ENVIRONMENTAL DESCRIPTION

Globally

This association is only known from the vicinity of the Point Reyes National Seashore and Golden Gate National Recreation Area. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

This association is found on the upper 1 / 3 of rocky, 16 - 30 degree angle, south facing slopes. Soil textures range from medium loam to moderately coarse sandy loam of sandstone origin. Most stands are above the average summer fog layer.

MOST ABUNDANT SPECIES

Globally

This association is only known from the Point Reyes National Seashore and Golden Gate National Recreation Area. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Shrub: *Adenostoma fasciculatum*

CHARACTERISTIC SPECIES

Globally

This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Herbaceous:

Shrub: *Adenostoma fasciculatum, Quercus chrysolepis, Mimulus aurantiacus*

VEGETATION DESCRIPTION

Globally
This association is only known from the locality. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Stands of the *Adenostoma fasciculatum - Mimulus aurantiacus* shrubland association are dominated by *Adenostoma fasciculatum . Mimulus aurantiacus covers 1 to 20% of the stand.* Also common in this association are the small non - native grasses *Aira caryophyllea* and *Gastridium ventricosum.* Other shrubs and understory herbs vary but may include *Melica californica, Hypericum concinnum, Nassella pulchra, Nassella lepida, Avena barbata, Zigadenus fremontii, Chlorogalum pomeridianum, Pleuropogon californicus, Bromus madritensis rubens, Cynosurus chinatus,* and *Baccharis pilularis. Umbellularia californica* may also be present. This association is found on the upper 1 / 3 of rocky, 16 - 30 degree angle, south facing slopes. Soil textures range from medium loam to moderately coarse sandy loam of sandstone origin.

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK G3 S3?

RANK JUSTIFICATION Based on existing information the association is limited to Marin County. However, with further investigation may be found in numerous other central coastal California sites.

DATABASE CODE

COMMENTS
Globally

PRNS / GGNRA
Although this association appears limited locally to non - serpentine substrates, it appears that a similar chamise - dominated association occurs on serpentine. Further sampling locally may substantiate the existence of this type of serpentine chamise chaparral.

Plots used to describe this association (n=0): no plots sampled

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MIXED MANZANITA MAPPING UNIT - pi code 21470

EASTWOOD MANZANITA ALLIANCE

Eastwood Manzanita *(Arctostaphylos glandulosa)* Alliance - pi code 21210

This alliance is represented by a single association in the study area, occurring on the upper slopes of Mt. Tamalpais and in small areas on the San Francisco Peninsula. The Eastwood manzanita alliance is widespread in California ranging from the Klamath Mountains to San Diego County. Most stands are montane and occur inland and above the distribution of coastal chaparral alliances.

Arctostaphylos glandulosa - Quercus wislizeni Association
- pi code - 21260

COMMON NAME	Eastwood Manzanita - Interior Live Oak Shrubland Association
SYNONYM	None
PHYSIOGNOMIC CLASS	Shrubland
PHYSIOGNOMIC SUBCLASS	Evergreen Shrubland
PHYSIOGNOMIC GROUP	Temperate Broad - leaved Evergreen Shrubland
PHYSIOGNOMIC SUB GROUP	Natural / Semi - Natural

FORMATION Sclerophyllous temperate broad - leaved evergreen shrubland

ALLIANCE *Arctostaphylos glandulosa* Shrubland Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE

Globally

Although both characteristic species and the alliance are widespread in California, this association is only known from the Point Reyes National Seashore and Golden Gate National Recreation Areas. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Stands of the *Arctostaphylos glandulosa - Quercus wislizeni* shrubland association are apparently restricted to the My Tamalpias region of the PRNS and GGNRA mapping area.

ENVIRONMENTAL DESCRIPTION

Globally

This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

This association is found at low elevations on the upper 1 / 3 or ridge tops of 15 - 22 degree slopes with south - southeast aspects. Soil textures range from generally moderately fine sandy clay loam to moderately coarse, sandy loam of sandstone or siltstone origin. These slopes are generally gravelly or cobbley. Most stands are above the average level of summer fog.

MOST ABUNDANT SPECIES

Globally

This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Shrub: *Arctostaphylos glandulosa*
Tree / Shrub: *Quercus wislizeni*

CHARACTERISTIC SPECIES

Globally

This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Herbaceous: *Aira caryophyllea, Mimulus aurantiacus, Lonicera hipidula*
Shrub: *Arctostaphylos glandulosa*
Tree / Shrub: *Quercus wislizeni, Lithocarpus densiflorus*

VEGETATION DESCRIPTION

Globally

This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Stands of the *Arctostaphylos glandulosa - Quercus wislizeni* shrubland association form an open understory herb layer with 7% at .5 - 1 m tall and an open to continuous shrub layer with 6 - 63% cover at 1 - 2m tall, and 18 - 85% at 2 - 5 m tall. *Arctostaphylos glandulosa* (45 - 65 % cover) - and *Quercus wislizeni*(15 - 30 % cover) are dominant. *Lonicera hispidula, Aira caryophyllea, Mimulus aurantiacus,* and *Lithocarpus* densiflorus are also present. Additional species, contributing little cover, vary and may include U*mbellularia californica, Adenostoma fasciculatum, Heteromeles arbutifolia, Melica torreyana, Gallium nuttallii, Holcus lanatus, Pellaea mucronata, Ceanothus cuneatus, Bromus diandrus, Agrostis hallii, Iris sp. Ceanothus sp. Vaccinium ovatum, Lepichinia calycina* and *Pteridium aquilinum*. *Quercus wislizeni* may act as a shrub or a small tree in this association, probably reflecting varying moisture and fire history between stands.

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK G3 S3?

RANK JUSTIFICATION The two characteristic species are widespread but the association has only been described from the vicinity of Mt. Tamalpias in Marin County.

DATABASE CODE

COMMENTS
Globally

PRNS / GGNRA
The average cover of the characteristic species in the three stands sampled is similar. It is possible that some of the shrubby live oaks in this association are *Q. parvula* and not *Q. wislizenii*.

Plots used to describe this association (n=4): PRNS183, PRNS189, PRNS185, GGNRA296

MOUNT TAMALPAIS MANZANITA ALLIANCE

Hooker Manzanita *(Arctostaphylos hookeri)* Alliance - pi code 21440

This alliance is limited to the outer central coast ranges of California and is typically considered part of the maritime chaparral habitat. Individual stands are represented in different geographical areas by different subspecies of *A. hookeri*. The local stands are unique in that they are found on serpentine and are represented by the endemic *A. hookeri* ssp. *montana,* only known from the Mt. Tamalpais area.

Arctostaphylos hookeri ssp. *montana* Association
- pi code 21440

COMMON NAME	Mount Tamalpais Manzanita Shrubland Association
SYNONYM	None
PHYSIOGNOMIC CLASS	Shrubland
PHYSIOGNOMIC SUBCLASS	Evergreen Shrubland
PHYSIOGNOMIC GROUP	Temperate Broad - leaved Evergreen Shrubland
PHYSIOGNOMIC SUB GROUP	Natural / Semi - Natural
FORMATION	Sclerophyllous temperate broad - leaved evergreen shrubland

ALLIANCE *Arctostaphylos hookeri* ssp. *montana* Shrubland Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE

Globally
This association is only known from the Golden Gate National Recreation area and adjacent areas on Mount Tamalpais State Park. Because the characteristic species is endemic to Mt Tamalpais the global extent is essentially the same as the local extent

PRNS / GGNRA
Stands of the *Arctostaphylos hookeri* ssp *montana* shrubland association are found on Mt. Tamalpais in the mapping areas of MARINSP and PRNS.

ENVIRONMENTAL DESCRIPTION
Globally
Stands of the *Arctostaphylos hookeri* ssp *montana* shrubland association are found at rocky serpentine ridge tops or the upper 1 / 3 of south facing slopes that are convex or curved. Soil textures range from moderately coarse, sandy loam. This association is found on gravelly soils derived from serpentine.

PRNS / GGNRA
Stands of the *Arctostaphylos hookeri ssp montana* shrubland association are found at rocky serpentine ridge tops or the upper 1 / 3 of south facing slopes that are convex or curved. Soil textures range from moderately coarse, sandy loam. This association is found on gravelly soils derived from serpentine.

MOST ABUNDANT SPECIES
Globally
Shrub: *Arctostaphylos hookeri ssp montana , Adenostoma fasciculatum*

PRNS / GGNRA
Shrub: *Arctostaphylos hookeri ssp Montana, Adenostoma fasciculatum*

CHARACTERISTIC SPECIES
Globally
This association is only known from the Mt Tamalpias area of the mapping project *Arctostaphylos hookeri* ssp. *montana* (Mt. Tamalpias manzanita) is a local endemic and Mt. Tamalpias is its only known locality.

PRNS / GGNRA
Shrub: *Arctostaphylos hookeri ssp montana, Adenostoma fasciculatum, Arctostaphylos glandulosa glandulosa.*

VEGETATION DESCRIPTION
Globally
see below PRNS / GGNRA vegetation description.

PRNS / GGNRA
Stands of the Arctostaphylos hookeri ssp montana shrubland association form an intermittent herb layer averaging 40% cover at 25 - 50 cm tall and an intermittent shrub layer averaging 35% cover at 0.5 to 1 m tall. It is dominated by *Arctostaphylos hookeri montana,* a rare species generally found on serpentine outcrops on Mt. Tamalpais. *Adenostoma fasciculatum, Arctostaphylos glandulosa glandulosa* is also found at this association. *Heteromeles abutifolia, Calamagrostis ophitis, Melica sp, Clarkia, Vulpia myuros, Eriodytion californicum, Pseudotsuga menziesii, Castilleja foliolosa, Iris douglasiana,* and *Hypericum concinnum* may also contribute minor cover. Compared to the other chaparral associations on serpentine in the Mt Tamalpias area, this association is lower in stature and occupies the tops of ridgelines or dry exposed southerly - facing upper slopes. It is strongly dominated by *A. hookeri ssp. montana*. This species makes up ca. 70 - 90% relative cover of the stands.

OTHER NOTEWORTHY SPECIES *Arctostaphylos hookeri ssp montana* is a rare species only found on serpentine outcrops on Mt. Tamalpais.

CONSERVATION RANK G1S1.2

RANK JUSTIFICATION The only known populations of the species defining this type are on Mt Tamalpias, Marin County.

DATABASE CODE

COMMENTS
Globally

PRNS / GGNRA
These stands were not reliably mapped in the project due to indistinct photo signatures. However it is likely that no more than a dozen large stands exist.

Plots used to describe this association (n=2): PRNS184, Marinsp17

LEATHEROAK ALLIANCE

Leather Oak (*Quercus durata*) Alliance - pi code 21270

This alliance is represented by a single association in the study area and is a typical serpentine chaparral, found on the upper slopes of Mt. Tamalpais in the study area. The alliance is endemic to California and typically (though not always) occurs on serpentine rocks from Shasta Co. to Santa Barbara County.

Quercus durata - Arctostaphylos glandulosa Association
- pi code21270

COMMON NAME	Leather Oak - Eastwood Manzanita Shrubland Association
PHYSIOGNOMIC CLASS	Shrubland
PHYSIOGNOMIC SUBCLASS	Evergreen Shrubland
PHYSIOGNOMIC GROUP	Temperate Broad - leaved Evergreen Shrubland
PHYSIOGNOMIC SUB GROUP	Natural / Semi - Natural
FORMATION	Sclerophyllous temperate broad - leaved evergreen shrubland
ALLIANCE	*Quercus durata* Shrubland Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Stands of the *Quercus durata - Arctostaphylos glandulosa* shrubland association are found at Mt. Tamalpais, in the San Rafael 7.5 minute topographic quad in the mapping areas of GGNRA.

ENVIRONMENTAL DESCRIPTION
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory. It is likely that this type of serpentine chaparral occurs elsewhere in the Central California Coast Ranges.

PRNS / GGNRA
Stands of the *Quercus durata - Arctostaphylos glandulosa* shrubland association are found at relatively high elevations (2371 - 2532 ft) of Mt. Tamalpais on mid to upper 1 / 3 of moderate to steep, rocky, southeast to southwest facing slopes. Soil textures are coarse loamy sand from serpentine rocks.

MOST ABUNDANT SPECIES
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Shrub: *Quercus durata, Arctostaphylos glandulosa*

CHARACTERISTIC SPECIES
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Shrub: *Quercus durata, Arctostaphylos glandulosa, Adenostoma fasciculatum*

VEGETATION DESCRIPTION
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
This association forms dense stands that are dominated by *Quercus durata - Arctostaphylos glandulosa* in the shrub layer with continuous cover with 2 - 67% cover at 1 - 2 m tall and 30 - 100%cover at 2 - 5 m tall. Often found in this association is *Iris douglasiana* and *Toxicodendron diversilobum, Heteromeles arbutifolia, Rhamnus californica, Adenostoma fasciculatum, Eriodictyon californicum,* and *Baccharis pilularis.* Trees in this association may include shrubby *Umbellularia californica* and young or emergent *Pseudotsuga menziesii.* Other species that contribute to minor cover may include *Quercus chrysolepis, Pteridium aqilinum, Ceanothus cuneatus* ,and *Arctostaphylos virgata.* This association is often adjacent to stands of *Arctostaphylos hookeri ssp. montana* association, or *Adenostoma. fasciculatum - Arctostaphylos glandulosa - Ceanothus jepsonii / Calamagrostis ophitidis* association.

OTHER NOTEWORTHY SPECIES *Arctostaphylos virgata* (Marin Manzanita) a rare species, is occasionally present in stands of this association.

CONSERVATION RANK G3S3?

RANK JUSTIFICATION Although both widespread species, generally *Quercus durata* and *Arctostaphylos glandulosa* do not associate commonly in the California Central coast Ranges. *Quercus durata* is a serpentine indicator and *A. glandulosa* is a widespread species off of serpentine and only locally an indicator of serpentine soils (Kruckeberg 1984).

DATABASE CODE

COMMENTS
Globally

PRNS / GGNRA

Plots used to describe this association (n=3): GGNRA258, GGNRA254, GGNRA256

Mesic Chaparral

WOOLLY - LEAF MANZANITA ALLIANCE

Woolly - leaf Manzanita (*Arctostaphylos tomentosa)* Alliance - pi code 21450

This alliance is generally considered part of the maritime chaparral and is endemic to the outer coast ranges of central and northern California. It is represented locally by stands on Montara Mountain and in other adjacent areas of the San Francisco Peninsula. The following general description characterizes the alliance including the stands known from the study area.

COMMON NAME	Woolly - leaf Manzanita Maritime Chaparral
SYNONYM	Central Maritime Chaparral, Northern Maritime Chaparral, Poison - oak Chaparral (Holland); Manzanita Series(PSW - 45); Mixed chaparral (Thorne); Mixed Chaparral (WHR)
PHYSIOGNOMIC CLASS	Shrubland
PHYSIOGNOMIC SUBCLASS	Evergreen Shrubland
PHYSIOGNOMIC GROUP	Temperate Broad - leaved Evergreen Shrubland
PHYSIOGNOMIC SUB GROUP	Natural / Semi - natural
FORMATION	Sclerophyllous Temperate Broad - leaved Evergreen Shrubland
ALLIANCE	*Arctostaphylos tomentosa* Shrubland
CLASSIFICATION CONFIDENCE LEVEL	
USFWS WETLAND SYSTEM	Upland

RANGE

Globally

Central California Coast and Coastal Ranges. Griffin (1978) describes stands near Fort Ord in Monterey Co.; NDDB has plot data on file for Contra Costa Co., Fort Ord Military Reservation in Monterey Co., and Burton Mesa in Santa Barbara Co.

PRNS / GGNRA

A single plot of chaparral dominated by Woolly - leaf Manzanita (*Arctostaphylos tomentosa*) was recorded in the mapping area, found in SF Peninsula area, near Montara Mtn., San Mateo County.

ENVIRONMENTAL DESCRIPTION

Globally

Bluffs, dunes, mesas, outcrops, slopes, terraces. Soils sand, sandstone, shale, or volcanic - derived. Elevation sea - level - 1500m.

PRNS / GGNRA

Middle of northeast - facing slope; undulating topography; soil medium to fine sandy loam with abundant litter cover.

MOST ABUNDANT SPECIES

Globally

Tree:	*Cercocarpus betuloides, Quercus agrifolia*
Shrub:	*Arctostaphylos tomentosa, Adenostoma fasciculatum, Artemisia californica, Baccharis pilularis, Eriogonum fasciculatum, Heteromeles arbutifolia, Rhamnus californica, Salvia mellifera, Toxicodendron diversilobum*

PRNS / GGNRA

Tree:	*Quercus agrifolia*
Shrub:	*Arctostaphylos tomentosa, Toxicodendron diversilobum*

CHARACTERISTIC SPECIES
Globally
Shrub: *Arctostaphylos tomentosa*

PRNS / GGNRA
Shrub: *Arctostaphylos tomentosa*

VEGETATION DESCRIPTION
Globally
Forms of *Arctostaphylos tomentosa* are dominant or important in the shrub canopy with one or more rare *Ceanothus* spp. or *Arctostaphylos* spp.; *Adenostoma fasciculatum, Artemisia californica, Baccharis pilularis, Eriogonum fasciculatum, Heteromeles arbutifolia, Rhamnus californica, Salvia mellifera,* and / or *Toxicodendron diversilobum* may be present. Emergent *Cercocarpus betuloides* and / or *Quercus agrifolia* may be present. Shrubs < 3 m; canopy continuous. Ground layer sparse.

PRNS / GGNRA
Single plot in mapping area with *Arctostaphylos tomentosa* strongly dominant in the shrub canopy with *Toxicodendron diversilobum*. Emergent *Quercus agrifolia* present. Shrubs <5m; canopy continuous; ground layer sparse. Plot adjacent to Oak Woodland and Redwood Alliances.

OTHER NOTEWORTHY SPECIES The following local manzanita are found along central California coast. The CNPS List 1B plants are *Arctostaphylos cruzensis, A. edmundsii, A. glutinosa, A. hookeri ssp. hearstiorum, A. h. ssp. hookeri, A. h. ssp. Montana, A. imbricata, A. luciana, A. montaraensis, A. morroensis, A. nummularia var. sensitiva,*
A. osoensis, A. pajaroensis, A. pechoensis, A. pilosula, A. pumila, A. purissima, A. rudis, A. silvicola, Arctostaphylos tomentosa ssp. bracteosa, A. t. ssp. crustacea, A.t. ssp. daciticola, and *A. t. ssp. eastwoodiana, A. wellsi.* The CNPS List 4 plants are *A. hooveri* and *A. obispoensis* (CNPS 2001).

Local Ceanothus species are also well represented along central California coast: *Ceanothus cuneatus* var. *fascicularis, C. c. var. rigidus, C. dentatus, C. hearstiorum, C. impressus.* and *C. maritimus* (a CNPS List 1B plant) (CNPS 2001). Currently we are recognizing stands that have *A. tomentosa* as a consistent component as part of this alliance, even if other species may be the dominant.

CONSERVATION RANK G2 S2

RANK JUSTIFICATION Many areas of chaparral on the central California coast and Coastal Ranges have concentrations of local, endemic *Arctostaphylos* and *Ceanothus* species. Such areas are often called maritime chaparral. In this alliance, forms of *Arctostaphylos tomentosa* are a common component along with familiar members of other forms of chaparral and coastal scrub. Local stands in the Santa Cruz Mountains (Af), including Montara Mountain within the Golden Gate national Recreation Area, where locally Montara Manzanita (*A. montaraensis*) may be present or even dominate the stands. Stands of Morro Manzanita (Ak) are threatened and management by prescribed fire has proven difficult and tricky (Tyler et al 2000). Stands are restricted to local areas such as Burton Mesa (Davis and Hickson 1988, Odion 1995) where numerous endemic shrub species may occur.

DATABASE CODE

COMMENTS
Globally
The commonly perceived chaparral syndrome of relatively high fire frequencies is not true in many of these coastal stands (see below). Instead the edaphic restriction of stands is often more influential in their maintenance. Many coastal stands are restricted to coarse marine sandstone, Aeolian sand deposits, or fine textured mud and siltstones including the Purissima formation, Monterey Formation, and others (Wells 1962, Norris and Webb 1990).

Natural fire regimes in coastal chaparral are characterized by relatively long intervals between fire events. The evidence for many coastal stands suggests that intervals were commonly > 100 years (Keeley 2002), however Native American burning may have greatly increased frequencies in some areas. *Arctostaphylos tomentosa* resprouts following fire. However, many of its associated local endemic *Arctostaphylos* are obligate seeders.

Plot - based descriptions: Griffin (1978) describes stands near Fort Ord in Monterey Co.; NDDB has plot data on file for Contra Costa Co., Fort Ord Military Reservation in Monterey Co., and Burton Mesa in Santa Barbara Co. Golden Gate National Recreation Area sampled a plot near Montara Mtn., San Mateo County (Keeler - Wolf et al. 2002).

Status regionally
Central California Coast (261A): local stands in the Santa Cruz Mountains (Af), including Montara Mountain within the Golden Gate national Recreation Area, where locally Montara Manzanita (*A. montaraensis*) may be present or even dominate the stands. Stands of Morro Manzanita (Ak) are threatened and management by prescribed fire has proven difficult and tricky (Tyler et al 2000).
Southern California Coast (261B): Stands are restricted to local areas such as Burton Mesa (Davis and Hickson 1988, Odion 1995) where numerous endemic shrub species may occur.

PRNS / GGNRA
A. tomentosa stands appear to be local in the Montara Mountain area of the study area. Dynamics of similar stands of maritime chaparral (Odeon and Tyler 2002, VanDyke and Hall 2001) suggest careful observation and monitoring of species diversity and colonization trends would be useful to understand optimum management for fire - based regeneration. Most stands of maritime chaparral studied appear to do well with long intervals between fires.

Plot used to define alliance locally (n=1): GGNRA327

SENSATIVE MANZANITA ALLIANCE

Sensitive Manzanita (*Arctostaphylos nummularia*) Alliance - pi code 21480

This alliance is represented by a single association, found locally only on Bolinas Ridge. The sensitive manzanita alliance is restricted to the outer coast ranges of Central and Northern California from the Santa Cruz Mountains to Mendocino Stands are locally restricted to marine sedimentary rocks and are often surrounded by forest alliance stands on adjacent deeper soils.

Arctostaphylos nummularia var. *sensitiva* - *Vaccinium ovatum* - *Chrysolepis chrysophylla* var. *minor* Association - pi code 21481

COMMON NAME	Sensitive Manzanita - Huckleberry - Giant Chinquapin Shrubland Association
SYNONYM	None
PHYSIOGNOMIC CLASS	Shrubland
PHYSIOGNOMIC SUBCLASS	Evergreen Shrubland
PHYSIOGNOMIC GROUP	Temperate Broad - leaved Evergreen Shrubland
PHYSIOGNOMIC SUB GROUP	Natural / Semi - Natural
FORMATION	Sclerophyllous temperate broad - leaved evergreen shrubland
ALLIANCE	*Arctostaphylos nummularia* var. *sensitiva* Shrubland Alliance (putative)

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM	Upland

RANGE

Globally
Similar stands occur in the Santa Cruz Mountains in Big Basin State Park (Hecht et al. 1973). The range of sensitive manzanita is restricted to the Santa Cruz Mountains and the Mount Tamalpais area.

PRNS / GGNRA
Stands of the *Arctostaphylos nummularia* var. *sensitiva - Vaccinium ovatum - Chrysolepis chrysophylla* shrubland association are mapped only on the Bolinas Ridge portion of the mapping area of PRNS / GGNRA.

ENVIRONMENTAL DESCRIPTION
Globally
This association is only known from the Golden Gate National Recreation Area and Mt Tamalpais State Park. Information about its global characteristics is not available without additional inventory. Similar stands of *A. nummularia* - dominated chaparral occur in the Santa Cruz Mountains of Santa Cruz and San Mateo Counties (Hect *et al.* 1993)

PRNS / GGNRA
This association is found at moderate elevations (ca. 1600 ft.) on gradual upper slopes and ridge tops with west to southwest aspects. Soil textures range from moderately coarse sandy loam of Franciscan Melange (marine mudstone and siltstone) origin.

MOST ABUNDANT SPECIES
Globally
This association is only known from the Golden Gate National Recreation Area and Mt Tamalpias State Park. Information about its global characteristics is not available without additional inventory. Other stands inventoried in the Santa Cruz Mountains share all three of the PRNS / GGNRA abundant species, but have not been quantitatively sampled.

PRNS / GGNRA
Shrub: *Arctostaphylos nummularia* var. *sensitiva, Vaccinium ovatum, Chrysolepis chrysophylla*

CHARACTERISTIC SPECIES
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Herbaceous: *Pteridium aquilinum*
Shrub: *Arctostaphylos nummularia* var. *sensitiva, Vaccinium ovatum, Chrysolepis chrysophylla, Arctostaphylos glandulosa,*

VEGETATION DESCRIPTION
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Stands of the *Arctostaphylos nummularia - Vaccinium ovatum - Chrysolepis chrysophylla* shrubland association is dominated by *Arctostaphylos nummularia* var. *sensitiva*. *Vaccinium ovatum* and *Chrysolepis chrysophylla* contribute to significantly less cover, but are common and constant in this association. *Pteridium aquilinum,* and *Arctostaphylos glandulosa* also constant in this association. *Pickeringia montana, Sequoia sempervirens,* and *Pseudotsuga menziesii* may also be found in this association. There is a continuous shrub layer 97% cover at 1 - 2m tall; most of this consists of *Arctostaphylos nummularia*. This association is found adjacent to *Pseudotsuga menziesii, Sequoia sempervirens, Chrysolepis chrysophylla,* and *Adenostoma fasciculatum* alliance stands. Thus, occupying the interface between forest and chaparral on the seaward slopes of Mt Tamalpias and Bolinas Ridge.

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK G2 S2

RANK JUSTIFICATION Relatively few stands exist in a narrow range of the western San Francisco Bay Area. Many stands have had altered fire regimes. Stands appear to be edaphically restricted to fine - grained marine sediments.

DATABASE CODE

COMMENTS

Globally

Arctostaphylos nummularia var. *sensitiva* is a narrow endemic to the Western San Francisco Bay Area from Mt Tamalpias to the Santa Cruz Mountains.

PRNS / GGNRA

The persistence of this alliance in the absence of fire warrants observation. The role of conifer colonization from adjacent tree - dominated alliances should be monitored. It is likely that very long intervals between fires would be required before any significant shifts in species composition would occur, due to the harsh rocky substrates on which it occurs.

Plots used to describe this association (n=3): GGNRA 293, PRNS126, PRNS129

COASTAL SCRUB

Dune Vegetation (in part)

MIXED COYOTEBRUSH ALLIANCE (in part)

Coyotebrush (*Baccharis pilularis*) Alliance [in part] - pi code 24050

The coyotebrush shrubland alliance is the most diverse single alliance in the study area. Because of the way it is defined by the predominance of *B. pilularis* in the shrub layer, and the broad environmental tolerance of that species within the study area, the *B. pilularis* alliance can be expressed in several settings. The following association is the single association within the dune vegetation.

Baccharis pilularis - *Lupinus arboreus / Lupinus chamissonis* Association
- pi code 240523

COMMON NAME	Coyote Brush - Yellow Bush and / or Dune Lupine Shrubland Association
SYNONYM	None
PHYSIOGNOMIC CLASS	Shrubland
PHYSIOGNOMIC SUBCLASS	Evergreen Shrubland
PHYSIOGNOMIC GROUP	Microphyllous evergreen shrubland
PHYSIOGNOMIC SUB GROUP	Natural / Semi - Natural
FORMATION	Lowland microphyllous evergreen shrubland
ALLIANCE	*Baccharis pilularis* Shrubland Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE

Globally

This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Stands of *Baccharis pilularis* - *Lupinus arboreus* and / or *L. chamissonis s*hrubland association are found primarily on stabilized dunes adjacent to the immediate coast
in the mapping areas of GGNRA and PRNS.

ENVIRONMENTAL DESCRIPTION

Globally

This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Stands of *Baccharis pilularis* - *Lupinus arboreus* and or *L. chamissonis s*hrubland association are found at low elevations on 0 - 21degree slopes of dunes, planes, and mid 1 / 3 of slopes facing southwest to south - southwest. Soil textures range from medium sand of sand dunes to shale. Most stands are on dunes or sand sheets near the immediate coast. They often occupy the so - called “back dune” scrub (e.g., Holland 1986) areas near the interface of upland terraces and bluffs and the dune vegetation.

MOST ABUNDANT SPECIES

Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Herbaceous: *Bromus diandrus, Pteridium aquilinum, Vulpia sp., Eschscholzia californica*
Shrub: *Baccharis pilularis, Lupinus arboreus*

CHARACTERISTIC SPECIES
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory. *Lupinus arboreus* is an introduced species from Point Reyes north (Pickart and Sawyer 1998), which may or may not occur on sandy substrates. While *L. chamissonis* is largely restricted to sand and is common from Oregon to southern California.

PRNS / GGNRA
Herbaceous: *Bromus diandrus, Pteridium aquilinum, Vulpia sp.,*
Shrub: *Baccharis pilularis, Lupinus arboreus, L. chamissonis*

VEGETATION DESCRIPTION
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Stands of *Baccharis pilularis - Lupinus arboreus and or L. chamissonis s*hrubland association form an open to intermittent herb layer with 6 - 55% cover at 0 - 25cm tall, 11 - 30% at 25 - 50cm tall, and 10 - 51% cover at 0.5 - 1 m tall and an open to intermittent shrub layer 0 - 65% at 1 - 2 m tall. Average overall cover is 55%. This shrubland association is dominated by *Baccharis pilularis* and *Lupinus arboreus* and *Bromus diandrus, Pteridium aquilinum, Vulpia sp.,* are also found in this association although they contribute to minor cover. Various other species may also contribute to minor cover, including, *Poa douglasii, Cardioniema ramosissimum, Eriogonum latifolium, Eschscholzia californica, Rubus ursinus, Bromus carinatus maritimus, Marah fabaceus, Carpobrotus edulis* (exotic), *Claytonia perfoliata, Lotus scoparius, Dudleya farinosa, Melica imperfecta, Osmorhiza chilensis, Toxicodendron diversilobum, Polypodium californicum* and *Leymus triticoides.* This association is often adjacent to beach communities. *Lupinus arboreus* is a short - lived perennial, which may or may not be present in the stands in vegetative form. *L. chamissonis* is rarely the dominant but is present in 75% of the plots at between 2 and 15% cover.

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK G3S3?

RANK JUSTIFICATION Stands with low exotic species component are rare and stands in general are restricted to the few well developed dune systems along the California coast.

DATABASE CODE

COMMENTS
Globally

PRNS / GGNRA
There is some debate on whether *Lupinus arboreus* is native to Point Reyes. Most floras (Hickman 1993 and Munz 1968) list *L. arboreus* as native from Point Reyes south. The dune front vegetation of the Point Reyes Peninsula has been clearly modified by the presence of *Ammophila arenaria* and *Carpobrotus edulus* (see discussion in Pickart and Sawyer 1998). Local back dune ecology has also potentially been altered by the introduction of *L arboreus*. It is uncertain whether the clearly native *L. chamissonis* is affected by the presence

of the physically similar *L. arboreus*. However, both do co - occur naturally in coastal dunes of Central and Southern California (Sawyer and Keeler - Wolf 1995).

Plots used to define this association (n=4): PRNS030, GGNRA392, PRNS055, PRNS151

DUNE LUPINE - GOLDENBUSH ALLIANCE

Dune Lupine - Goldenbush (*Lupinus chamissonis - Ericameria ericoides*) Alliance - pi code 62063

This alliance is represented by a single association in the study area. However, additional variation in the alliance is expressed in two additional plots with the following characteristics: One plot dominated strongly by *Ericameria ericoides* without *L. chamissonis* but with *L. arboreus* (PRNS015) and another without *Ericameria* , but dominated by *L. chamissonis with Toxicodendron diversilobum* (PRNS043). It is likely that further sampling will refine the association. The range of this alliance is from Northern California to NW Baja California.

Lupinus chamissonis - Ericameria ericoides Association
- pi code 62061

COMMON NAME	Dune Lupine - California Heath - Goldenrod -
SYNONYM	None
PHYSIOGNOMIC CLASS	Shrubland
PHYSIOGNOMIC SUBCLASS	Evergreen Shrubland
PHYSIOGNIMIC GROUP	Microphyllous Evergreen Shrubland
PHYSIOGNOMIC SUB GROUP	Natural
FORMATION	Microphyllous Evergreen Shrubland
ALLIANCE	Lupinus chamissonis - Ericameria ericoides Shrub Alliance

CLASSIFICATION CONFIDENCE LEVEL 3

USFWS WETLAND SYSTEM Upland

RANGE

Globally

This association is known from Northern and Central California coastal dune systems from Humboldt County to Monterey County..

PRNS / GGNRA

This association is found along the open coast in dunes. Most stands are located north of the Pt. Reyes lighthouse to the tip of Tomales Point. Additional stands occur in the Golden Gate National Recreation area from Rodeo Lagoon to the Baker Beach area of the San Francisco Presedio.

ENVIRONMENTAL DESCRIPTION

Globally

This association occurs on coastal dunes. It has been reported (at the alliance level) from stabilized dunes up and down much of the California coast to at least as far south as Point Conception. (Sawyer and Keeler - Wolf 1995).

PRNS / GGNRA

This association grows on the stabilized dunes of coastal bars, river mouths, spits along coastlines, coastal bluffs and terraces. Stands occur along the summer fog - influenced coast of California and occur on undulating topography.

MOST ABUNDANT SPECIES

Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Shrub	*Ericameria ericoides, Lupinus chamissonis*
Forb	*Cardioniema ramosissimum , Monardella undulata Poa douglasii*

CHARACTERISTIC SPECIES
Globally
This association is characterized by the presence of the two shrubs *Lupinus chamissonis* and *Ericameria ericoides*. The cover of the two species vary from stand to stand, some stands strongly dominated by one or the other, and some with near equal mixes of the two. Numerous additional species may be present including *Baccharis pilularis, Lupinus arboreus,* and *Artemisia pycnocephala* (Sawyer and Keeler - Wolf 1995). Locally *Ericameria* seems to be generally more abundant than Lupinus chamissonis.

PRNS / GGNRA

Shrub	*Ericameria ericoides, Lupinus chamissonis*
Forb	*Abronia latifolia*

VEGETATION DESCRIPTION
Globally
This association is typified by a varied mixture of the two characteristic species. Stands always occur on dunes along the coast. In some cases these may be climbing dunes (forced up coastal bluffs by prevailing onshore winds), but typically these are hummocky dunes along low lying coastlines immediately back from the beach. Cover is variable from 10% to over 60%.

PRNS / GGNRA
This shrubland association is characterized by a variable mix of *Ericameria ericoides* and *Lupinus chamissonis*. In most local stands *Ericameria* is the dominant shrub with *L. chamissonis* making up less than half of the total vegetation cover. The shrub canopy is open. Some individuals of *Baccharis pilularis* may be present. Forbs may include *Monardella undulata, Gilia capitata* ssp. *chamissonis, Camissonia* sp., *Vulpia* sp. (exotic), and / or *Solanum* sp. (exotic). *Poa douglasii* and various exotic graminoids may be present.

OTHER NOTEWORTHY SPECIES None

CONSERVATION RANK G2S2.2

RANK JUSTIFICATION Native coastal dune vegetation is threatened and has been decimated throughout much of California and elsewhere on the Pacific coast. Introduction of invasive non - native species such as *Ammophila arenaria* and *Carpobrotus edulus* have invaded native stands of this association and have altered the physical setting of native dune systems throughout CA (Pickart and Sawyer 1999)

DATABASE CODE To be determined

COMMENTS
Globally

PRNS / GGNRA
Grazing has impacted many stands of this association.

Plots used to define this association (n=3): PRNS50, PRNS47, GGNRA391

Dense Coyotebrush and Related Scrub

CALIFORNIA SAGEBRUSH ALLIANCE

California Sagebrush (*Artemisia californica)* Alliance - pi code 24080

This alliance is poorly represented in the study area. A few plots are strongly dominated by A. californica and technically fall within the description. However, most stands have at least some Baccharis pilularis in them and are probably more closely related to the *B. pilularis* alliance. The following description will serve as a general characterization of the *Artemisia californica* alliance as it occurs in the study area.

COMMON NAME	California Sagebrush Scrub
SYNONYMS	Central Lucian Coastal Scrub, Diablan Sage Scrub, Northern Coastal Bluff Scrub, Riversidian Upland Sage Scrub, Southern Coastal Bluff Scrub, Venturan Coastal Sage Scrub (Holland); Coastal Bluff Scrub, Sagebrush Scrub, Sagebrush - monkeyflower Scrub (Jones & Stokes); Coastal Sagebrush Series (PSW - 45); Southern Coastal Scrub (Thorne); Coastal Scrub (WHR)
PHYSIOGNOMIC CLASS	Shrubland
PHYSIOGNOMIC SUBCLASS	Evergreen Shrubland
PHYSIOGNOMIC GROUP	Microphyllous Evergreen Shrubland
PHYSIOGNOMIC SUB GROUP	Natural / Semi - natural
FORMATION	Microphyllous Evergreen Shrubland
ALLIANCE	*Artemisia californica* Shrubland
CLASSIFICATION CONFIDENCE LEVEL	
USFWS WETLAND SYSTEM	Upland

RANGE

Globally

This association occurs along the Central and Southern California coasts, the Central California Coastal Ranges, the Southern California Mountains and Valleys, the Channel Islands, and also in Baja California.

PRNS / GGNRA

Field crews for the mapping project sampled one stand at Golden Gate National Recreation Area, Marin Co. This alliance reaches its northern - most distribution in Marin Co. and is represented locally on southwest - facing slopes in the Marin Headlands area of GGNRA.

ENVIRONMENTAL DESCRIPTION

Globally

The *Artemisia californica* alliance occurs on steep, south - facing slopes on rarely flooded low - gradient deposits along streams. Soils may be alluvial, colluvial, or bedrock - derived, and shallow to moderately deep.

PRNS / GGNRA

A single plot in the mapping area on gravelly, southwest - facing slope; soil: coarse loamy sand. Local stands appear to transcend to *Baccharis pilularis* alliance (often *B. pilularis - Artemisia californica - Toxicodendron diversilobum* association) on slightly less exposed and dry sites.

MOST ABUNDANT SPECIES

Globally
Shrub: *Artemisia californica, Adenostoma fasciculatum, Baccharis pilularis, Encelia californica, E. farinosa, Eriogonum fasciculatum, Isocoma menziesii, Keckiella cordifolia, Lotus scoparius, Mimulus aurantiacus, Salvia apiana, S. leucophylla, S. mellifera, Toxicodendron diversilobum, and / or Yucca whipplei*

PRNS / GGNRA
Shrub: *Artemisia californica, Eriophyllum staechadifolium, Baccharis pilularis*

CHARACTERISTIC SPECIES
Globally
Artemisia californica

PRNS / GGNRA
Artemisia californica

VEGETATION DESCRIPTION
Globally
Artemisia californica is dominant in the shrub canopy; *Adenostoma fasciculatum, Baccharis pilularis, Encelia californica, E. farinosa, Eriogonum fasciculatum, Isocoma menziesii, Keckiella cordifolia, Lotus scoparius, Mimulus aurantiacus, Salvia apiana, S. leucophylla, S. mellifera, Toxicodendron diversilobum,* and / or *Yucca whipplei* may be present. Emergent *Rhus integrifolia, Quercus douglasii,* or *Sambucus mexicana* trees may be present. Shrubs < 2 m; canopy continuous or intermittent. Ground layer variable.

PRNS / GGNRA
Artemisia californica dominant in the shrub canopy; *Eriophyllum staechadifolium* significant, *Baccharis pilularis* present. Shrubs <1m; ground layer sparse.

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK G4S4

RANK JUSTIFICATION The alliance is widespread in central and southern coastal California.

DATABASE CODE

COMMENTS
Globally
This alliance is often considered part of the coastal scrub that is better thought of as a collection of alliances. This approach allows comparison of stands of similar composition regardless of geographic location. Coast bluff scrub descriptions of most authors are included here. In general, Artemisia californica is a central and southern California alliance, ranging into northern Baja California. Stands of the alliance become less extensive northward along the coast. Northern - most stands may occur in the Diablo Range of Alameda Co. Stands along the immediate coast tend to become mixed with *Baccharis pilularis* and are better called the *Artemisia californica - Baccharis pilularis* alliance and the northern most outer coast range stands of this alliance are probably in southern Marin County.

Keeler - Wolf (1990e) qualitatively describes *Artemisia californica* stands at Limekiln Creek RNA (now part of the Cone Peak Gradient RNA) in Monterey Co.

Status Regionally:
Central California Coast (261A): common in the Santa Lucia Mountains primarily above and inland of the zone of summer fog
Southern California Coast (261B): Widespread throughout the LA Basin, the Orange County Coast and coastal San Diego County, also common in the Santa Monica Mountains and other parts of coastal Ventura and Santa Barbara counties.

Central California Coastal Ranges (M262A): common in the Diablo Range, and the inner coast ranges of San Benito, Monterey and San Luis Obispo counties. Often interfaces with *Salvia mellifera* and *Eriogonum fasciculatum* alliance stands, also often adjacent to Quercus agrifolia and less commonly with *Q douglasii* alliance stands, also frequently associates with *Bromus - Avena* annual grassland alliance stands.
Southern California Mountains and Valleys (M262Ba): Common. Inland forms tend to associate with Salvia apiana, Encelia farinosa, and Eriogonum fasciculatum alliance stands; and coastal forms tend to associate with Salvia leucophylla or *Eriogonum cinereum* stands.

PRNS / GGNRA
Further sampling may identify association level stands in the southern portion of the study area. The relationships with the adjacent *Baccharis pilularis* and *Baccharis pilularis - Artemisia californica* stands need to be clarified. The Borchart et al. (2000) treatment of their mixed *Baccharis pilularis - Artemisia californica* alliance may have warrant locally for such stands.

Plots used to define the alliance locally (n=2): GGNRA309, GGNRA263

MIXED COYOTEBRUSH ALLIANCE (in part)

Coyotebrush (*Baccharis pilularis*) Alliance (in part) - pi code 24050

This portion of the coyotebrush alliance is characterized by stands with high shrub cover. It contains the highest diversity of associations of the alliance. It is more ecologically closely related to local stands of *Ceanothus thyrsiflorus, Rhamnus californica, Prunus illicifolia,* and *Toxicodendron diversilobum* alliances than to other stands of *Baccharis pilularis* on dunes or moist coastal grasslands. See discussion of the alliance under dune vegetation, drier coastal grassland / open scrub, and moist coastal grassland for additional information on this alliance. This alliance is endemic to California, found primarily in the outer coast ranges from Humboldt to San Diego County, but best represented in central coastal California. The recent work by Borchart et al (2000) suggests that *Baccharis pilularis - Artemisia californica - Toxicodendron diversilobum / Monardella villosa* Shrubland association included herein may better by coandered part of a *B. pilularis - Artemisia californica* alliance. However, we are taking the conservative approach here until further information about the relationship between *B. pilularis* and *Artemisia californica* is clarified elsewhere.

Baccharis pilularis - Artemisia californica - Toxicodendron diversilobum / Monardella villosa Association
- pi code 24051

COMMON NAME	Coyotebrush - Coastal Sagebrush - Pacific Poison Oak / Coyote Mountain balm Shrubland
SYNONYM	None
PHYSIOGNOMIC CLASS	Shrubland
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland
PHYSIOGNIMIC GROUP	Microphyllous evergreen shrubland
PHYSIOGNOMIC SUB GROUP	Natural / Semi - natural
FORMATION	Microphyllous evergreen shrubland
ALLIANCE	*Baccharis pilularis* Shrubland Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global range is not available without additional inventory. Anecdotal observation of this association by Todd

Keeler - Wolf (personal communication June 20001) supports the occurrence of this association from the Vicinity of Point Reyes south to at least Central Monterey County. Similar associations with *Baccharis pilularis* and *Artemisia californica* as main components have been noted as far south as Los Angeles County (Heady et al 1977, Kirkpatrick and Hutchinson 1977)

PRNS / GGNRA
This association is widespread throughout the PRNS / GGNRA planning area. Over 200 polygons of this association are mapped.

ENVIRONMENTAL DESCRIPTION
Globally
This association is only positively known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
This association grows on moderate, east south, southwest, or west - facing slopes. Stands are found from the lower to upper third of the slope. Soils vary from clay to coarse, loamy sand.

MOST ABUNDANT SPECIES
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Shrub *Baccharis pilularis*

CHARACTERISTIC SPECIES
Globally
This association is only positively known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Shrub *Baccharis pilularis, Artemisia californica, Toxicodendron diversilobum*
Forb *Monardella villosa* ssp. *villosa, Eriophyllum staechadifolium*

VEGETATION DESCRIPTION
Globally
This association is only known positively from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
The shrub canopy of this association is dominated by either *Baccharis pilularis* or *Artemisia californica. Toxicodendron diversilobum* can also be very important. The canopy is open to continuous, and 1 - 2 meters in height. The subshrubs *Monardella villosa* ssp. *villosa* and *Eriophyllum staechadifolium* are often present at low cover values. The herbaceous layer is very diverse and can include *Clinopodium douglasii, Maianthemum stellatum, Briza minor* (exotic), *Sanicula crassicaulis, Diplacus aurantiacus* and / or *Stachys ajugoides.*

OTHER NOTEWORTHY SPECIES Shrub *Dirca occidentalis,* a CNPS list 4 plant (Skinner and Pavlik, 1994*)* is sometimes found within this association.

CONSERVATION RANK G4 S4

RANK JUSTIFICATION There are over 200 stands of this association mapped within the PRNS / GGNRA mapping area.

DATABASE CODE To be determined

COMMENTS
Globally

PRNS / GGNRA

Plots used to define this association (n=7): GGNRA303 , GGNRA347, GGNRA288, GGNRA348, GGNRA270, PRNS099, GGNRA319

Baccharis pilularis - Ceanothus thyrsiflorus Association
- pi code 24054

COMMON NAME	Coyote Brush - Blue Blossom Shrubland Association
SYNONYM	None
PHYSIOGNOMIC CLASS	Shrubland
PHYSIOGNOMIC SUBCLASS	Evergreen Shrubland
PHYSIOGNOMIC GROUP	Microphyllous evergreen shrubland
PHYSIOGNOMIC SUB GROUP	Natural / Semi - Natural
FORMATION	Lowland microphyllous evergreen shrubland

ALLIANCE *Baccharis pilularis* Shrubland Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE
Globally
This association is only known from the Point Reyes National Seashore and Golden Gate National Recreation Area. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Stands of the *Baccharis pilularis - Ceanothus thyrsiflorus s*hrubland association are found throughout the Montara Mountain and Bolinas topographic quads of the mapping areas of GGNRA. It has also been observed on the southern portion of Point Reyes Peninsula.

ENVIRONMENTAL DESCRIPTION
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Stands of the *Baccharis pilularis - Ceanothus thyrsiflorus s*hrubland association are found at low elevations on 4 - 24 degree slopes with north to northwest facing slopes. Soil textures range from moderately coarse sandy loam to moderately fine sandy clay loam. Stands on Point Reyes were affected by the 1995 Mt. Vision fire and have young individuals of *C. thyrsiflorus* and resprouts of *B. pilularis*.

MOST ABUNDANT SPECIES
Globally
This association is only known from the Point Reyes National Seashore and Golden Gate National Recreation Area. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Shrub: *Baccharis pilularis, Ceanothus thyrsiflorus*

CHARACTERISTIC SPECIES
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Shrub: *Baccharis pilularis, Ceanothus thyrsiflorus*

VEGETATION DESCRIPTION
Globally
This association is only known from the Golden Gate National Recreation Area. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Stands of the *Baccharis pilularis - Ceanothus thyrsiflorus s*hrubland association form an open to continuous herb layer with 4 - 40% cover at 0 - 25 cm tall, 5 - 40% cover at 25 - 50 cm tall, and 1 - 25% cover at 0.5 - 1 m tall, an intermittent to continuous shrub layer with 35 - 90% at 1 - 2 m tall and sometimes and open tree layer with 1 - 5% cover at 5 - 10m tall. It is dominated by *Baccharis pilularis* and *Ceanothus thyrsiflorus, Toxicodendron diversilobum* is usually present and a variety of other species found in this association may include *Bromus hordeaceus, B. carinatus, Chlorogalum pomeridianum, Satureja douglasii, Sanicula crassicaulis, Pseudotsuga menziesii, Rhamnus californica, Rubus ursinus* or *R. parviflorus,* and *Marah fabaceus.* This association is frequently found adjacent to *Baccharis pilularis - Toxicodendron diversilobum* association stands. This association is found at low elevations on 4 - 24 degree slopes with north to northwest facing slopes. Soil textures range from moderately coarse sandy loam to moderately fine sandy clay loam

OTHER NOTEWORTHY SPECIES *Arctostaphylos montaraensis*, a rare species is found at one of the six plots (GGNRA368).

CONSERVATION RANK G3S3?

Plots used to define this association (n=6): GGNRA340, GGNRA382, GGNRA266, GGNRA368, GGNRA297, GGNRA374

Baccharis pilularis / Dudleya farinosa Association
- pi code 24069

COMMON NAME	Coyote Brush - Cliff Lettuce Shrubland Association
SYNONYM	None
PHYSIOGNOMIC CLASS	Shrubland
PHYSIOGNOMIC SUBCLASS	Evergreen Shrubland
PHYSIOGNOMIC GROUP	Microphyllous evergreen shrubland
PHYSIOGNOMIC SUB GROUP	Natural / Semi - Natural
FORMATION	Lowland microphyllous evergreen shrubland

ALLIANCE *Baccharis pilularis* Shrubland Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory. . Similar vegetation sharing many of the same

species has been found throughout central and northern coastal California from Monterey County to Mendocino County (Keeler - Wolf, personal observation 1991 - 2001).

PRNS / GGNRA
Stands of *Baccharis pilularis / Dudleya farinosa* shrubland association are found on coastal bluffs and climbing dunes on the Point Reyes Peninsula and perhaps in other parts of the mapping area such as Fort Funston and Marin Headlands.

ENVIRONMENTAL DESCRIPTION
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory

PRNS / GGNRA
Stands of *Baccharis pilularis / Dudleya farinosa* shrubland association are found at low elevations on the mid to upper 1 / 3 of southeast to southwest facing, 31 - 45degree slopes. Soil textures range from fine silty clay to sand and are of shale or conglomerate parent material. Stands are immediately adjacent to the coast on bluffs of sedimentary rock or on sand dunes and sheets that have been blown up on headlands from prevailing onshore salt - laden winds.

MOST ABUNDANT SPECIES
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Shrub: *Baccharis pilularis*

CHARACTERISTIC SPECIES
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Herbaceous: *Dudleya farinosa, Eriophyllum staechadifolium, Vulpia sp., Bromus carinatus, Bromus diandrus, Carpobrotus edulis, Gnaphalium purpureum, Hypochaeris radicata, Lolium perenne, Plantago erecta*
Shrub: *Baccharis pilularis, Lupinus arboreus*

VEGETATION DESCRIPTION
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory. Much of the Northern Coastal Bluff scrub vegetation of Holland (1986) is equivalent to this association)

PRNS / GGNRA
Stands of *Baccharis pilularis / Dudleya farinosa* shrubland association form an intermittent to continuous herb layer with 51 - 75% cover at 0 - 25 cm tall and a short shrub layer of 14 - 25% cover at 25 - 50 cm tall. This association is dominated by *Baccharis pilularis* in its low prostrate form (formerly known as *B. pilularis* var. *pilularis*) and characterized by the succulent rosette herb *Dudleya farinosa*. The stands also include the low shrubs *Eriophyllum staechadifolium* and *Lupinus arboreus*, and a number of herbaceous species including *Vulpia sp, Bromus carinatus, Carpobrotus edulis, Bromus diandrus, Gnaphalium purpureum, Hypochaeris radicata, Lolium perenne, Plantago erecta*, which contribute to minor cover. A variety of other species may be found in this association including *Iris douglasiana, Nassella pulchra, Chlorogalum pomeridianum, Elymus glaucus, Erigeron glaucus, Frageria chiloensis, Pinus radiata, Phacelia californica, Anagallis arvensis, Eriogonum*

latifolium, *Festuca rubra*, and *Grindelia stricta*. This association is often found adjacent to disturbed grassland associations, but may also occur near denser, taller associations of *Baccharis pilularis* alliance, in particular the *B. pilularis - Eriophyllum staechadifolium* association. This association is found at low elevations on the mid to upper 1 / 3 of southeast to southwest facing, 31 - 45degree slopes. Soil textures range from fine silty clay to sand and are of shale, dune, or conglomerate parent material.

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK G3S3?

RANK JUSTIFICATION Intact coastal bluff scrub equating to this association is relatively rare in CA due to human development and invasion from exotics.

DATABASE CODE

COMMENTS
Globally

PRNS / GGNRA
The stands sampled locally suggest that this association is relatively heavily besieged with invasive exotics.

Plots used to define this association (n=2): PRNS194, PRNS036

Baccharis pilularis - Eriophyllum staechadifolium Association
- pi code 24060

COMMON NAME	Coyote Brush - Seaside Woolly Sunflower Shrubland Association
SYNONYM	None
PHYSIOGNOMIC CLASS	Shrubland
PHYSIOGNOMIC SUBCLASS	Evergreen Shrubland
PHYSIOGNOMIC GROUP	Microphyllous evergreen shrubland
PHYSIOGNOMIC SUB GROUP	Natural / Semi - Natural
FORMATION	Lowland microphyllous evergreen shrubland
ALLIANCE	*Baccharis pilularis* Shrubland Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM `` Upland

RANGE
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory. It was described from the Northern Coast of California by Baxter (1992) and reported by Sawyer and Keeler - Wolf (1995). This association has been identified as far south as Monterey County, but Marin County appears to be its northern limit (Keeler - Wolf personal observation).

PRNS / GGNRA
Stands of the *Baccharis pilularis - Eriophyllum staechadifolium* shrubland association are scattered throughout the coastal portion of the mapping areas of GGNRA and PRNS. Most stands are in Golden Gate National Recreation Area including the Marin Headlands and the Presedio - Baker Beach units.

ENVIRONMENTAL DESCRIPTION

Globally
This association is a coastward expression of the *Baccharis pilularis* alliance. The character species, *Eriophyllum staechadifolium* is largely restricted to bluffs and slopes within a short distance of the open ocean coast. Stands are commonly exposed to strong onshore winds and are often bathed in fog by salt - laden winds much of the year.

PRNS / GGNRA
Stands of the *Baccharis pilularis - Eriophyllum staechadifolium* shrubland association are found at low elevations of linear, lower to mid 1 / 3 of 20 - 31 degree slopes with north to northwest aspects. Soil textures range from moderately fine sandy clay loam to moderately coarse sandy loam over shale or silty mudstone.

MOST ABUNDANT SPECIES
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Herbaceous: *Frageria chiloensis, Satureja douglasii, Pteridium aquilinum, Mimulus aurantiacus, Toxicodendron diversilobum, Rhamnus californica, Artemisia californica*

Shrub: *Baccharis pilularis, Eriophyllum staechadifolium,*

CHARACTERISTIC SPECIES
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Herbaceous: *Satureja douglasii, Pteridium aquilinum, Mimulus aurantiacus, Erigeron glaucus, Rubus ursinus, Toxicodendron diversilobum, Holcus lanatus, Frageria chiloensis, Rhamnus californica, Artemisia californica*

Shrub: *Baccharis pilularis, Eriophyllum staechadifolium*

VEGETATION DESCRIPTION
Globally
This association appears to be similar in composition to the locally described stands wherever it occurs (see PRNS - GOGA description below).

PRNS / GGNRA
Stands of the *Baccharis pilularis - Eriophyllum staechadifolium* shrubland association vary in structure forming an open to intermittent herb layer of 2 - 60% cover at 0 - 25 cm tall, 11 - 30% cover at 25 to 50 cm tall 15 - 35% at 0.5 to 1 m tall and 0 - 90% cover at 1 - 2 m tall. Average total vegetation cover is 85%. This association is dominated by *Baccharis pilularis* and *Eriophyllum staechadifolium* and includes *Satureja douglasii, Pteridium aquilinum, Mimulus aurantiacus, Erigeron glaucus, Rubus ursinus, Toxicodendron diversilobum,* and *Holcus lanatus.* It may also include, *Frageria chiloensis, Rhamnus californica,* and *Artemisia californica*.

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK G3S3

RANK JUSTIFICATION Stands occupy a narrow coastal strip with relatively small total area, from south - Central to north - central California. Many stands are affected by invasive exotics such as *Cortaderia* spp. (Pampas grass), *Holcus lanatus* (velvet grass), Carpobrotus edulus (iceplant) and other species.

DATABASE CODE

COMMENTS
Globally

PRNS / GGNRA

Plots used to define this association in addition to Baxter (1992), (n=2): GGNRA259, PRNS098

Baccharis pilularis - Rhamnus californica - Rubus parviflorus Association
- pi code 24055

COMMON NAME	Coyote Brush - Coffeeberry - Thimbleberry Shrubland Association
SYNONYM	None
PHYSIOGNOMIC CLASS	Shrubland
PHYSIOGNOMIC SUBCLASS	Evergreen Shrubland
PHYSIOGNOMIC GROUP	Microphyllous evergreen shrubland
PHYSIOGNOMIC SUB GROUP	Natural / Semi - Natural
FORMATION	Lowland microphyllous evergreen shrubland
ALLIANCE	*Baccharis pilularis* Shrubland Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE
Globally
This association is only known from the Point Reyes National Seashore and the Golden Gate National Recreation Area. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Stands of the *Baccharis pilularis - Rhamnus californica - Rubus parviflorus* shrubland association are found throughout the Montara Mountain 7.5 minute topographic quad within the mapping areas of GGNRA.

ENVIRONMENTAL DESCRIPTION
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory

PRNS / GGNRA
Stands of the *Baccharis pilularis - Rhamnus californica - Rubus parviflorus* shrubland association are found at moderate elevations (samples taken from 1423 - 1561ft., but observed as low as 300 ft.) on 0.5 - 10degree slopes with southeast facing slopes. Soil textures range from medium to very fine sandy loam to moderately coarse sandy loam. Most of these stands occur on ridges within the summer fog belt and may receive substantial additional moisture from fog drip. This is a late seral stage of *Baccharis pilularis* alliance. Notes for the sample plots suggested that these stands had not been disturbed for many years. This is also in keeping with the model of *Baccharis* transition states into a *Rhamnus californica* alliance in moist foggy coastal areas of the study area.

MOST ABUNDANT SPECIES
Globally
This association is only known from the Point Reyes National Seashore and Golden Gate National Recreation Area. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Shrub: *Baccharis pilularis, Rhamnus californica, Toxicodendron diversilobum*

CHARACTERISTIC SPECIES
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Shrub: *Baccharis pilularis, Rhamnus californica, Rubus parviflorus*

VEGETATION DESCRIPTION
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Stands of the *Baccharis pilularis - Rhamnus californica - Rubus parviflorus* shrubland association forms an open herb layer with 5 - 17% cover at 0 - 25 cm tall and 5 - 15% cover at 25 - 50 cm tall, and a open to continuous shrub layer with 13 - 15% cover at 0.5 - 1 m tall, 70 - 85% cover at 1 - 2 m tall, and 0 - 8% cover at 2 - 5 m tall. It is dominated by *Baccharis pilularis, Rhamnus californica,* and *Rubus parviflorus. Scrophularia californica, Rubus ursinus, Heracleum lanatum, Pteridium aquilinum, Satureja douglasii, Vaccinium ovatum* and *Toxicodendron diversilobum* are usually also present. Other species that may be present are *Ceanothus palmeri, Mimulus aurantiacus,* and *Polystichum munitum.*

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK G2S2?

RANK JUSTIFICATION This association appears to be relatively uncommon in the study area, particularly notable in the Montara Mountain area of the southern portion of GOGA. It has not been inventoried from any other portion of the range of *Baccharis pilularis* alliance.

DATABASE CODE

COMMENTS
Globally

PRNS / GGNRA

Plots used to define this association (n=2): GGNRA355, GGNRA369

Baccharis pilularis - Holodiscus discolor Association
- pi code 24070

COMMON NAME	Coyote Brush - Oceanspray Shrubland Association
SYNONYM	None
PHYSIOGNOMIC CLASS	Shrubland
PHYSIOGNOMIC SUBCLASS	Evergreen Shrubland
PHYSIOGNOMIC GROUP	Microphyllous evergreen shrubland
PHYSIOGNOMIC SUB GROUP	Natural / Semi - Natural
FORMATION	Lowland microphyllous evergreen shrubland

ALLIANCE *Baccharis pilularis* Shrubland Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE

Globally

This association is only known from the Golden Gate National Recreation Area. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Stands of the Baccharis pilularis - Holodiscus discolor shrubland association are found within the 7.5 minute topographic quads of Point Bonita and Montara Mountain within the mapping areas of GGNRA.

ENVIRONMENTAL DESCRIPTION

Globally

This association is only known from the Golden Gate National Recreation Area. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Stands of the *Baccharis pilularis - Holodiscus discolor* shrubland association are found at low elevations (190 - 962 ft) on 16 - 31degree slopes with southeast to north - northwest aspects. This association is found on the middle1 / 3 to the entire convex to concave slopes. Soil textures range from medium to very fine sandy loam to moderately coarse, sandy loam from sandstone. This is a mesophytic association that, if found on southerly exposures is usually found on concave slopes.

MOST ABUNDANT SPECIES

Globally

This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Herbaceous: *Festuca rubra, Mimulus aurantiacus*
Shrub: *Baccharis pilularis, Holodiscus discolor, Toxicodendron diversilobum, Quercus agrifolia, Rhamnus californica, Rubus ursinus*

CHARACTERISTIC SPECIES

Globally

This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Herbaceous: *Mimulus aurantiacus*
Shrub: *Baccharis pilularis, Holodiscus discolor*

VEGETATION DESCRIPTION

Globally

This association is only known from the Golden Gate National Recreation Area. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Stands of the *Baccharis pilularis - Holodiscus discolor* shrubland association vary in structure with 5 - 40% cover at 0 - 25 cm tall, 7 - 40% cover at 25 cm tall, 10 - 25% cover at 0.5 - 1 m tall, 0 - 50% at 1 - 2 m tall, and 0 - 45% cover at 2 - 5 m tall. This association is dominated by *Baccharis pilularis* (14 - 35% cover) and *Holodiscus discolor* (3 - 20% cover) and usually includes *Toxicodendron diversilobum, Rhamnus californica, Rubus ursinus, Mimulus aurantiacus. Festuca rubra* may be a common grass and *Quercus agrifolia* may also be very common as a low wind - swept shrub. A variety of other species may be found including *Corylus cornuta,*

Festuca californica, Lonicera hispidula, Eriophyllum staechadifolium, Heracleum lanatum, Stachys bullata, Umbellularia californica, Symphoricarpos mollis, Satureja douglasii, and *Pteridium aquilinum.* This association appears to occur adjacent to wooded or forested alliance stands and may represent the transition between *Baccharis pilularis* alliance and various coastal forests such as *Quercus agrifolia, Umbellularia californica,* and *Pseudotsuga menziesii* alliances. Such common shrubs in this *B. pilularis - Holodiscus discolor* association as *Corylus cornuta* and *Holodiscus discolor* are also common associates of these forest alliances. Many individuals of the aforementioned trees are stunted in these stands, the result of salt - laden winds.

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK G3S3?

RANK JUSTIFICATION Uncertain distribution beyond the study area.

DATABASE CODE

COMMENTS
Globally

PRNS / GGNRA

Plots used to define this association (n=3): GGNRA271, GGNRA337, GGNRA380

Baccharis pilularis / Polystichum munitum Association
- pi code 24053

COMMON NAME	Coyote Brush - Sword Fern Shrubland Association
SYNONYM	None
PHYSIOGNOMIC CLASS	Shrubland
PHYSIOGNOMIC SUBCLASS	Evergreen Shrubland
PHYSIOGNOMIC GROUP	Microphyllous evergreen shrubland
PHYSIOGNOMIC SUB GROUP	Natural / Semi - Natural
FORMATION	Lowland microphyllous evergreen shrubland

ALLIANCE *Baccharis pilularis* Shrubland Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory. Grams *et al*. (1977) also notes this association from the Point Reyes Peninsula.

PRNS / GGNRA
Stands of the *Baccharis pilularis - Polystichum munitum* shrubland association are found in the coastal areas of Point Reyes Peninsula and the Marin Headlands unit of GOGA. It has not been inventoried from other portions of the study area.

ENVIRONMENTAL DESCRIPTION
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Stands of the *Baccharis pilularis - Polystichum munitum* shrubland association are found at low elevations on 19 - 25 degree, north facing slopes and are found on the middle to the entire sides of slopes. Soil textures range from medium to very fine sandy loam to moderately coarse sandy loam of granitic origin. These stands are currently unknown off of granitic substrate. These stands are often adjacent to other forms of *Baccharis pilularis* alliance such as *B. pilularis - Toxicodendron diversilobum* (on adjacent westerly or easterly - facing slopes), *B. pilularis - Artemisia californica / Monardella villosa* (on southerly - facing slopes), or *B. pilularis - Ceanothus thyrsiflorus* (on neutral slopes). On adjacent bottomland *Salix lasiolepis, Rubus spectabilis, Salix lasiolepis / Rubus* sp. and *Alnus rubra / Sambucus racemosa* associations may occur. This association appears to have the capacity to develop following regrowth of *B. pilularis* alliance after clearing of north - facing exposures for pasture. Some stands near Drakes Estero (Johnson's Oyster Farm) were cleared in the early part of this century. It is likely that this association may further proceed without disturbance to the *B. pilularis - Holodiscus discolor* or *B. pilularis - Rhamnus californica - Rubus parviflorus* associations, depending on microclimate and geographic location.

MOST ABUNDANT SPECIES
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Herb: *Polystichum munitum*
Shrub: *Baccharis pilularis*

CHARACTERISTIC SPECIES
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Herb: *Polystichum munitum*
Shrub: *Baccharis pilularis, Toxicodendron diversilobum, Rubus parviflorus, Rubus ursinus*

VEGETATION DESCRIPTION
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Stands of the *Baccharis pilularis - Polystichum munitum* shrubland association form an open herb layer with 6 - 15% cover at 0 - 25 cm tall and 9 - 20% cover at 25 - 50 cm tall, and an intermittent shrub layer with 50 - 65% cover at 0.50 - 1 m tall, and 51 - 57% cover at 1 - 2 m tall. The overall affect is a dense two tiered shrubland with *B. pilularis* forming the dominant overstory and *Polystichum munitum* the dominant understory. Also present in this association is *Agrostis pallens, Erechtites minima, Pteridium aquilinum, Stachys ajugoides, Holodiscus discolor, Iris douglasiana, Toxicodendron diversilobum, Rubus parviflorus, Rubus ursinus, Smilacina stellata, Heracleum lanatum, Holcus lanatus, Marah fabaceus, Satureja douglasii* and *Scrophularia californica.* Other species that may be present are *Calamagrostis nutkaensis, Berberis pinnata, Galium californicum, Rhamnus californica,* and *Elymus californicus.*

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK G3S3?

RANK JUSTIFICATION Stands are restricted to northerly exposures and are relatively late - seral. They are only known from the mapping area at this time.

DATABASE CODE

COMMENTS
Globally

PRNS / GGNRA

Plots used to define this association in addition to Grams (1977), (n=2): PRNS170, PRNS182

Baccharis pilularis - Toxicodendron diversilobum Association
- pi code 24059

COMMON NAME	Coyotebrush - Pacific Poison Oak Shrubland
SYNONYM	None
PHYSIOGNOMIC CLASS	Shrubland
PHYSIOGNOMIC SUBCLASS	Mixed evergreen - deciduous shrubland
PHYSIOGNIMIC GROUP	Mixed evergreen - cold - deciduous shrubland
PHYSIOGNOMIC SUB GROUP	Natural / Semi - natural
FORMATION	Mixed evergreen - cold - deciduous shrubland
ALLIANCE	*Baccharis pilularis* Shrubland Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE
Globally
This association is only known from the vicinity of the Point Reyes National Seashore and Golden Gate National Recreation Area. Information about its global range is not available without additional inventory. It is likely that this association is widespread in coastal California from near the Oregon border south to at least the vicinity of Santa Barbara.

PRNS / GGNRA
This association is widespread throughout the PRNS / GGNRA mapping area.

ENVIRONMENTAL DESCRIPTION
Globally
This association is only known from the vicinity of the Point Reyes National Seashore and Golden Gate National Recreation Area. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
This association grows on gentle to moderately steep slopes of all aspects and all upland slope positions. Soils are generally medium to fine sandy loams. This is probably the most abundant association of *Baccharis pilularis* alliance in the PRNS / GGNRA mapping area. It is found from the immediate coast to several miles inland, usually within the influence of the summer fog belt. It is usually dense in cover and appears to be present in moderately young to moderately old stands of the alliance. The progression of *B. pilularis* associations in the area ranges from the invasive open grassy stands including the *Baccharis pilularis - Rubus ursinus* association, to old thick stands that are co - dominated with *Rhamnus californica* ssp. *Californica* (California coffeeberry). The stands of *B. pilularis - Toxicodendron diversilobum* association appear to occupy the modal representation of temporal development of stands of this alliance.

MOST ABUNDANT SPECIES

Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Shrub: *Baccharis pilularis, Toxicodendron diversilobum*

CHARACTERISTIC SPECIES
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Shrub: *Baccharis pilularis, Toxicodendron diversilobum*

VEGETATION DESCRIPTION
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Stands of this association are heavily dominated by *Baccharis pilularis* and *Toxicodendron diversilobum,* which typically combine for more than 50% cover. The shrub canopy is usually between 1 - 2 meters in height. Other shrubs present often include *Rubus ursinus* and / or *Heteromeles arbutifolia.* The herbaceous layer is diverse and often includes *Pteridium aquilinum, Aira caryophyllea* (exotic), and / or *Heracleum maximum.* Many graminoids can be present like *Holcus lanatus* (exotic), *Bromus hordeaceus* (exotic), *Nassella lepida*, and / or *Nassella pulchra.*

OTHER NOTEWORTHY SPECIES None

CONSERVATION RANK G5S5?

RANK JUSTIFICATION There are hundreds of stands of this association mapped in the PRNS / GGNRA study area and it is likely to be widespread beyond the mapping area.

DATABASE CODE To be determined

COMMENTS
Globally

PRNS / GGNRA
Exotics are an important impact to this association.

Plots used to define this association (n=17): PRNS021, PRNS063, GGNRA312, GGNRA377, GGNRA360, PRNS010, PRNS155, GGNRA373, PRNS 154, PRNS109, PRNS025, PRNS164. PRNS107, GGNRA351, GGNRA346, GGNRA315, PRNS053

Baccharis pilularis - Native Grassland Association (preliminary)
- pi code 24058 Insufficient relevé plots to describe this association)

Baccharis pilularis - Annual Grassland Association (preliminary)
- pi code 24057 Insufficient relevé plots to describe this association, previously listed as *Baccharis pilularis / Avena barbata* Association)

Baccharis pilularis - Corylus cornuta Association (preliminary)
- pi code 24066 Insufficient relevé plots to describe this association, currently rolled into classification hierarchy with *Baccharis pilularis - Rhamnus californicus - Rubus parviflorus* Association - pi code 24055)

BLUE BLOSSOM ALLIANCE

Blueblossom *(Ceanothus thyrsiflorus)* Alliance - pi code 20020

This alliance is represented in the study area by two associations. The *Ceanothus thyrsiflorus - Baccharis pilularis - Toxicodendron diversilobum* Association is more closely related to the coastal scrubs with high *Baccharis pilularis* cover and the *Ceanothus thyrsiflorus - Vaccinium ovatum - Rubus parviflorus* Association occurs within the vicinity of stands of *Pinus muricata* and *Pseudotsuga menziesii* alliance and appears to largely represent a post - fire association following the Mt. Vision Fire. The range of this alliance is from Humboldt County to Monterey County along the outer coast ranges of California.

Ceanothus thyrsiflorus - Baccharis pilularis - Toxicodendron diversilobum Association
- pi code 20020

COMMON NAME	Blueblossom - Coyotebrush - Poison oak Shrubland
SYNONYM	None
PHYSIOGNOMIC CLASS	Shrubland
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland
PHYSIOGNIMIC GROUP	Temperate broad - leaved evergreen shrubland
PHYSIOGNOMIC SUB GROUP	Natural / Semi - natural
FORMATION	Hemi - sclerophyllous temperate broad - leaved evergreen shrubland
ALLIANCE	*Ceanothus thyrsiflorus* Shrubland Alliance

CLASSIFICATION CONFIDENCE LEVEL 3

USFWS WETLAND SYSTEM Upland

RANGE

Globally

Stands of the *Ceanothus thyrsiflorus* Shrubland Alliance occur from the central California coast to Oregon and inland to the lower elevations of the Klamath ranges. It is likely that this association occurs along the coastal strip of Northern and Central California, however, no plot data exist beyond the confines of PRNS / GGNRA. A description of Ceanothus thyrsiflorus alliance stands from the Cone Peak Gradient Research Natural Area (Keeler - Wolf 1990) likely substantiates the existence of this association as far south as central Monterey County.

PRNS / GGNRA

Stands of the *Ceanothus thyrsiflorus - Baccharis pilularis - Toxicodendron diversilobum* shrubland association are found throughout the mapping area of PRNS / GGNRA. Stands generally occur below 600 ft elevation and within 2 miles of the coast, well within the summer fog belt.

ENVIRONMENTAL DESCRIPTION

Globally

This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory. However, likely stands occur throughout the coastal strip of Northern and Central California. This is a low elevation scrub tied to foggy coasts. It occurs within the main distribution of the *Baccharis pilularis* alliance and is usually within sight of the ocean.

PRNS / GGNRA
This association is found at low elevation on middle to upper slopes. Most stands are within 1 - 2 miles from the open coast. Aspects are generally north and east.

MOST ABUNDANT SPECIES
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global species composition is not available without additional inventory.

PRNS / GGNRA
Shrub: *Ceanothus thyrsiflorus, Baccharis pilularis, Toxicodendron diversilobum, Rubus ursinus,*
Herbaceous: *Pteridium aquilinum*

CHARACTERISTIC SPECIES
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global species composition is not available without additional inventory.

PRNS / GGNRA
Shrub: *Ceanothus thyrsiflorus, Rubus ursinus Toxicodendron diversilobum, Baccharis pilularis*

VEGETATION DESCRIPTION
This vegetation includes stands co - dominated by *Ceanothus thyrsiflorus and Rubus ursinus* with 35% - 100% cover provided by the two dominant species. *Baccharis pilularis* and *Toxicodendron diversilobum* fill out the shrub canopy. The canopy is between 1 - 2 meters in height, but emergent individuals may be present. *Pteridium aquilinum* and a wide variety of herbaceous species contribute minor cover.

OTHER NOTEWORTHY SPECIES None

CONSERVATION RANK G4?

RANK JUSTIFICATION Within the PRNS / GGNRA area the mapping unit for this association has 54 mapped occurrences. The parent alliance is also ranked G4.

DATABASE CODE To be determined

COMMENTS
Globally
We suggest that this association may be one of the most common associations of this alliance in the cool coastal strip of northern and central California.

PRNS / GGNRA
One stand sampled in the San Francisco Municipal Watershed lands of the southern portion of the mapping area (GGNRA321) has a high cover of *Heteromeles arbutifolia* (20%). It is possible that there is further variation in this association that has not been sampled in this southern area. This association is being influenced by exotic species.

Plots used to define this association (n=3): PRNS078, PRNS070, GGNRA321

Ceanothus thyrsiflorus - Vaccinium ovatum - Rubus parviflorus
- pi code 20020

COMMON NAME Blueblossom - Black Huckleberry - Thimbleberry Shrubland
SYNONYM None
PHYSIOGNOMIC CLASS Shrubland

PHYSIOGNOMIC SUBCLASS	Evergreen shrubland
PHYSIOGNIMIC GROUP	Temperate broad - leaved evergreen shrubland
PHYSIOGNOMIC SUB GROUP	Natural / Semi - natural
FORMATION	Hemi - sclerophyllous temperate broad - leaved evergreen shrubland

ALLIANCE *Ceanothus thyrsiflorus* Shrubland Alliance

CLASSIFICATION CONFIDENCE LEVEL 3

USFWS WETLAND SYSTEM Upland

RANGE

Globally

Stands of the *Ceanothus thyrsiflorus* Shrubland Alliance occur from the central California coast to Oregon and inland to the lower elevations of the Klamath ranges. This association is likely to occur elsewhere in the range, but is unconfirmed outside the PRNS / GGNRA area

PRNS / GGNRA

Stands of the *Ceanothus thyrsiflorus - Vaccinium ovatum—Rubus parviflorus* shrubland association appear to be locally restricted to the Inverness Ridge portion of the Point Reyes Peninsula.

ENVIRONMENTAL DESCRIPTION

Globally

This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

This association is found at higher elevation on granitic slopes of Inverness Ridge. Most stands are the result of the 1995 Mount Vision Fire. *Ceanothus thyrsiflorus* is an obligate seeding species, which dominates areas a few years after fire. These stands were part of the *Pinus muricata* alliance stands prior to the Mt Vision fire. The characteristic species: *Rubus parviflorus* and *Vaccinium ovatum* are both common understory species in the unburned portions of the *Pinus muricata* alliance. Field notes on the plots sampled in 1997suggest that the *Ceanothus* and associated shrubs were still rapidly growing and most were less than 2 m in height. Aspects are generally north and east.

MOST ABUNDANT SPECIES

Globally

This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global species composition is not available without additional inventory.

PRNS / GGNRA

Shrub: *Ceanothus thyrsiflorus*
Herbaceous: *Erechtites minima* (exotic), *Pteridium aquilinum*

CHARACTERISTIC SPECIES

Globally

This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global species composition is not available without additional inventory.

PRNS / GGNRA

Shrub: *Ceanothus thyrsiflorus, Vaccinium ovatum, Rubus parviflorus*

VEGETATION DESCRIPTION

This vegetation includes stands dominated by *Ceanothus thyrsiflorus* forming a fairly open shrub canopy between 1 - 2 meters in height. The understory may contain *Chrysolepis chrysophylla* var. *minor , Pteridium*

aquilinum, Gaultheria shallon, Erechtites minima and a wide variety of herbaceous species contributing minor cover. The two other characteristic species; *Vaccinium ovatum* and *Rubus parviflorus* occur in low cover, but may increase following resprouting from fire.

OTHER NOTEWORTHY SPECIES None

CONSERVATION RANK G3S3?

RANK JUSTIFICATION This is a temporally defined type (fire - following) apparently of limited distribution. Within the PRNS / GGNRA area the association seems restricted to higher elevation or moister sites than the more common *Ceanothus thyrsiflorus - Baccharis pilularis - Toxicodendron diversilobum* association. The parent alliance is also ranked G4.

DATABASE CODE To be determined

COMMENTS
Globally

PRNS / GGNRA
This association is not mapped because the air photos were taken too close to the date of the fire to detect it.

Plots used to define this association (n=2): PRNS057 PRNS176

CALIFORNIA COFFEEBERRY ALLIANCE
Rhamnus californica Alliance - pi code 21460

This alliance was defined from the data collected in this study and so far as is currently known restricted to the vicinity of the study area from Point Reyes Peninsula to the Montara Mountain area. It is represented by a single association.

Rhamnus californica - Baccharis pilularis / Scrophularia californica Association
- pi code 21461

COMMON NAME	California Coffeeberry - Coyotebrush / California Figwort Shrubland
SYNONYM	None
PHYSIOGNOMIC CLASS	Shrubland
PHYSIOGNOMIC SUBCLASS	Evergreen Shrubland
PHYSIOGNIMIC GROUP	Temperate broad - leaved evergreen shrubland
PHYSIOGNOMIC SUB GROUP	Natural / Semi - natural
FORMATION	Temperate broad - leaved evergreen shrubland

ALLIANCE To be determined

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global range is not available without additional inventory. Our expectation is that this is a common association along the immediate coast of Northern California from Santa Cruz county north to Humboldt County.

PRNS / GGNRA
Stands of this association are found throughout the PRNS / GGNRA mapping area.

ENVIRONMENTAL DESCRIPTION
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
This association grows on moderate north and east facing slopes, from the lower to upper third of the slope. Stands prefer soils which retain moisture much of the year such as moderate sandy loams. This association is likely the result of a transition from late seral associations of B pilularis alliance such as *Baccharis / Polystichum* or *Baccharis / Rhamnus - Rubus parviflorus* stands into *Rhamnus californica* alliance stands if undisturbed for several years. It appears that *Rhamnus californica* does not colonize disturbed *B. pilularis* stands for many years and typically occupies stands in relatively mesic sites such as northerly facing slopes. It is uncertain what happens to relatively old *Rhamnus californica* ssp. *californica - Baccharis pilularis / Scrophularia californica* association stands following fire or other disturbance. *Rhamnus* will resprout vigorously following fire (McMurray, 1990). *Baccharis pilularis* has a variable response depending on intensity, resprouting more vigorously when burned in low to moderate intensity fires (Keeler - Wolf personal observation). It appears that the oldest stands are those most strongly dominated by *Rhamnus californica*. Many of these older stands show senescence in the canopy of individual *Rhamnus* shrubs and a very heavy lichen load on the stems of the shrubs.

MOST ABUNDANT SPECIES
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Shrub: *Rhamnus californica* ssp. *californica, Baccharis pilularis*

CHARACTERISTIC SPECIES
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Shrub: *Rhamnus californica ssp. californica, Baccharis pilularis*
Forb: *Scrophularia californica*

VEGETATION DESCRIPTION
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
This vegetation is heavily dominated by *Rhamnus californica* ssp. *californica* and *Baccharis pilularis*, which combine for 50% - 90% cover. *Toxicodendron diversilobum* may be present (usually less than 10%) . The canopy is densest between 2 - 5 meters. *Scrophularia californica* is diagnostic in the herbaceous and short shrub layers, ranging from a few percent to 35% cover.

OTHER NOTEWORTHY SPECIES None

CONSERVATION RANK G4 S4

RANK JUSTIFICATION There are well over 150 stands of this vegetation mapped in the PRNS / GGNRA mapping area.

DATABASE CODE To be determined

COMMENTS
Globally

PRNS / GGNRA
Exotics are an impact on this association.

Plots used to define this association (n=8): GGNRA357, GGNRA372, GGNRA326, PRNS167, PRNS119, PRNS105, PRNS074, PRNS 206

HOLLY - LEAFED CHERRY ALLIANCE

Holly - leaf Cherry (*Prunus illicifolia)* Alliance - pi code 21250

This alliance is represented locally by a single association. However additional variation is exhibited in a plot with: *P. illicifolia* and *Ceanothus thyrsiflorus* as the main shrub species: (GGNRA339).
In general, this alliance is considered throughout most of its range a mesic chaparral that may range far inland. However, locally it is near its most coastal low elevation expression and shares more ecologically with associated dense coastal scrubs. The alliance ranges from NW Baja California, Mexico to the north coast ranges of California. It does not occur in the Sierra Nevada foothills.

Prunus ilicifolia / Sanicula crassicaulis Association

COMMON NAME	Hollyleaf Cherry / Sanicula Shrubland Association
SYNONYM	None
PHYSIOGNOMIC CLASS	Shrubland
PHYSIOGNOMIC SUBCLASS	evergreen Shrubland
PHYSIOGNOMIC GROUP	sclerophyllous shrubland
PHYSIOGNOMIC SUB GROUP	Natural / Semi - Natural
FORMATION	Temperate sclerophyllous shrubland

ALLIANCE *Prunus ilicifolia* Shrubland Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE
Globally
This association is only known from the Golden Gate National Recreation Area. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Stands of the *Prunus ilicifolia / Sanicula crassicaulis* shrubland association are found within the Montara Mountain 7.5 minute topographic quad in the mapping areas of GGNRA, including the San Francisco Watershed lands.

ENVIRONMENTAL DESCRIPTION
Globally
This association is only known from the Golden Gate National Recreation Area. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Stands of the *Prunus ilicifolia / Sanicula crassicaulis* shrubland association are found at low elevations on 4 - 13 degree slopes. Aspects are east - northeast to southwest on undulating lower to upper slopes. Soil textures range from moderately fine sandy clay loam to moderately coarse sandy loam.

MOST ABUNDANT SPECIES
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Herbaceous: *Sanicula crassicaulis, Toxicodendron diversilobum*
Shrub: *Prunus ilicifolia*

CHARACTERISTIC SPECIES
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Herbaceous: Sanicula crassicaulis, Heracleum lanatum, Marah fabaceous, Silybum marianum
Shrub: Prunus ilicifolia, Dirca occidentalis, Heteromeles arbutifolia, Toxicodendron diversilobum

VEGETATION DESCRIPTION
Globally
This association is only known from the Golden Gate National Recreation Area. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Stands of the *Prunus ilicifolia / Sanicula crassicaulis* shrubland association form dense stands dominated by *Prunus ilicifolia* with continuous cover of 60 - 80 percent cover in the shrub layer. *Sanicula crassicaulis* is an important understory herb with from 5 to 30% cover. A variety of herbs and shrubs that are often found in this association include *Dirca occidentalis, Sanicula crassicaulis, Toxicodendron diversilobum, Heracleum lanatum, Marah fabaceus, Ribes californicum, Heteromeles arbutifolia, Ceanothus thyrsiflorus*. Other species that may be included in stands are *Conium maculatum, Sambucus mexicana, Ribes sanguineum, Stellaria media, Galium aparine, Dryopteris arguta, Solanum douglasii, Smilacina racemosa, Satureja douglasii, Carduus pycnocephalus, Artemisia californica, Baccharis pilularis, Solanum xanti, Hesperocnide tenella,* and *Polystichum munitum.* This association is often adjacent *Baccharis* Alliance communities and is found at low elevations on 4 - 13 degree slopes. Aspects are east - northeast to southwest on undulating lower to upper slopes. Soil textures range from moderately fine sandy clay loam to moderately coarse sandy loam.

OTHER NOTEWORTHY SPECIES *Dirca occidentalis* is considered a list 1B rare species by California Native Plant Society (Skinner and Pavlik 1994).

CONSERVATION RANK G2S2?

RANK JUSTIFICATION This is the northernmost and most coastal expression of the *Prunus illicifolia* alliance. Its occurrence adjacent to typically north coastal alliance stands such as *Baccharis pilularis* and *Toxicodendron diversilobum* are unusual. Throughout most of its range it is a dry chaparral alliance with the center of its range in the South Coast Ranges and the Southern California Mountains (Borchert 2000)

DATABASE CODE

COMMENTS
Globally

PRNS / GGNRA
Note all plots of this association were defined from the Montara Mountain area and further stands should be searched out further south in the San Francisco Peninsula and Santa Cruz Mountains. Transitional relationships with Baccharis pilularis and Ceanothus thyrsiflorus alliance stands should be investigated further.

Plots used to define this association (N=5): GGNRA313, GGNRA314, GGNRA320, GGNRA324, GGNRA350

Baccharis pilularis / Prunus illicifolia Association (preliminary)
- pi code 24067 Insufficient relevé plots to describe this association, currently rolled into classification hierarchy with Holly - leafed Cherry Alliance - pi code 21250)

MEXICAN ELDERBERRY ALLIANCE
Mexican Elderberry *(Sambucus mexicana)* Alliance - pi code 30020

COMMON NAME	Mexican Elderberry Stands
SYNONYMS	Elderberry Savanna (Holland); Riparian Woodland (Thorne); Freshwater Emergent Wetland (WHR)
PHYSIOGNOMIC CLASS	Shrubland
PHYSIOGNOMIC SUBCLASS	Deciduous Shrubland
PHYSIOGNOMIC GROUP	Cold - deciduous Shrubland
PHYSIOGNOMIC SUB GROUP	Natural / Semi - natural
FORMATION	Intermittently Flooded Cold - deciduous Shrubland
ALLIANCE	*Sambucus mexicana* Intermittently Flooded Shrubland
CLASSIFICATION CONFIDENCE LEVEL	
USFWS WETLAND SYSTEM	Palustrine Forested

RANGE
Globally
Located in California in the Central California Coastal Ranges, Great Valley, and Southern California Coast. The species ranges from southern British Columbia and western Alberta to California, Arizona, and New Mexico It extends east into western Montana, western Colorado, and Trans - Pecos Texas, south into northwest Mexico (Crane 1989).

PRNS / GGNRA
No plots were taken. *S. mexicana* occurs in small scattered stands in the study area.

ENVIRONMENTAL DESCRIPTION
Globally
Habitat intermittently flooded. Water chemistry: fresh. Floodplains. The national list of wetland plants (Reed 1988) lists *Sambucus mexicana* as a Facultative wetland species in California.

PRNS / GGNRA
Habitat intermittently flooded. Water chemistry: fresh. Floodplains. May also occur on slopes as a sparse overstory to mesic shrub species characteristic of the coastal scrub.

MOST ABUNDANT SPECIES
Globally
Sambucus mexicana

PRNS / GGNRA

Sambucus mexicana

CHARACTERISTIC SPECIES

Globally

Sambucus mexicana

PRNS / GGNRA

Sambucus mexicana

VEGETATION DESCRIPTION

Globally

Sambucus mexicana is dominant in the shrub canopy; *Fraxinus latifolia, Salix exigua, Toxicodendron diversilobum,* and / or *Vitis californica* may be present. Emergent *Populus fremontii Quercus agrifolia,* or *Quercus lobata* may be present. Shrubs < 8 m tall; canopy continuous, intermittent, or open. Ground layer grassy. Mature individuals of S. mexicana are the host for the larvae of the endangered valley longhorn elderberry beetle, a spectacular species endemic to the Great Valley Province of California

PRNS / GGNRA

Sambucus. mexicana occurs in small scattered stands in the study area, typically as open woodlands or tall shrublands over a shorter shrub cover dominated by *Baccharis pilularis, Rhamnus californica,* and other mesic shrubland species.

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK G3 S3

RANK JUSTIFICATION *Sambucus mexicana* stands are often in relatively frequently disturbed settings such as riparian zones or meadow edges or in openings in moist forest habitats and in moist areas within drier, more open habitats. It is part of the riparian communities of the Central Valley of California, and stands may be found in relatively gravelly alluvium and upper terrace deposits associated with *Populus fremontii,* or *Quercus lobata* alliance stands. Mature individuals of *S. mexicana* are the host for the larvae of the endangered valley longhorn elderberry beetle, a spectacular species endemic to the Great Valley Province of California. In Oregon and California it is being used for riparian plantings and streambank stabilization plantings. Natural stands are limited by their moisture requirements and the limited extent of riparian terraces in the Great Valley, and Southern California Mountains and Valleys sections.

DATABASE CODE

COMMENTS

Globally

Plants of *Sambucus mexicana* are common in many alliances, often as emergent trees or tall shrubs over coastal scrubs, chaparrals, or as an understory shrub in forests. This alliance includes only those stands with relative high cover of *S. mexicana* (including *S. caerulea*) in the overstory .

The way in which plants are classified varies greatly among references. *The Jepson Manual* considers *Sambucus mexicana* to be comparable to *S. caerulea.* Munz (1968) differentiates *S. caerulea* from *S. mexicana* on leaflet number and location. Kartesz & Meacham (1999) consider that California has two subspecies of continental ranging *S. nigra* (*S. n.* ssp. *caerulea* and *S. n.* ssp. *Canadensis = S. mexicana*). The first subspecies grows at montane elevations in the mountains and occurs as individual plants. The second subspecies grows as individuals and in local stands at low elevations.

Sambucus mexicana is a multi - stemmed tall shrub and occasionally a single stemmed small tree, with soft pithy wood. It is relatively fast growing, and is relatively short lived (Crane 1989). There are good seed crops almost every year, and the seeds are dispersed by birds and other animals that eat the fruit. Seeds retain their viability for up to 16 years in storage. Seedlings may bloom and bear fruit by their 2nd or 3rd year. Plants can reach full size in 3 to 4 years. It is a mesophyte and does not typically occur in soils saturated through the growing season.

Blue elderberry is able to resprout and seed buried in seed banks germinates following fire. Since it is short lived and shade intolerant, blue elderberry is usually absent from the understory of closed - canopy forests before fire occurs and must rely on seed banks for regeneration.

Blue elderberry is a palatable browse plant that is sought and consumed in excess of its relative importance in the vegetative community by elk and deer. Its fruit provides food for many species of birds including bluebirds, magpies, warbling vireo, western tanager, house finch, green - tailed towhee, woodpeckers, grosbeaks, Townsend solitaire, grouse, quail, pheasant, and hummingbirds who visit flowers for nectar (Crane 1989).

Status Regionally
Central California Coastal Ranges (M262A) occasional stands on upper river and stream terraces
Great Valley (262A). Occasional usually small stands along American River. Sacramento River, Feather River and other major streams and rivers
Southern California Mountains and Valleys (M262B). Occasional small stands in alluvial scrub settings adjacent to major intermittent streams such as Santa Ana River, San Gabriel River, etc.

PRNS / GGNRA
Local stands are largely upland as opposed to bottomland. Successional relationships in these stands are unclear, but may only represent transitional stands to woodland dominated by *Umbellularia* and / or *Quercus agrifolia*.

Plot used to define this alliance locally (n=1): GGNRA383

POISON OAK ALLIANCE

Poison Oak (*Toxicodendron diversilobum)* Alliance - pi code 30040

This alliance is represented by one association locally. It is very closely related to other dense coastal scrub associations in different alliances such as Rhamnus californica and Baccharis - Rhamnus associations, however is strongly dominated by poison - oak. The range of this alliance is from Humboldt Co to Los Angeles Co. along the coast of California.

Toxicodendron - Baccharis pilularis - Rubus parviflorus Association
- pi code 30041

COMMON NAME	Poison Oak - Coyote Brush - Thimbleberry Shrubland
SYNONYM	None
PHYSIOGNOMIC CLASS	Shrubland
PHYSIOGNOMIC SUBCLASS	Mixed Evergreen - Deciduous Shrubland
PHYSIOGNIMIC GROUP	Mixed Evergreen - Cold - deciduous Shrubland
PHYSIOGNOMIC SUB GROUP	Natural
FORMATION	Mixed Evergreen - Cold - deciduous Shrubland
ALLIANCE	To be determined , putatively *Toxicodendron diversilobum* shrubland alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global range is not available without additional inventory.

PRNS / GGNRA
This association is common in the southern units of GOGA as at Sweeney Ridge and on the San Francisco Municipal Water District Lands. It is uncommon in Marin Headlands and at Point Reyes.

ENVIRONMENTAL DESCRIPTION
Globally
This association is only known from the vicinity of the Point Reyes National Seashore and Golden Gate National Recreation Area. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
This association is found on the upper third of moderate slopes. Aspects are north to east and soil textures can vary from medium silty loams to moderately coarse sandy loams. Slopes are often concave. This association is a mesic expression of the "North Coastal Scrub" where *Toxicodendron* is strongly dominant. It is clearly related to other *Baccharis pilularis* associations and with further investigation may be considered a phase of that alliance.

MOST ABUNDANT SPECIES
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Shrub: *Toxicodendron diversilobum, Baccharis pilularis, Rubus sp.*

CHARACTERISTIC SPECIES
Globally
This association is only known from the vicinity of the Point Reyes National Seashore and Golden Gate National Recreation Area. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Shrub: *Toxicodendron diversilobum, Baccharis pilularis, Rubus parviflorus*.

VEGETATION DESCRIPTION
Globally
This association is only known from the vicinity of the Point Reyes National Seashore and Golden Gate National Recreation Area. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Vegetation within this association includes stands dominated by *Toxicodendron diversilobum* with significant amounts of *Baccharis pilularis* and *Rubus parviflorus* or *Rubus ursinus* in the shrub layer. The shrub canopy is fairly continuous and between 1 - 2 meters in height. Emergent, shrubby individuals of *Pseudotsuga menziesii* are often present. *Marah fabaceus* is usually present at about 1% cover. Species present in the herbaceous layer may include *Scrophularia californica, Sanicula crassicaulis, Pteridium aquilinum, Phacelia californica,* and / or *Maianthemum stellatum.*

OTHER NOTEWORTHY SPECIES None

CONSERVATION RANK G3S3?

RANK JUSTIFICATION Although *Toxicodendron diversilobum* is an abundant species, stands strongly dominated by this species only occur close to the coast in Central and Northern California. As far as is known these stands are few in number and relatively small in size.

DATABASE CODE To be determined

COMMENTS

Globally

PRNS / GGNRA
This association is ecologically similar to the *Baccharis pilularis - Toxicodendron association* of the *Baccharis pilularis* alliance. However, in most cases *Toxicodendron* is dominates by from 2 to 10 times the cover of *Baccharis pilularis*. These stands are relatively mesic, more so than the typical *Baccharis - Toxicodendron* association. The largest stands are on east and NE - facing slopes in fog gaps as near the summit of Highway 92 in San Mateo County.

Plots used to define this association (n=7): GGNRA370, GGNRA356, GGNRA375, GGNRA325, PRNS102, GGNRA353, GGNRA363

Drier Coastal Grassland / Open Scrub (in part)

COYOTEBRUSH ALLIANCE (unable to key) - pi code 24099

MIXED COYOTEBRUSH ALLIANCE (in part)
Coyotebrush (*Baccharis pilularis)* Alliance (in part) - pi code 24050

This portion of the coyotebrush alliance is represented by three associations with relatively low shrub cover and relatively high herbaceous cover. Most of the stands placed in this ecological group are responding to relatively recent or repeated disturbance and represent *Baccharis pilularis* colonizing or re - colonizing herb dominated stands that may have been maintained by grazing or other disturbance.

Baccharis pilularis / Non - native Grassland Association
- pi code 24065

COMMON NAME	Coyote Brush / annual non - native grass Shrubland Association
SYNONYM	None
PHYSIOGNOMIC CLASS	Shrubland
PHYSIOGNOMIC SUBCLASS	Evergreen Shrubland
PHYSIOGNOMIC GROUP	Microphyllous evergreen shrubland
PHYSIOGNOMIC SUB GROUP	Natural / Semi - Natural
FORMATION	Lowland microphyllous evergreen shrubland
ALLIANCE	*Baccharis pilularis* Shrubland Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE

Globally

This association is currently only described from the Point Reyes National Seashore and Suisun Marsh (Solano County, CA). It is likely to be a common and widespread association from Northern to Southern coastal California. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Stands of the *Baccharis pilularis /* annual non - native grass shrubland association are found throughout the mapping areas of MARINSP and GGNRA.

ENVIRONMENTAL DESCRIPTION

Globally

Outside of the mapping area, this association is only known from Suisun Marsh (Keeler - Wolf *et al.* 2000) There it is occasional where it occupies edges of disturbed grasslands and levee banks below 10 ft above sea level.

PRNS / GGNRA

Stands of the *Baccharis pilularis /* annual non - native grass shrubland association are found at low elevations on the mid 1 / 3 to ridge tops of approximately 15 - degrees, south to southwest facing slopes. Soil textures range from medium to very fine sandy loam to moderately fine silty clay loam.

MOST ABUNDANT SPECIES

Globally

This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory. At Suisun Marsh (Keeler - Wolf et al 2000) *Baccharis pilularis* is the most common shrub from 55 - 70 % while annual exotic grasses such as *Lolium multiflorum, Bromus diandrus,* and *Avena barbata* along with annual herbs such as *Raphanus sativa* comprise most of the herbaceous cover

PRNS / GGNRA

Herbaceous: *Avena barbata, Lolium perenne, Bromus hordeaceus, Vulpia bromoides, Plantago lanceolata*
Shrub: *Baccharis pilularis*

CHARACTERISTIC SPECIES

Globally

This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Herbaceous: *Avena barbata, Anagallis arvensis, Vulpia sp., Sonchus asper*
Shrub: *Baccharis pilularis*

VEGETATION DESCRIPTION

Globally

This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory. The relatively stochastic colonization of areas by different species of introduced annual grasses in California has precluded a definitive set of indicator species beyond the general category of " annual non - native grasses" for this association.

PRNS / GGNRA

Stands of the *Baccharis pilularis /* annual non - native grass shrubland association vary in structure, forming an open to continuous herb layer with 0 - 20% at 0 - 25 cm tall and 20 - 70% at 25 - 50 cm tall, open to intermittent shrub layer with 0 to 40% cover at 0.5 to 1 m, and 0 - 60% cover at 1 - 2m tall. It is dominated by *Baccharis pilularis* and a variety of annual introduced grasses including *Avena barbata Bromus hordeaceus, Vulpia bromoides,* and *Plantago lanceolata.* A variety of other species are also found in this association including *Briza minor, Toxicodendron diversilobum, Brassica nigra, Elymus glaucus, Filago gallica, Lolium multiflorum, Plantago lanceolata, Viola sp.,* and *Sisyrinchium bellum*. Other species may include *Avena fatua, Bromus hordeaceus, Chlorogalum pomeridianum, Bromus sterilis, Geranium dissectum, Lactuca serriola, Nassella pulchra, Dipsacus fullonum, Briza maxima,* and *Aira caryophyllea.*

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK G5S5?

RANK JUSTIFICATION Likely to be a common association in disturbed coastal sites throughout most of California.

DATABASE CODE

COMMENTS

Globally

PRNS / GGNRA

We expect that this association occurs on somewhat drier, more fine - grained soils than the related *B. pilularis - Rubus ursinus* association. The latter association may occur more regularly in cool seaward sites, while the former is often in warmer, drier settings. However, both are similar and share some species and with more data it may be warranted to combine them as one association.

Plots used to define this association (n=3): Marinsp21, Marinsp12, GGNRA333

Baccharis pilularis - Nassella pulchra Association
- pi code 24056

COMMON NAME	Coyote Brush / Purple Needle Grass Shrubland Association
SYNONYM	None
PHYSIOGNOMIC CLASS	Shrubland
PHYSIOGNOMIC SUBCLASS	Evergreen Shrubland
PHYSIOGNOMIC GROUP	Microphyllous evergreen shrubland
PHYSIOGNOMIC SUB GROUP	Natural / Semi - Natural
FORMATION	Lowland microphyllous evergreen shrubland
ALLIANCE	Baccharis pilularis Shrubland Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE
Globally
This association is only known from the Point Reyes National Seashore and Golden Gate National Recreation Area. Information about its global characteristics is not available without additional inventory. It is likely that this association exists in other parts of central coastal California such as the Santa Cruz Mountains.

PRNS / GGNRA
Stands of the *Baccharis pilularis - Nassella pulchra* shrubland association are found throughout the mapping areas of GGNRA, including plots from the Point Bonita and the San Mateo 7.5 minute topographic quads, and PRNS.

ENVIRONMENTAL DESCRIPTION
Globally
This association is only known from the Point Reyes National Seashore and Golden Gate National Recreation Area. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Stands of the *Baccharis pilularis - Nassella pulchra* shrubland association are found at low elevations on the mid to upper 1 / 3 of 14 - 45 degree angle, usually on undulating slopes with east - southeast to southwest aspects. Soil textures range from moderately fine clay loam to medium to very fine sandy loam and are from shale or sandstone origin. In the Marin Headlands unit of GOGA, where this association occurs commonly, these stands occupy the south - facing ridgelines of spur ridges where grazing kept the *Baccharis* from invading for many years. Currently many of these stands are being more rapidly colonized by Baccharis as a result of reduced grazing. There is probably a dynamic relation ship between soil type (xeric fine grained, but relatively shallow) and disturbance (more frequent disturbance from grazing reduces Baccharis), which if shifted will result in either more grass or more *Baccharis* in these stands.

MOST ABUNDANT SPECIES
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Herb: *Nassella pulchra, Anagallis arvensis*
Shrub: *Baccharis pilularis*

CHARACTERISTIC SPECIES
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Herb: *Nassella pulchra, Plantago lanceolata, Gnaphalium californicum*
Shrub: *Baccharis pilularis*

VEGETATION DESCRIPTION
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
The *Baccharis pilularis - Nassella pulchra* shrubland association forms an intermittent to continuous herb layer with 15 - 75% cover at 0 - 25 cm tall, 0 - 30% cover at 25 - 50 cm tall, and an open to intermittent shrub layer with 5 - 40% cover at .5 - 1 m tall, and 0 - 75% cover at 1 - 2m tall. This is an open scrub - steppe dominated by *Baccharis pilularis* and characterized by the bunchgrass *Nassella pulchra*. There is a variety of other species that may be found in this association. Often found in this association is *Achillea millefolium, Aira caryophyllea, Vulpia myuros, Plantago lanceolata, Lolium multiflorum, Gnaphalium californicum, Anagallis arvenis, Galium sp., Avena barbata, Erodium sp, Hypochaeris sp, Chlorogalum pomeridianum, Sonchus sp, Danthonia californica.* Species contributing to minor amounts of cover vary and may include *Artemisia californica, Agrostis sp., Briza minor, Bromus carinatus, Castilleja brevistyla, Dichondra donelliana, Eschscholzia californica, Eriogonum latifolium, Grendelia stricta, Lotus sp., Madia sp., Marah fabaceus, Pteridium aquilinum, Rubus ursinus, Rumex acetosella, Sanicula crassicaulis,* and *Silene gallica.* Often adjacent to *Baccharis* and *Toxicodendron diversilobum* Associations, this shrubland association is found at low elevations on the mid to upper 1 / 3 of 14 - 45 degree angle, usually undulating slopes with east - southeast to southwest aspects. Soil textures range from moderately fine clay loam to medium to very fine sandy loam and are of shale or sandstone origin.

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK G3S3?

RANK JUSTIFICATION Distribution of this type is uncertain beyond the study area, but it is likely to be relatively uncommon as a result of altered disturbance regime, and presence of invasive exotics.

DATABASE CODE

COMMENTS
Globally

PRNS / GGNRA

Plots used to define this association (n=4): GGNRA302, PRNS011, PRNS124, GGNRA352

Baccharis pilularis - Rubus ursinus / weedy herb Association
- pi code 24064

COMMON NAME Coyote Brush - California Blackberry / weedy herb Shrubland Association
SYNONYM None
PHYSIOGNOMIC CLASS Shrubland

PHYSIOGNOMIC SUBCLASS Evergreen Shrubland
PHYSIOGNOMIC GROUP Microphyllous evergreen shrubland
PHYSIOGNOMIC SUB GROUP Natural / Semi - Natural
FORMATION Lowland microphyllous evergreen shrubland

ALLIANCE *Baccharis pilularis* Shrubland Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory. However, it is likely that this association is common in foggy coastal areas in northern California expressing a stage transition from open pasture and perennial non - native grassland to a more continuous cover of *Baccharis pilularis*.

PRNS / GGNRA
Stands of the *Baccharis pilularis - Rubus ursinus /* weedy herb shrubland association are found throughout the coastal strip within the mapping areas of PRNS and GGNRA.

ENVIRONMENTAL DESCRIPTION
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Stands of the *Baccharis pilularis - Rubus ursinus /* weedy herb shrubland association are found at low elevations on the lower 1 / 3 to ridge tops of 18 - 35 degree, southwest to northwest facing slopes. Soil textures range from moderately fine silty clay loam to coarse loamy sand. This association typically occupies the coastal terrace and coastward sides of the mapping area. *Rubus ursinus* is a common colonizer of moist area in this zone and this association is indicative of a slightly cooler and moister setting than the *Baccharis pilularis* / annual non - native grass association. Under equivalent moisture conditions, it also indicates a somewhat more advanced stage in the stand dynamics of the *B pilularis* alliance than the former association.

MOST ABUNDANT SPECIES
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Shrub: *Baccharis pilularis, Rubus ursinus*

CHARACTERISTIC SPECIES
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Herb: *Satureja douglasii*
Shrub: *Baccharis pilularis, Rubus ursinus*

VEGETATION DESCRIPTION

Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Stands of the *Baccharis pilularis - Rubus ursinus /* weedy herb shrubland association forms an open to intermittent herb layer with 3 - 30% cover at 0 - 25% cm tall, 10 - 40% cover at 25 - 50 cm, an open to intermittent shrub layer with 8 - 60% cover at 0.5 - 1 m tall, 20 - 65% cover at 1 - 2 m tall, and 0 - 40% cover at 2 - 5 m tall. It is dominated by *Baccharis pilularis* and *Rubus ursinus*. *Toxicodendron diversilobum* and *Satureja douglasii* are usually present and a variety of other species that may also be present include *Lonicera hispidula, Rhamnus californica, Aster chilensis, Oemleria cerasiformis, Heracleum lanatum, Marah fabaceus, Holcus lanatus, Agrostis* sp.*, Briza minor, Plantago lanceolata, Pteridium aquilinum, Geranium dissectum, Scrophularia californica,* and *Hypochaeris radicata.*

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK G5S5?

RANK JUSTIFICATION This is likely to be an early seral *Baccharis pilularis* association that is widespread in coastal northern California

DATABASE CODE

COMMENTS
Globally

PRNS / GGNRA

Plots used to define this association (n=3): PRNS156, GGNRA264, GGNRA359

MIXED BROOM ALLIANCE

Broom (Cytisus, Genista, Spartium spp.) Alliance - pi code 24040

This alliance is represented locally by at least three species of introduced Eurasian leguminous shrubs, collectively known as "broom". The most widespread and invasive species is *Genista monspessulana*. The alliance in California ranges throughout the outer coast ranges from the Oregon border to Mexico, and also occurs in the Sierra Nevada foothills.

COMMON NAME	Broom stands
SYNONYM	None
PHYSIOGNOMIC CLASS	Shrubland
PHYSIOGNOMIC SUBCLASS	Evergreen Shrubland
PHYSIOGNOMIC GROUP	Microphyllous evergreen shrubland
PHYSIOGNOMIC SUB GROUP	Natural / Semi - Natural
FORMATION	Microphyllous evergreen shrubland
ALLIANCE	*Cytisus scoparius, Genista monspessulana, Spartium junceum* Alliance

CLASSIFICATION CONFIDENCE LEVEL

USFWS WETLAND SYSTEM Upland

RANGE

Globally
In California broom stands occur throughout the Southern, Central, and Northern California Coast Ranges, the Klamath Mountains and Southern Cascades, the Southern California Mountains and Valleys, and the Sierra Nevada and its Foothills.

PRNS / GGNRA
Two plots dominated by broom species in the project area, near the peak of Monticello Trail, and off Marincello Road, about ¼ mile from the split with Bobcat Trail on its west side.

ENVIRONMENTAL DESCRIPTION
Globally
All upland slopes; elevation sea - level - 1000m.

PRNS / GGNRA
Plots dominated by the noxious weedy shrub, gorse (*Ulex europaeus),* in this area usually in mesic coastal terrace locations, with a relatively open, non - native grass understory. Plots dominated by either *Cytisus scoparius* or *C. striatus* on upper slopes or terraces on coarse sandy to fine silty - clay loam.

MOST ABUNDANT SPECIES
Globally
Shrub: *Cytisus scoparius, Genista monspessulana, Spartium junceum, Ulex europaeus*

PRNS / GGNRA
Shrub: *Cytisus striatus, Cytisus scoparius, Ulex europaeus*

CHARACTERISTIC SPECIES
Globally
Shrub: *Cytisus scoparius, Genista monspessulana, Spartium junceum, Ulex europaeus*

PRNS / GGNRA
Shrub: Cytisus striatus, Cytisus scoparius, Ulex europaeus

VEGETATION DESCRIPTION
Globally
Cytisus scoparius, Genista monspessulana, Spartium junceum, or Ulex europaeus sole dominant shrub in the canopy; other species of *Cytisus* or *Genista* may be present. Emergent trees may be present. Shrubs < 6 m; canopy continuous. Ground layer sparse.

PRNS / GGNRA
Cytisus scoparius, C. striatus, or Ulex europaeus dominant in shrub canopy; *Baccharis pilularis* significant in one plot; Shrubs 1 - 5m, canopy intermittent to continuous; ground layer sparse.

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK Exotic

RANK JUSTIFICATION Invasive in many areas of coastal California

DATABASE CODE

COMMENTS
Globally
Invasiveness of broom species is well appreciated. Ten species of broom or gorse from four legume genera are included in this type. *The Jepson Manual* recognizes three *Cytisus*, five *Genista*, one *Spartium*, and one *Ulex* in California. French broom, Spanish broom, and Scotch broom are the major invading brooms of disturbed areas in the state. The following are uncommon or locally common: *Cytisus multiflorus, Cytisus striatus, Genista*

canariensis, *Genista linifolia*, *Genista maderensis*, *Genista stenopetala*, and *Ulex europaeus*. In areas where trees form dense canopies with age, broom is killed; however a persistent seed bank remains. The treatment here is broad, recognizing the importance of these introduced species in the vegetation of California. The most invasive species in central California appears to be *Genista monspessulana.* It is likely that with further sampling, individual broom alliances and associations will be defined. These may include Spanish broom (*Spartium junceum)*) from southern coastal California, French Broom (*Genista monspessulana*) from central California, and Scotch Broom (*Cytisus multiflorus*) from northern California.

PRNS / GGNRA
Genista monspessulana is a common and persistent invader of ecotones between *Quercus agrifolia* and various open herbaceous stands of vegetation including California annual grassland and non - native perennial grassland. Canary Island Broom (Cytisus striatus) also forms local stands in the Marin Headlands portion of GGNRA.
Plots used to define this alliance locally: None

Plots used to describe this association (n=0): no plots sampled

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YELLOWBUSH LUPINE ALLIANCE

Yellowbush Lupine (*Lupinus arboreus)* Shrubland Alliance - pi code 19010

Although the alliance is common in the study area, no associations were defined. This is primarily the result of the early seral state of most stands with the short lived perennial Lupinus arboreus colonizing many different types of open herbaceous vegetation. The following general account will serve to distinguish the alliance as it is expressed locally.

COMMON NAME	Yellow Bush Lupine Scrub
SYNONYMS	Northern Coastal Bluff Scrub, Northern Dune Scrub, Venturan Coastal Sage Scrub (Holland); Lupine Series (PSW - 45); Northern Coastal Scrub (Thorne); Coastal Scrub (WHR)
PHYSIOGNOMIC CLASS	Shrubland
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland
PHYSIOGNOMIC GROUP	Temperate broad - leaved evergreen shrubland
PHYSIOGNOMIC SUB GROUP	Natural / semi - natural
FORMATION	Temperate broad - leaved evergreen shrubland
ALLIANCE	*Lupinus arboreus* Shrubland Alliance
CLASSIFICATION CONFIDENCE LEVEL	2
USFWS WETLAND SYSTEM	Upland

RANGE
Globally
Northern and Central California Coast

PRNS / GGNRA
Point Reyes Peninsula, Marin County.

ENVIRONMENTAL DESCRIPTION
Globally
Stabilized dunes of coastal bars, river mouths and spits along coastline; coastal bluffs and terraces; elevation sea - level to 30 meters.

PRNS / GGNRA
Most plots on moderate, slopes on coarse sandy loam within one mile of the Pacific Ocean..

MOST ABUNDANT SPECIES
Globally
Shrub: *Lupinus arboreus, Alnus rubra, Baccharis pilularis, Myrica californica*

PRNS / GGNRA
Shrub: *Lupinus arboreus, Rubus ursinus*
Herb: *Achillea millefolium, Brassica rapa*

CHARACTERISTIC SPECIES
Globally
Lupinus arboreus

PRNS / GGNRA
Lupinus arboreus

VEGETATION DESCRIPTION
Globally
Lupinus arboreus is sole or dominant in the shrub canopy; *Alnus rubra, Baccharis pilularis,* and / or *Myrica californica* present. Shrubs < 2 m; canopy continuous or intermittent. Ground layer variable.

PRNS / GGNRA
Lupinus arboreus dominant in the shrub canopy; *Rubus ursinus* present; shrubs <2m, canopy intermittent. Herbs present include *Achillea millefolium* and *Brassica rapa*; layer intermittent.

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK G4S4, partially exotic

RANK JUSTIFICATION Stands south of Point Reyes peninsula are generally considered native while, northern CA stands are exotic (Sawyer and Keeler - Wolf 1995).

DATABASE CODE

COMMENTS
Globally
The range of *Lupinus arboreus* covers most of central and northern California coast. It grows on coastal dunes, headlands, and terraces. This California native is considered an "exotic" north of Manchester Beach in Mendocino Co. In Humboldt Co., it has a history of being planted to stabilize sand (Miller 1988). It is very successful at colonizing and enriching the sand, and as a result is changing vegetation patterns. *L. arboreus* stands in Humboldt Co. are being managed by annual removal to restore stands of the *Ambrosia chamissonis* alliance and enhance populations of rare species (Pickart & Sawyer 1998).

PRNS / GGNRA
Stands may occur on dunes, grazed annual and perennial grasslands and on coastal bluffs. The rapid growth and senescence of the local stands make them difficult to verify due to presence (or absence) in aerial photographs, but general absence (or presence) a few years hence. The history of the local stands is not entirely clear and at least some seed may have been introduced (J. Sawyer, personal communication 2002).

Plots used to define this alliance locally (n=2): PRNS177, PRNS173, PRNS023

GORSE ALLIANCE

Gorse (*Ulex europaeus)* Alliance - pi code 24999

This invasive alliance is represented by a single association in the study area. The dominant is a European species that has become a troublesome and invasive weed in the outer north coast ranges of California.

Ulex europaeus Association
- pi code 24999

COMMON NAME	Gorse Shrubland
SYNONYM	None
PHYSIOGNOMIC CLASS	Shrubland
PHYSIOGNOMIC SUBCLASS	Evergreen Shrubland
PHYSIOGNIMIC GROUP	Temperate Broad - leaved Evergreen Shrubland
PHYSIOGNOMIC SUB GROUP	Natural
FORMATION	Temperate Broad - leaved Evergreen Shrubland
ALLIANCE	To be determined

CLASSIFICATION CONFIDENCE LEVEL 3

USFWS WETLAND SYSTEM Upland

RANGE
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global range is not available without additional inventory. *Ulex europaeus* is a common introduced species of the north coast of California and it is likely that other introduced stands with high cover can be considered as this association. The native range of *Ulex europaeus* is northwestern Europe, including the British Isles.

PRNS / GGNRA
This association is only known from the mainland side of Tomales Bay, at the mouth of the estuary near the town of Tomales.

ENVIRONMENTAL DESCRIPTION
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Stands of this association are found on gentle to moderate, east facing slopes. This association grows on the lower to upper third of the slope, on moderately coarse, sandy loams derived from Franciscan Melange. These stands a typically on land with a long grazing history. Prior to colonization by *Ulex* the land was dominated by non - native annual grassland.

MOST ABUNDANT SPECIES
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Shrub: *Ulex europaeus* (exotic)

CHARACTERISTIC SPECIES
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Shrub : *Ulex europaeus* (exotic)

VEGETATION DESCRIPTION

Globally

This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

This association is dominated by *Ulex europaeus* (exotic). The canopy is open to intermittent. A wide variety of exotic and native forbs and graminoids are usually present. These can include *Hypochaeris radicata* (exotic), *Calystegia purpurata, Plantago lanceolata* (exotic), *Chlorogalum pomeridianum, Anagallis arvensis* (exotic), *Carex* sp., *Rubus ursinus,* and / or *Holcus lanatus* (exotic).

OTHER NOTEWORTHY SPECIES None

CONSERVATION RANK Introduced exotic

RANK JUSTIFICATION

DATABASE CODE To be determined

COMMENTS

Globally

PRNS / GGNRA

This vegetation can be extremely invasive. Every effort should be made to remove it.

Plots used to define this association (n=2): PRNS059, PRNS061

Moist Coastal Grassland (in part)

MIXED COYOTEBRUSH ALLIANCE (in part)
Coyotebrush *(Baccharis pilularis)* Alliance (in part) - pi code 24050

This portion of the coyotebrush alliance is represented by three associations that have a high cover of native grasses and graminoids. These associations are restricted to moist coastal prairie settings and are more closely ecologically related to coastal terrace prairie grasslands.

Baccharis pilularis / Carex obnupta - Juncus patens Association
- pi code 24063

COMMON NAME	Coyotebrush / slough sedge - western rush shrubland
SYNONYM	None
PHYSIOGNOMIC CLASS	Shrubland
PHYSIOGNOMIC SUBCLASS	Evergreen Shrubland
PHYSIOGNOMIC GROUP	Microphyllous evergreen shrubland
PHYSIOGNOMIC SUB GROUP	Natural / Semi - Natural
FORMATION	Lowland microphyllous evergreen shrubland
ALLIANCE	*Baccharis pilularis* Shrubland Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland / Wetland Palustrine Emergent Wetland

RANGE

Globally

This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory. *Carex obnupta* is a common sedge and *Juncus patens* a common rush in many coastal areas of Northern California. These species are likely to form mixes with *Baccharis pilularis* in many relatively undisturbed freshwater wetland borders.

PRNS / GGNRA

Stands of *Baccharis pilularis / Carex obnupta - Juncus patens* shrubland association are found throughout the mapping areas of GGNRA and PRNS. They usually occur in low - lying swales and adjacent to seeps and ponds along the coastal strip below 200 ft. elevation.

ENVIRONMENTAL DESCRIPTION

Globally

This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Stands of *Baccharis pilularis / Carex obnupta - Juncus patens* shrubland association are found in bottomlands adjacent to creeks and swales or on the lower thirds of slopes up to 9 degrees. Soil texture is moderately fine silty clay loam. Parent material is marine sediments. The stands occur adjacent to several associations including *Nassella pulchra, Carex obnupta,* and non - native perennial grassland stands. *Baccharis pilularis* does tolerate some intermittent flooding and temporarily saturated soils, however, the *B. pilularis / Carex obnupta - Juncus patens* association represents the moistest environment known for the *B. pilularis* alliance.

MOST ABUNDANT SPECIES

Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Herbaceous: *Carex obnupta, Juncus patens, Holcus lanatus*
Shrub: *Baccharis pilularis*

CHARACTERISTIC SPECIES
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Herbaceous: *Carex obnupta, Juncus patens, Holcus lanatus, Mentha pulegium, Plantago lanceolata, Bromus carinatus, Cirsium vulgare, Conium maculatum, Elymus glaucus Erechtites minima*
Shrub: *Baccharis pilularis*

VEGETATION DESCRIPTION
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Stands of *Baccharis pilularis / Carex obnupta - Juncus patens* shrubland association form an open to intermittent herbaceous with 2 - 20% cover at 0.5 - 1 m tall and an open to intermittent shrub layer with 3 - 50% cover at 1 - 2 m tall. This association is dominated by *Baccharis pilularis, Carex obnupta* and *Juncus patens* and *Holcus lanatus* is also commonly found. *Bromus hordeaceus, Mentha pulegium, Plantago lanceolata, Bromus carinatus, Cirsium vulgare, Conium maculatum, Elymus glaucus* and *Erechtites minima* contribute to minor cover. Other species that may be found contributing to minor cover in this association is *Lolium multiflorum, Lolium perenne, Mentha pulegium, Mimulus guttatus, Pteridium aquilinum, Rubus ursinus, Iris douglasiana.*

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK G3S3?

RANK JUSTIFICATION Despite the uncertainty of the extent of this vegetation type, stands of coastal marsh dominated by sedges, rushes with an open to intermittent *Baccharis pilularis* shrub cover are expected to be relatively uncommon in Northern California.

DATABASE CODE

COMMENTS
Globally

PRNS / GGNRA

Plots used to describe this association (n=3): GGNRA390, PRNS012, PRNS039

Baccharis pilularis / Danthonia californica Association
- pi code 24061

COMMON NAME Coyote Brush / California Oatgrass Shrubland Association
SYNONYM None
PHYSIOGNOMIC CLASS Shrubland

PHYSIOGNOMIC SUBCLASS Evergreen Shrubland
PHYSIOGNOMIC GROUP Microphyllous evergreen shrubland
PHYSIOGNOMIC SUB GROUP Natural / Semi - Natural
FORMATION Lowland microphyllous evergreen shrubland

ALLIANCE *Baccharis pilularis* Shrubland Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory. It is likely that this association is transitional between "coastal terrace prairie" and " north coastal scrub" communities (*sensu* Holland 1986), and was thus at a time prior to invasive exotic grass colonization, relatively common. Stands with high cover of native grasses such as *Danthonia californica* are now restricted in northern and central coastal California. It is likely that some of the best remaining stands of this association occur within the mapping area of this project.

PRNS / GGNRA
Stands of the *Baccharis pilularis / Danthonia californica* shrubland association are restricted to the immediate coastal strip of the Point Reyes Peninsula and perhaps a few sites in Golden Gate National Recreation Area adjacent to Tomales Bay and in Marin Headlands.

ENVIRONMENTAL DESCRIPTION
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Stands of the *Baccharis pilularis / Danthonia californica* shrubland association are found at convex or linear, middle 1 / 3 of slopes to ridge tops of 8 - 45 degree slopes on all aspects. Soil textures range from coarse sandy loam to moderately fine clay loam of shale, siltstone, and sandstone. The stands may occur on the landward side of coastal dune systems such as at North Beach on Point Reyes Peninsula. Some stands have more windblown sand in the soil surface layer while others are found on fine - grained marine sediments. Moisture content is somewhat higher than surrounding upland annual grassland vegetation, but somewhat lower than adjacent *Deschampsia cespitosa* alliance stands or stands of the *Baccharis pilularis - Deschampsia cespitosa* association.

MOST ABUNDANT SPECIES
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Herbaceous: *Danthonia californica*
Shrub: *Baccharis pilularis*

CHARACTERISTIC SPECIES
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Herbaceous: *Danthonia californica*

Shrub: *Baccharis pilularis*

VEGETATION DESCRIPTION
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Stands of the *Baccharis pilularis / Danthonia californica* shrubland association have a continuous herbaceous cover of 65 - 95% cover at 0 - 25 cm tall and 4 - 25% cover at 25 - 50 cm tall. It is dominated by low subshrubs of *Baccharis pilularis* (30% average cover) and *Danthonia californica* (25% average cover), and usually includes *Pteridium aquilinum, Aira caryophyllea, Plantago lanceolata, Achillea millefolium, Holcus lanatus, Bromus carinatus maritimus, Carex sp., Cirsium quercetorum, Rumex acetosella*. Often found in this association is *Iris douglasiana, Eriogonum latifolium, Vulpia sp., Elymus glaucus, Bromus hordeaceus, Grindelia stricta, Hypochaeris radicata, Gnaphalium californicum,* and *Madia sp.* This association is frequently found adjacent to annual grasslands.

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK G2S2

RANK JUSTIFICATION A strong native grass component of *Danthonia californica* is rare in *Baccharis pilularis* stands as a result of replacement of native grasses by invasive exotic grass species.

DATABASE CODE

COMMENTS
Globally

PRNS / GGNRA
Grazing has affected some stands for years.

Plots used to define this association (n=5): PRNS045, PRNS002, PRNS003, PRNS008, PRNS013

Baccharis pilularis / Deschampsia cespitosa Association
- pi code 24068

COMMON NAME	Coyote Brush / Tufted Hairgrass Association
SYNONYM	None
PHYSIOGNOMIC CLASS	Shrubland
PHYSIOGNOMIC SUBCLASS	Evergreen Shrubland
PHYSIOGNOMIC GROUP	Microphyllous evergreen shrubland
PHYSIOGNOMIC SUB GROUP	Natural / Semi - Natural
FORMATION	Lowland microphyllous evergreen shrubland

ALLIANCE *Baccharis pilularis* Shrubland Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory. It was described from the Point Reyes Peninsula by

Elliott and Wehausen (1974). It is likely that prior to invasion of exotic grasses in the coastal terrace and dune systems of Northern California, this association was more common. Small remnant stands of similar vegetation occur at locations such as Salt Point State Park, Sonoma County, CA (California Natural Diversity Database 1993).

PRNS / GGNRA
Only a few stands of *Baccharis pilularis / Deschampsia cespitosa* shrubland association occur in the mapping area of PRNS. The stands are limited to the central portion of the Point Reyes Peninsula near North Beach. Data is also available for this association from Elliot & Wehausen (1974).

ENVIRONMENTAL DESCRIPTION
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Stands of *Baccharis pilularis / Deschampsia cespitosa* shrubland association are found on linear dune tops of 5 - degree slopes facing north - northwest. The soil textures are moderately coarse sandy loam from stabilized sand dunes. The north - facing sides of fog - shrouded dunes of North Beach provide a surprisingly mesic environment, allowing the mesophytic association to develop. Litter and humus content on the soil surface is relatively high for most dune vegetation.

MOST ABUNDANT SPECIES
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Herbaceous: *Deschampsia cespitosa, Aira caryophyllea, Danthonia californica, Holcus lanatus, Iris douglasiana*
Shrub: *Baccharis pilularis*

CHARACTERISTIC SPECIES
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Herbaceous: Deschampsia cespitosa
Shrub: Baccharis pilularis

VEGETATION DESCRIPTION
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
There is limited data for this association since only one plot was recorded in this study. However this association forms an intermittent (Sawyer and Keeler - Wolf 1995) to continuous herb layer with 45% cover at 0 - 25 cm tall and 40% cover at 25 - 50 cm tall. It is dominated by *Baccharis pilularis* and *Deschampsia cespitosa* and may include *Aira caryophyllea, Danthonia californica, Holcus lanatus, Iris douglasiana, Vulpia sp., Hypochaeris radicata, Rubus ursinus, Rumex acetosella* and *Bromus carinatus. Bromus hordeaceus, Erigeron glaucus, Gnaphalium purpureum, Lupinus arboreus, Plantago lanceolata,* and *Stachys ajugoides* may contribute minor amounts of cover. This association may be adjacent to *Ammophila arenaria*, and *Juncus* stands, *Baccharis - Lupinus* Dunes and Cultivated Pastures. Stands of *Baccharis pilularis / Deschampsia cespitosa* shrubland

association are found at linear ridge tops of 5 - degree slopes facing north - northwest. The Soil textures range from moderately coarse sandy loam from sand dunes.

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK G2S1

RANK JUSTIFICATION This association may occur in Oregon, but is very rare in California.

DATABASE CODE

COMMENTS
Globally

PRNS / GGNRA

Plots used to define this association in addition to Elliott and Wehausen (1974), (n=1): PRNS048

HERBACEOUS VEGETATION DESCRIPTIONS

GRASSLAND - HERBACEOUS

Moist Coastal Grassland (in part)

PACIFIC REEDGRASS ALLIANCE

Pacific Reedgrass *(Calamagrostis nutkaensis)* Alliance - pi code 45020

This alliance is represented by two associations in the study area. The *Calamagrostis nutkaensis - Baccharis pilularis* Association is an upland association found on moist wind - swept coastal bluffs and hills and the *Calamagrostis nutkaensis - Carex - Juncus* Association occurs on more moist - to - wet bottomlands and lower slopes. The alliance ranges from Washington and British Columbia to San Francisco.

Calamagrostis nutkaensis - Baccharis pilularis Association
- pi code 46021

COMMON NAME	Pacific Reedgrass / Coyote Brush Herbaceous Vegetation
SYNONYM	None
PHYSIOGNOMIC CLASS	Herbaceous vegetation
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation
PHYSIOGNIMIC GROUP	Temperate or subpolar grassland
PHYSIOGNOMIC SUB GROUP	Natural
FORMATION	Tall sod temperate grassland
ALLIANCE	*Calamagrostis nutkaensis* Herbaceous Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE

Globally

Stands of the *Calamagrostis nutkaensis* Herbaceous Alliance occur along the California, Oregon and Washington coasts. The *Calamagrostis nutkaensis / Baccharis pilularis* association is known only from the Point Reyes Peninsula, although it is likely to occur in other areas where the range of the two species overlap from San Mateo County California to central coastal Oregon.

PRNS / GGNRA

This association is only known from the vicinity of the Point Reyes National Seashore. Stands are found inland of the coastal zone in scattered locations from Tomales Point southwards to Drake's Estero

ENVIRONMENTAL DESCRIPTION

Globally

This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

This association occurs on gentle to moderate slopes (9 - 28 degrees). It is found from mid - slope to ridge positions with northern to eastern exposures. Stands are located within 5 kilometers of the Pacific Ocean. . Stands are frequently small, less than 2 acres in size and occur on mesic northward slopes from the top to middle third of slopes. These slopes are frequently fog - shrouded in the summer months and exposed to strong winds.

MOST ABUNDANT SPECIES
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Shrub *Baccharis pilularis*
Graminoid *Calamagrostis nutkaensis*
Herbaceous *Holcus lanatus (exotic), Pteridium aquilinum*

CHARACTERISTIC SPECIES
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Short Shrub *Baccharis pilularis*
Graminoid *Calamagrostis nutkaensis*

VEGETATION DESCRIPTION
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
This type includes stands dominated by *Calamagrostis nutkaensis* with cover between 30 - 70%. *Baccharis pilularis* is also present with cover values from 7 - 15%. The canopy is fullest between 50 - 100 cm, with emergent flowering stems of *Calamagrostis* to 2 meters. *Baccharis pilularis* is typically stunted and less than 1 m tall. Thus the grass layer is as tall or taller than the sparse shrubs. Common associates include *Pteridium aquilinum, Holcus lanatus* (exotic), *Plantago lanceolata* (exotic), *Rubus ursinus,* and *Iris douglasiana.*

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK G2 S1.2

RANK JUSTIFICATION This association is only known from the vicinity of the Point Reyes National Seashore. Its distribution has been reduced by grazing, land conversion and invasion by exotic species. Some search state - wide has been undertaken for *Calamagrostis nutkaensis* communities including stands from Mt San Bruno to Del Norte County. So far the most stable and most extensive examples have been found at Point Reyes National Seashore. (California Natural Diversity Database 1993 north coastal inventory in published staff report July 1993, administrative report on file at CNDDB Sacramento CA)

DATABASE CODE To be determined

COMMENTS
Globally

PRNS / GGNRA
Because *Calamagrostis nutkaensis* is taller and has higher cover values than *Baccharis pilularis,* this association is defined as an herbaceous type.

Plots used to define this association (n=4): PRNS097, PRNS026, PRNS056, PRNS071

Calamagrostis nutkaensis - Carex spp. - Juncus spp. Association

- pi code 46022

COMMON NAME	Nootka Reedgrass - Sedge - Rush Herbaceous Wetland
SYNONYM	None
PHYSIOGNOMIC CLASS	Herbaceous vegetation
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation
PHYSIOGNIMIC GROUP	Temperate or subpolar grassland
PHYSIOGNOMIC SUB GROUP	Natural / Semi - natural
FORMATION	Seasonally flooded temperate or subpolar grassland
ALLIANCE	*Calamagrostis nutkaensis* Herbaceous Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Palustrine

RANGE

Globally

This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global range is not available without additional inventory.

PRNS / GGNRA

Stands of this association are scattered throughout the Point Reyes peninsula.

ENVIRONMENTAL DESCRIPTION

Globally

This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory. Vegetation fitting the general description of this association has been identified in Sonoma County near Bodega Head, Salt Point and Sea Ranch (CNDDB administrative report north coast vegetation field survey July 1993.)

PRNS / GGNRA

This vegetation grows in seasonally saturated soils on gentle slopes of all aspects. Stands prefer seeps, basins, swales, and plains, which collect water during the rainy season. Soils are moderately coarse to fine sandy loams. Stands are generally small, under 2 ha. Moisture relations are intermediate between permanently saturated herbaceous associations such as *Scirpus microcarpus* association and intermittently flooded types such as *Deschampsia cespitosa* alliance stands.

MOST ABUNDANT SPECIES

Globally

This association is only positively known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Graminoid : *Calamagrostis nutkaensis, Carex* sp., *Juncus effusus* var. *brunneus, Juncus patens,*

CHARACTERISTIC SPECIES

Globally

This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Graminoid : *Calamagrostis nutkaensis, Carex sp., Juncus sp.*

VEGETATION DESCRIPTION

Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Stands of this vegetation are normally dominated by *Calamagrostis nutkaensis,* which can contribute up to 70% cover in the canopy. *Carex* and *Juncus* species also contribute significant cover. These may include *Juncus effusus* var. *brunneus, Juncus patens, Carex obnupta, Carex densa,* and / or *Carex hartfordii.* Common associates may include *Scrophularia californica, Rubus spectabilis, Rubus ursinus, Erechtites minima* (exotic), *Holcus lanatus* (exotic), and / or *Iris douglasiana.* The canopy is between 1 - 2 meters in height.

OTHER NOTEWORTHY SPECIES None

CONSERVATION RANK G2 S2.1

RANK JUSTIFICATION Stands are of limited extend due to type conversion and development and are limited to within a few km of the coast

DATABASE CODE To be determined

COMMENTS
Globally

PRNS / GGNRA
Exotics and grazing are impacts on stands of this association.

Plots used to define this association (n=4): PRNS017, GGNRA310, PRNS049, PRNS122

SLOUGH SEDGE ALLIANCE

Slough Sedge *(Carex obnupta)* Alliance - pi code 52060

This alliance is represented by a single association in the study area. It ranges from Washington to Central California along the coastal strip.

Carex obnupta - Juncus patens Association
- pi code 52061

COMMON NAME	Slough Sedge - Spreading Rush Herbaceous Wetland
SYNONYM	None
PHYSIOGNOMIC CLASS	Herbaceous vegetation
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation
PHYSIOGNIMIC GROUP	Temperate or subpolar grassland
PHYSIOGNOMIC SUB GROUP	Natural / Semi - natural
FORMATION	Seasonally flooded temperate or subpolar grassland

ALLIANCE To be determined (Preliminarily, *Carex obnupta* alliance)

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Palustrine

RANGE
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global range is not available without additional inventory. Other stands of *Carex obnupta* have been identified

from Humboldt County, California (Pickart and Sawyer, 1998) and attributed to the *Carex* spp. series (Sawyer and Keeler - Wolf 1995)

PRNS / GGNRA
Stands of this association are scattered throughout the Point Reyes peninsula and Marin Headlands of GOGA.

ENVIRONMENTAL DESCRIPTION
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory. Vegetation fitting the general description of this association has been identified in backdune wetlands in Humboldt County (Pickart and Sawyer 1998)

PRNS / GGNRA
This vegetation grows in seasonally saturated soils on gentle slopes of all aspects. Stands prefer basins, bottoms and plains, which collect water during the rainy season and usually hold water through or have saturated soils most of the growing season. Soils are moderately coarse to fine sandy loams. Stands are generally small, under 2 ha. Moisture relations are close to permanently saturated herbaceous associations such as *Scirpus microcarpus* association.

MOST ABUNDANT SPECIES
Globally
This association is only positively known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory. *Carex obnupta* often dominates stands of seasonally flooded wetlands along the outer coastal strip of Northern California. However, its association with *Juncus patens* is only known from the PRNS / GGNRA mapping area.

PRNS / GGNRA
Graminoid: *Carex obnupta, Juncus patens*

CHARACTERISTIC SPECIES
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Graminoid: *Carex obnupta, Juncus patens*

VEGETATION DESCRIPTION
Globally
This association is only known from the vicinity of the Point Reyes National Seashore and Golden Gate National Recreation Area. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Stands of this vegetation are normally dominated by *Carex obnupta*, which can contribute up to 90% cover (range 15 - 90% n=4) in the canopy. *Juncus patens* is present in all stands and may also contributes significant cover. Other species that may cover greater than 4% may include *Juncus effusus* var. *brunneus, Juncus phaeocephalus, Juncus balticus, Carex densa*, and / or *Carex harfordii.* Common associates may include *Scrophularia californica, Rubus spectabilis, Rubus ursinus, Erechtites minima* (exotic), *Holcus lanatus* (exotic), *Lotus corniculatus* (exotic) and / or *Iris douglasiana.* The canopy is between 1 - 2 meters in height. Baccharis pilularis may cover up to 10% of the stands. Stands with > 10% *Baccharis* are classified as the *Baccharis pilularis / Carex obnupta - Juncus patens* association.

OTHER NOTEWORTHY SPECIES None

CONSERVATION RANK G3 S3?

RANK JUSTIFICATION Stands are of limited extend, are restricted to within a few km of the coast, but are expected to range more widely than just the study area, along the outer coast of Northern California.

DATABASE CODE To be determined

COMMENTS
Globally

PRNS / GGNRA
Exotics and grazing are impacts on stands of this association.

Plotus used to define this association (n=4): PRNS196, GGNRA268, GGNRA269, GGNRA305

TUFTED HAIRGRASS ALLIANCE

Tufted Hairgrass *(Deschampsia cespitosa)* Alliance - pi code 52040

This alliance is represented locally by two associations. The *Deschampsia cespitosa - Danthonia californica* association is found on moist terraces and gentle slopes while the *Deschampsia cespitosa - Horkelia marinensis* Grassland Association occurs on sandy soils adjacent to stabilized dunes. This is a very wide - ranging alliance occurring in mountains and cool coastal strips throughout much of North America.

Deschampsia cespitosa - Danthonia californica Association
– pi code 52040

COMMON NAME	Tufted Hairgrass - California Oatgrass Grassland Association
SYNONYM	None
PHYSIOGNOMIC CLASS	Herbaceous Vegetation
PHYSIOGNOMIC SUBCLASS	Perennial Graminoid Vegetation
PHYSIOGNOMIC GROUP	Temperate of Subpolar Grassland
PHYSIOGNOMIC SUB GROUP	Natural / Semi - Natural
FORMATION	l Sod Temperate Grassland
ALLIANCE	Deschampsia cespitosa Grassland Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory. It was likely to be more widespread along the coast from Santa Cruz Co north to Washington, prior to the introduction if invasive exotic annual and perennial grasses. Small stands resembling this association have been inventoried at Salt Point State Park in Sonoma County (California Natural Diversity Database 1993). The National Vegetation Classification (November 1999) lists this type from CA and Oregon.

PRNS / GGNRA
Stands of *Deschampsia cespitosa - Danthonia californica* Grassland Association are restricted to the outer Point Reyes Peninsula the mapping area.

ENVIRONMENTAL DESCRIPTION

Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory. Other similar stands at Salt Point State Park occur adjacent to the coastal bluffs as a rim of native grassland adjacent to non - native annual and perennial grassland.

PRNS / GGNRA
This vegetation is found on flat to moderately sloping terrain (0 to 17 - degrees). Soil textures range from medium sand to loamy sand, to moderately fine sandy loam. Substrate may be stabilized dunes, granitic, or siltstone. Stands occur adjacent to the dune fields of the North Beach area of the Point Reyes Peninsula and on slopes on Tomales Point. The stands frequently occur adjacent to *Lupinus arboreus, Baccharis - Lupinus* dune scrub, *Ammophila arenaria* stands, and various non - native grassland stands. They are generally moister and more poorly - drained soils than adjacent sand sheets with *Baccharis pilularis - Deschampsia cespitosa* association and occupy lower slope positions and more mesic to moist sites than the *Danthonia californica - Aira caryophyllea,* association. Compared to the *Deschampsia cespitosa - Horkelia marinensis* association it is less likely to associate with stabilized coastal dunes.

MOST ABUNDANT SPECIES
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Herbaceous: *Deschampsia cespitosa, Danthonia californica,*
Shrub or subshrub: *Baccharis pilularis*

CHARACTERISTIC SPECIES
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Herbaceous: *Deschampsia cespitosa, Danthonia californica,*

VEGETATION DESCRIPTION
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory. Similar stands occur in the coastal strip of the Sonoma County.

PRNS / GGNRA
Stands of *Deschampsia cespitosa - Danthonia californica* grassland association form a continuous herb layer of 60%5 - 60% cover 0 - 25 cm and 25 - 95% at 25 - 50 cm tall. There is usually less than 20% cover between 0.5 and 1 m tall. This association is dominated by *Deschampsia cespitosa* and *Danthonia californica Aira caryophyllea. Plantago lanceolata, Lolium perrene, Rumex acetosella* and *Nassella pulchra* may also be present.

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK G2 S2

RANK JUSTIFICATION Stands are few and small in California, may have been decimated and destroyed by type conversion to invasive exotic grassland.

DATABASE CODE

COMMENTS

Globally

PRNS / GGNRA
The *Deschampsia cespitosa* alliance is represented by montane and coastal associations in California. The coastal associations are more threatened and rare due to the impacts of invasive alien grasses, inappropriate grazing regimes, and impacts associated with development.

Plots used to define this association (n=4): PRNS028, PRNS077, PRNS052, PRNS031

Deschampsia cespitosa - Horkelia marinensis Association
- pi code 52040

COMMON NAME	Tufted Hairgrass - Marine Horkelia grassland association
SYNONYM	None
PHYSIOGNOMIC CLASS	Herbaceous Vegetation
PHYSIOGNOMIC SUBCLASS	Perennial Graminoid Vegetation
PHYSIOGNOMIC GROUP	Temperate of Subpolar Grassland
PHYSIOGNOMIC SUB GROUP	Natural / Semi - Natural
FORMATION	Tall Sod Temperate Grassland
ALLIANCE	Deschampsia cespitosa Grassland Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory. It was likely to be more widespread along the coast from Santa Cruz Co. north to Washington, prior to the introduction if invasive exotic annual and perennial grasses. Small stands resembling this association have been inventoried at Salt Point State Park in Sonoma County (California Natural Diversity Database 1993).

PRNS / GGNRA
Stands of *Deschampsia cespitosa - Danthonia californica* Grassland Association are restricted to the outer Point Reyes Peninsula the mapping area.

ENVIRONMENTAL DESCRIPTION
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory. Other similar stands at Salt Point State Park occur adjacent to the coastal bluffs as a rim of native grassland adjacent to non - native annual and perennial grassland.

PRNS / GGNRA
This vegetation is found on north - easterly facing slopes of 3 to 9 - degrees. Soil textures range from medium sand to coarse loamy sand. Substrate may be stabilized dunes or siltstone, beneath a sandy surface. Stands occur adjacent to and among the sand fields of the Point Reyes Peninsula. The stands frequently occur adjacent to *Lupinus arboreus, Baccharis - Lupinus* dune scrub, *Ammophila arenaria* stands, and various non - native grass stands. They are generally moister and more poorly - drained soils than adjacent sand sheets with *Baccharis pilularis - Deschampsia cespitosa* association and occupy lower slope positions and more mesic to moist sites than the *Danthonia californica - Aira caryophyllea,* association. Compared to the *Deschampsia cespitosa - Danthonia californica* association it is more likely to associate with stabilized coastal dunes or sand fields.

MOST ABUNDANT SPECIES

Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Herbaceous: *Deschampsia cespitosa, Danthonia californica,*

CHARACTERISTIC SPECIES
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Herbaceous: *Deschampsia cespitosa, Danthonia californica,*

VEGETATION DESCRIPTION
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Stands of *Deschampsia cespitosa - Horkelia marinensis* grassland association form an intermittent to continuous herb layer of up to 25% mosses and lichens, 40 - 50% cover 0 - 25 cm and 7 - 15% at 25 - 50 cm tall. This association is dominated by *Deschampsia cespitosa, Horkelia marinensis* is usually from 1% to 18% cover. Other species are characteristic of coastal dunes and include: *Cardioniema ramosissimum, Armeria maritimum, Gnaphalium purpureum, Vulpia bromoides* (exotic), *Carpobrotus edulus* (exotic), and *Holcus lanatus* (exotic).

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK G3 S1?

RANK JUSTIFICATION Stands are few and small in California, may have been decimated and destroyed by type conversion to *Ammophila arenaria* and *Carpobrotus edulus* exotic alliances.

DATABASE CODE

COMMENTS
Globally

PRNS / GGNRA
The *Deschampsia cespitosa* alliance is represented by montane and coastal associations in California. The coastal associations are more threatened and rare due to the impacts of invasive alien grasses, inappropriate grazing regimes, and impacts associated with development.

Plots used to define this association (n=2): PRNS032, PRNS029

RED FESCUE ALLIANCE
Red Fescue (*Festuca rubra)* Grassland Alliance - pi code 52050
This alliance is uncommon in the study area. Insufficient plot data exists to define associations. The following account will serve to describe the alliance locally.

COMMON NAME	Red fescue coastal prairie
SYNONYM	Coastal Prairies (Holland)
PHYSIOGNOMIC CLASS	Herbaceous

PHYSIOGNOMIC SUBCLASS	Perennial graminoid
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland
PHYSIOGNOMIC SUB GROUP	Natural / semi - natural
FORMATION	Medium - tall sod temperate or subpolar grassland

ALLIANCE *Festuca rubra* Herbaceous Alliance

CLASSIFICATION CONFIDENCE LEVEL

USFWS WETLAND SYSTEM Upland; Wetland: palustrine emergent

RANGE

Globally

Festuca rubra dominated stands are rare and scattered on coastal headlands on the Northern California Coast and in the Northern California Coast Ranges and in Oregon and Washington.

PRNS / GGNRA

A single plot in the study area identified at Point Reyes National Seashore, just north of Kehoe Ranch. However, other stands have been observed in the area.

ENVIRONMENTAL DESCRIPTION

Globally

Wetlands habitats are seasonally or permanently saturated with shallow water table. Water chemistry: fresh. Upland habitats occur at all topographic locations, from sea - level to 3500 meters. Soil texture clay, loam, sand. Stands may also occur on moist coastal terraces that are not wetlands.

PRNS / GGNRA

Upland location; southwest - facing; gently - sloping; soils medium to fine sandy loam; area currently being grazed. Other stands observed appear to be on deep fine - grained coastal terrace soils.

MOST ABUNDANT SPECIES

Globally

Herb: *Festuca rubra*
Shrub: *Baccharis pilularis, Artemisia calif*ornica

PRNS / GGNRA

Herb: *Festuca rubra, Iris douglasiana, Bromus hordeaceous, Plantago lanceolata, Lolium perenne, Hypochaeris radicata*

CHARACTERISTIC SPECIES

Globally

Festuca rubra

PRNS / GGNRA

Festuca rubra

VEGETATION DESCRIPTION

Globally

Festuca rubra dominant or most conspicuous native grass in the ground layer; *Achillea millefolium, Artemisia suksdorfii Avena barbata, Bromus carinatus, Camassia leichtlinii, Erigeron glaucus, Elymus glaucus, Eriophyllum lanatum, Festuca idahoensis, Danthonia californica, Calamagrostis nutkaensis, Koeleria macrantha, Nassella pulchra, Solidago Canadensis,* and *Viola adunca* may be present . Emergent trees and shrubs such as *Baccharis pilularis,* and *Lupinus arboreus*; The coniferous trees *Pseudotsuga menziesii, Pinus contorta,* and *Picea sitchensis*, may be present. Grass canopy < 1 m; intermittent to closed.

PRNS / GGNRA

Festuca rubra dominant in the ground layer with few emergent *Baccharis pilularis*; *Iris douglasiana, Bromus hordeaceous, Plantage lanceolata, Lolium perenne, Hypochaeris radicata* also present; Grass canopy < 1 m, continuous.

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK G3 S1.1

RANK JUSTIFICATION *Festuca rubra* is probably the rarest of the coastal terrace prairie alliances. This has much to do with the loss of original stands due to agriculture, introduction of exotics, and development.

DATABASE CODE

COMMENTS

Globally

Grasslands in northwest California are given the collective name of coastal prairie (Heady et al. 1977b). The coastal prairie occurs in two phases: the grasslands on coastal terraces are called terrace grasslands, and the inland grasslands found commonly on ridges and hilltops are called balds or prairies. Throughout the coastal northern California these prairies mix with *Pseudotsuga menziesii - Lithocarpus densiflorus* and *Sequoia sempervirens* forest and *Quercus garryana* woodlands on a coarse scale. *Festuca rubra*, dominated stands are rare and scattered on coastal headlands in northern California, Oregon and Washington. It often occurs as small patches in a mosaic of grassland, shrubland and forest communities. Festuca rubra is probably the rarest of the coastal terrace prairie alliances. This has much to do with the loss of original stands due to agriculture, introduction of exotics, and development.). The soils are derived from colluvium or sand, and are usually shallow, well - drained, and have a significant component of gravels. Persistent strong winds, salt - spray, and the shallow soils are important factors in the maintenance of these grasslands.

The few stands of *Festuca rubra* in CA appears to occur within the summer fog belt close to the coast in windswept locations. Today many former *Festuca rubra* grasslands are either dominated by perennial grasses such as Anthoxanthum odoratum, Arrhenatherum elatius, Danthonia pilosa, and *Holcus lanatus* or by annual grasses such as *Bromus hordeaceus* and *Cynosures cristatus, Lolium multiflorum,* and *Teaniatherum caput - medusae*.

Fires were probably important in the past in limiting invasion of these grasslands by coniferous tree species. Fire suppression over the past 80 years may have resulted in successional changes from grasslands to shrublands and forests.

PRNS / GGNRA

Point Tom and the Tomales Point stands in Marin Co. have non - native grass composition dominated by Holcus, but also include *Calamagrostis nutkaensis, Danthonia californica, Deschampsia cespitosa, Nassella pulchra, Iris douglasii,* and *Gentiana affinis* var. *ovata.* The most important known location for F. rubra stands in CA occurs at Point Reyes, where 16 stands have been inventoried with absolute cover of > / =15% *F. rubra* (Point Reyes Accuracy assessment database 2001). Some of these stands are formally members of other alliance stands, such as *Baccharis pilularis,* or *Nassella pulchra.*

Plots used to define this alliance locally (n=1): PRNS044

INTRODUCED COASTAL GRASSLAND MAPPING UNIT

Introduced Coastal Grassland Mapping Unit - pi code 47030

This alliance is characterized by several perennial non - native grasses. It has replaced native grass stands and native coastal scrubs as a result of clearing, planting of pasture grasses, and grazing disturbance throughout much of northern Coastal California and adjacent Oregon and Washington. Insufficient plot data exists to define associations.

Holcus lanatus - Anthoxanthum odoratum Association

- pi code 47030

COMMON NAME	Introduced coastal perennial grassland
SYNONYM	Coastal prairie (Holland, Munz)
PHYSIOGNOMIC CLASS	Herbaceous
PHYSIOGNOMIC SUBCLASS	Perennial graminoid
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland
PHYSIOGNOMIC SUB GROUP	Natural / semi - natural
FORMATION	Short sod temperate or subpolar grassland
ALLIANCE	Introduced Coastal Perennial Grassland Alliance

CLASSIFICATION CONFIDENCE LEVEL

USFWS WETLAND SYSTEM Upland; wetland: palustrine emergent

RANGE
Globally
In California on the Northern California Coast and in the Northern California Coast Ranges.

PRNS / GGNRA

ENVIRONMENTAL DESCRIPTION
Globally
Wetland habitats seasonally or permanently saturated with shallow water table. Water chemistry: fresh. On uplands at all topographic locations. Elevations from sea - level to 3500 meters. Soil texture clay, loam, sand.

PRNS / GGNRA
The sampled stands are on upland habitats on sand to sandy loam soils. .Some un - sampled stands dominated by *Holcus lanatus* appear to be close ecologically to some *Calamagrostis nutkaensis* and *Juncus patens* or *Carex obnupta* stands.

MOST ABUNDANT SPECIES
Globally
Holcus lanatus, Anthoxanthum odoratum, Arrhenatherum elatius, Danthonia pilosa

PRNS / GGNRA
Holcus lanatus

CHARACTERISTIC SPECIES
Globally
Holcus lanatus, Anthoxanthum odoratum, Arrhenatherum elatius, Danthonia pilosa, and other non - native perennial grasses.

PRNS / GGNRA
Ammophila arenaria, Festuca arundina,, Holcus lanatus, Lolium perenne, Phalaris aquatica.

VEGETATION DESCRIPTION
Globally
Introduced perennial grasses are dominant in the ground layer; *Agrostis stolonifera, Anthoxanthum odoratum, Arrhenatherum elatius Bromus carinatum, Carex tumulicola, Dactylis glomerata, Danthonia californica, Deschampsia cespitosa, Elymus glaucus, Festuca idahoensis, F. rubra, Holcus lanatus, Phalaris aquatalis, Poa secunda, P. pratensis,* and / or *Pteridium aquilinum* may be present. Emergent shrubs and trees may be present. Grass canopy < 1 m; intermittent to closed.

PRNS / GGNRA

Introduced perennial grasses are dominant in the ground layer. *Ammophila arenaria, Festuca arundinacea, Holcus lanatus, Lolium perenne, Phalaris aquatica* may be present. Emergent shrubs may be present. Grass canopy < 1m. intermittent to continuous.

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK Exotic

RANK JUSTIFICATION Exotic and invasive, persisting and overtaking native grassland stands along the coast of Northern California.

DATABASE CODE

COMMENTS

Globally

Grasslands in northwest California are given the collective name of coastal prairie (Heady et al. 1977b). Many of the original native grasslands have been replaced by grasslands dominated by non - native perennial grasses from Eurasia. The coastal prairie occurs in two phases: the grasslands on coastal terraces are called terrace grasslands, and the inland grasslands found commonly on ridges and hilltops are called balds or prairies. Throughout the coastal northern California these prairies mix with *Pseudotsuga menziesii - Lithocarpus densiflorus* and *Sequoia sempervirens* forest and *Quercus garryana* woodlands on a coarse scale.

The original grasslands are considered to have been dominated by *Danthonia californica, Festuca idahoensis*, or *F. rubra* (Brett - Davy 1902). Today many grasslands are either dominated by perennial grasses such as *Anthoxanthum odoratum, Arrhenatherum elatius, Danthonia pilosa,* and *Holcus lanatus* or by annual grasses such as *Bromus hordeaceus* and *Cynosurus cristatus, Lolium multiflorum*, and *Teaniatherum caput - medusae*. Once established, these non - native grasses are usually effectively excluders of most native grass species.

Plot - based descriptions: Grenier (1989) and Saenz & Sawyer (1986) defined an association in Redwood National Park, Humboldt Co.; Jimerson (1993) four associations in Six Rivers National Forest; Heady et al. (1977b) and Foin & Hektner (1977) two associations, Brown (1993) established monitoring sites that were dominated by *Holcus lanatus* at Sonoma Coast State Beaches, and NDDB has plot data on file for *Holcus lanatus* - dominated stands in Sonoma Co.

PRNS / GGNRA

Insufficient plot data exist to define associations locally. With further data it may become reasonable to defined separate alliances as well as associations using dominant or characteristic species such as *Holcus lanatus, Festuca arundinacea*, etc. These exotic grasses are persisting in areas where grazing pressure is relatively high, but also persist in areas where grazing pressure is lower than previous decades.

Plots used to define this alliance locally (n=5): GGNRA308, PRNS051, PRNS016, GGNRA307, PRNS042

Drier Coastal Grassland / Open Scrub (in part)

CALIFORNIA ANNUAL GRASSLAND MAPPING UNIT
California Annual Grassland Weedy Alliance - pi code 67010

This widespread alliance characterized by non - native annual grasses and forbs, is represented by two associations locally. In addition there are several individual plots suggesting further differentiation. These include: *Hordeum murinum - Lolium perenne* plot: (PRNS089), *Bromus diandrus - Phacelia distans - Carpobrotus sandy* plot (PRNS084), and *Bromus diandrus - Lolium multiflorum* plot (PRNS152). It is likely that with further sampling additional associations can be distinguished locally. The range of this alliance includes most of Cismontane California. Because of the large variation of species in this alliance locally we have chosen to include a general description of the alliance below, followed by descriptions of the two associations defined locally.

COMMON NAME	California Annual Grassland
SYNONYM	Non - native grassland, Wildflower Field (Holland); Cismontaine Introduced Grasses (Cheatham & Haller) Bromegrass Series, Wild Oats Series (PSW - 45); Great Valley and Coast Range Grassland (Thorne); Annual Grass (WHR)
PHYSIOGNOMIC CLASS	Herbaceous
PHYSIOGNOMIC SUBCLASS	Annual Graminoid or Forb
PHYSIOGNOMIC GROUP	Temperate or Subpolar Annual Grassland or Forb
PHYSIOGNOMIC SUB GROUP	Natural / Semi - natural
FORMATION	Short Temperate Annual Grassland
ALLIANCE	*Bromus diandrus - B. Hordeaceus - Hordeum* sp. Alliance (California Annual Grassland Alliance)

CLASSIFICATION CONFIDENCE LEVEL

USFWS WETLAND SYSTEM Upland

RANGE

Globally

This association occurs along the Central, Southern, and Northern California Coast, Central Valley, Klamath Mountains, Northern California Coastal Ranges, Northern California Interior Coastal Ranges, Sierra Nevada Foothills, Central California Coast Ranges, Southern California Mountains and Valleys, Mojave Desert, and Baja California.

PRNS / GGNRA

Five plots at just the alliance level were taken in the Pt. Reyes National Seashore and Golden Gate National Recreation Area study site, in the Pierce Point and Willow Camp Trail areas.

ENVIRONMENTAL DESCRIPTION

Globally

California annual grasslands occur on all topographic locations. They may occur on shallow rocky soils that once supported native scrub and chaparral or may occur on deep, fine - textured soils that originally supported native grasslands or steppes. The latter conditions are often indicated by a low percentage of native annual and perennial grassland species.

PRNS / GGNRA

Plots in the study area were located on slopes and ridge tops at sea - level to 400ft elevation; soils sandy loam to sand.

MOST ABUNDANT SPECIES

Globally

Avena spp., Brassica spp., Bromus spp., Castilleja spp., Cynosurus echinatus, Erodium spp., Eschscholzia californica, Lasthenia spp., Lupinus spp., Triphysaria eriantha

PRNS / GGNRA

Lolium multiflorum, Bromus diandrus, Carduus pycnocephala, Brassica nigra, Vulpia bromoides, Avena spp., *Rumex acetosella, Geranium dissectum, Bromus hordeaceus, Pteridium aquilinum, Carpobrotus edulis, Phacelia distans, Amsinckia spectabilis, Lupinus arboreus, Lolium perenne.*

CHARACTERISTIC SPECIES

Globally

Avena spp., *Bromus* spp., *Lolium* spp., and other annual grasses.

PRNS / GGNRA

Lolium multiflorum, Bromus diandrus, Carduus pycnocephala, Vulpia spp.

VEGETATION DESCRIPTION

Globally

Annual grasses and herbs dominant in ground layer; *Avena* spp., *Brassica* spp., *Bromus* spp., *Castilleja* spp., *Cynosurus echinatus*, *Erodium* spp., *Eschscholzia californica*, *Lasthenia* spp., *Lupinus* spp., *Triphysaria eriantha* may be present. Emergent shrubs and trees may be present. Grass < 1 m; continuous or open.

PRNS / GGNRA

Annual grasses and herbs dominate the ground layer; *Lolium multiflorum, L. perenne, Bromus diandrus, B. hordeaceus, Avena spp., Vulpia bromoides, Carduus pycnocephala, Brassica nigra, Rumex acetosella, Germanium dissectum, Pteridium aquilinum, Phacelia distans, Amsinckia spectabilis, Lupinus arboreus* may be present. Grass / herb canopy <1m, continuous.

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK Exotic

RANK JUSTIFICATION Exotic

DATABASE CODE

COMMENTS

Globally

This extensive grassland is composed of many alien and native annual species; composition varies among stands. Fall temperatures and precipitation are major factors determining grassland composition, along with light intensity affected by shading from plants and litter, and differences in micro - topography (Evans & Young 1989). The fine scale variation in temporal and spatial structure found in the California annual grassland suggests that recognition of many alliances is not useful (Bartolome 1989).

Plot - based descriptions: Saenz & Sawyer (1986) report on sites grazed for the full 1982 season. They were dominated by dogtail, in what now is Redwood National Park in Humboldt Co., Foin & Hektner (1986) define a Stable meadow in Sonoma Co.; Schlising & Sanders (1982) two associations associated with vernal pools in Butte Co.; Parsons & Stohlgren (1989) one Slender oat association at Sequoia National Park in Tulare Co.; Kopecko & Lathrop (1975) two types associated with vernal pools at Santa Rosa Plateau in Riverside Co.

PRNS / GGNRA

Insufficient plot data exist for development of more than two association level descriptions locally. There is some evidence that certain species considered within the California annual grassland may be used as indicators

of individual alliances (e.g., *Avena barbata, Bromus diandrus*). However, further plot data from around California is needed before subdivision of this complex is attempted. There is also evidence that native annual herbs such as *Trifolium* spp, *Lotus* spp., *Lasthenia* spp., and *Lupinus* spp. may also form their own alliances. With further sampling and subsequent analysis locally it is likely that the taxonomy will change radically for this generic alliance.

Plots used to describe this association (n=0): no plots sampled

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Brachypodium distachyon Association
- pi code 67010

COMMON NAME	None
SYNONYM	None
PHYSIOGNOMIC CLASS	Herbaceous Vegetation
PHYSIOGNOMIC SUBCLASS	Annual graminoid or forb vegetation
PHYSIOGNOMIC GROUP	Temperate or subpolar annual grasslands or forb vegetation
PHYSIOGNOMIC SUB GROUP	Non - native
FORMATION	Short temperate annual grassland
ALLIANCE	*Bromus diandrus - B. Hordeaceus - Hordeum* sp. Alliance (California Annual Grassland Alliance)

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE
Globally
This association is only known from the Golden Gate National Recreation Area and from the Santa Cruz Mountains several miles south of the study area (see comments section). Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Stands of the *Brachypodium distachyon* grassland association are found throughout the mapping area of GOGA within the Bolinas and Montara 7.5 minute topographic quads.

ENVIRONMENTAL DESCRIPTION
Globally
This association is only known from the Golden Gate National Recreation Area and the Santa Cruz Mountains. In both areas the stands are found on xeric exposures in areas that were likely to have supported native grasslands prior to the introduction of non - native grasses and forbs. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
This association is found on a wide range of elevations (48 - 1403 ft.) on mid to upper slopes and back slopes that are 12 - 32 degrees with southeast to southwest aspects. Soil textures range from moderately fine sandy clay loam to moderately course sandy loam.

MOST ABUNDANT SPECIES
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Herbaceous: *Brachypodium distachyon*

CHARACTERISTIC SPECIES

Globally

This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Herbaceous: *Brachypodium distachyon*

VEGETATION DESCRIPTION

Globally

This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Stands of the *Brachypodium distachyon* grassland association are usually dense grasslands under 1 m in height. They form an open to continuous herb layer with 15 - 95% cover at 0 - 25 cm tall, 5 - 30% cover at 25 - 30 cm tall, 0 - 80% cover at 0.5 to 1 m tall and 0 - 3% cover at 1 - 2 m tall. This association is dominated by *Brachypodium distachyon*. Other common herbs present may include *Hypochaeris glabra, Carpobrotus edulis, Brassica rapa, Nassella pulchra, Cynosurus echinatus,* and *Avena fatua.* Other species are variable and include a variety of invasive exotics. Often adjacent to *Baccharis pilularis* and *Pseudotsuga menziesii* alliance stands, this association is found on soils that are moderately fine sandy clay loam to moderately course sandy loam often with a relatively high percentage of litter.

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK Non - native exotic G4 S4?

RANK JUSTIFICATION

DATABASE CODE to be added

COMMENTS

Globally

About 30 stands of *Brachypodium distachyon* - dominated annual grassland have been sampled in the Santa Cruz mountains from 20 - 50 miles south of the mapping area. These records have been entered in the California Vegetation Information System Database (CNDDB 2001) They contain similar mixes of species to the PRNS samples including *Nassella pulchra* up to 30% cover. It appears that *B. distachyon* - dominated annual grassland occurs on soils suited for grass species and may have once been dominated by *Nassella pulchra*. Most Santa Cruz Mountains stands have *Nassella pulchra* as the principal native associate, suggesting that *B. distachyon* is a relatively close ecological equivalent to *Nassella pulchra* and may compete for sites with this important native species. Some stands in the Santa Cruz mountains and locally at Golden Gate National Recreation Area also have evidence of invasion by shrubs such as *Baccharis pilularis*. Most of the stands with *Baccharis* are underlain by a relatively coarser soil. It is likely that many of these stands were once stands of *Baccharis pilularis* alliance, converted by clearing and grazing.

PRNS / GGNRA

This annual grassland appears to have replaced once perennial stands of *Nassella pulchra* and possibly *Danthonia californica* Alliance. *Brachypodium* is most abundant in areas within 5 miles of the coast and occurs on soils that were likely occupied previously by native grassland.

Plots used to define this association (n=4): GGNRA274, GGNRA282, GGNRA261, GGNRA262

Raphanus sativus Association

- pi code 76010

COMMON NAME	Radish Grassland Association
SYNONYM	None
PHYSIOGNOMIC CLASS	Herbaceous Vegetation
PHYSIOGNOMIC SUBCLASS	Annual graminoid or forb vegetation
PHYSIOGNOMIC GROUP	Temperate or subpolar annual grasslands or forb vegetation
PHYSIOGNOMIC SUB GROUP	Non - native
FORMATION	Short temperate annual grassland
ALLIANCE	*Bromus diandrus - B. Hordeaceus - Hordeum* sp. Alliance (California Annual Grassland Alliance)

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE

Globally

This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Stands of the *Raphanus sativus* grassland association are found throughout the mapping area of PRNS.

ENVIRONMENTAL DESCRIPTION

Globally

This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

This association is found on upper linear, slopes of 7 - 9 degrees and ridge tops. Aspects range from north to south. Found on granitic soils that are medium loam to moderately coarse, sandy loam.

MOST ABUNDANT SPECIES

Globally

This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Herbaceous: *Raphanus sativus, Lolium multiflorum, Bromus diandrus*

CHARACTERISTIC SPECIES

Globally

PRNS / GGNRA

Herbaceous: *Raphanus sativus, Bromus diandrus*

VEGETATION DESCRIPTION

Globally

This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Stands of the *Raphanus sativus* grassland association form an intermittent to continuous grassland with 15 - 95% cover at 0 - 25 cm tall, 5 - 30% at 25 - 50 cm tall, 80% at 0.5 - 1 m tall and 3 percent at 1 - 2m tall. This association is dominated by *Raphanus sativus. Bromus diandrus* and or *Lolium multiflorum* may also be

common. *Stellaria media, Marah fabaceus, Claytonia perfoliata, Rumex acetosella, Vulpia bromoides, Amsinkia spectabilis* and a variety of other herbaceous species contribute minor cover. This association is found on upper linear, 7 - 9 degree slopes and ridge tops with aspects that range from north to south and found on granitic soils that are medium loam to moderately coarse sandy loam.

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK Invasive exotic

RANK JUSTIFICATION

DATABASE CODE

COMMENTS
Globally
Radish patches are minor variants of annual grassland probably reflecting certain disturbance regimes conducive to proliferation of these tall annuals over shorter annual grasses. This association is only known from the Point Reyes National Seashore. Similar *Raphanus sativus* dominated weedy stands occupy many disturbed areas in Cismontane California below about 600 m. However, only a few plots exist. Two plots from Suisun Marsh (Keeler - Wolf et al 2000) are widely divergent one with vestiges of brackish marsh species such as *Distichlis spicata* and *Frankinia salina* and another with an equal cover of the invasive yellow star thistle *Ceantaurea solstitialis*. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Plots used to define this association (n=3): PRNS060, PRNS085, PRNS118

CALIFORNIA ANNUAL GRASSLAND WITH NATIVE COMPONENT MAPPING UNIT
- pi code 67020

CALIFORNIA OATGRASS ALLIANCE
California Oatgrass *(Danthonia californica)* Alliance - pi code 67040
This alliance is represented by a single association in the study area. It occurs in moist to relatively dry coastal grasslands. The alliance ranges from Southern Oregon to Central California. It overlaps ecologically with the *Nassella pulchra* alliance and a single plot (PRNS004) demonstrates this overlap.

Danthonia californica - Aira caryophyllea Association
- pi code 67040

COMMON NAME	California Oatgrass - Silver European Hairgrass Grassland Association
SYNONYM	None
PHYSIOGNOMIC CLASS	Herbaceous Vegetation
PHYSIOGNOMIC SUBCLASS	Perennial Graminoid Vegetation
PHYSIOGNOMIC GROUP	Temperate of Subpolar Grassland
PHYSIOGNOMIC SUB GROUP	Natural / Semi - Natural
FORMATION	Tall Sod Temperate Grassland
ALLIANCE	*Danthonia californica* Grassland Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE

Globally

This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Stands of *Danthonia californica - Aira caryophyllea* Grassland Association are throughout the mapping area of PRNS.

ENVIRONMENTAL DESCRIPTION

Globally

This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

This vegetation is found on gentle convex, south - southwest facing dunes / sand fields. Soil textures range from medium sand or silt. Stands occur adjacent to the dune fields of the North Beach area of the Point Reyes Peninsula. They are on better - drained soils than adjacent flats with *Deschampsia cespitosa* association

MOST ABUNDANT SPECIES

Globally

This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Herbaceous: *Danthonia californica, Aira caryophyllea,*

CHARACTERISTIC SPECIES

Globally

This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Herbaceous: *Danthonia californica, Aira caryophyllea, Plantago lanceolata, Lolium perrene*

VEGETATION DESCRIPTION

Globally

This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory. Similar stands occur in the coastal strip of the Santa Cruz Mountains in San Mateo County (CNDDB 2001). However those stands tend to be drier and have more cover of non - native annuals such as *Brachypodium distachyon.*

PRNS / GGNRA

Stands of *Danthonia californica - Aira caryophyllea* grassland association form an intermittent herb layer of 40% cover 0 - 25 cm and 25 - 50 cm tall, and 20% cover at 0.5 - 1 m tall. This association is dominated by *Danthonia californica* and *Aira caryophyllea. Plantago lanceolata, Lolium perrene, Rumex acetosella* and *Bromus hordeaceus* may also be present. It is often adjacent to introduced perennial grasslands and *Juncus* meadows.

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK G3S2?

RANK JUSTIFICATION This association has probably been greatly reduced in extent and quality as a result of increased grazing and introduction of exotics.

DATABASE CODE

COMMENTS
Globally

PRNS / GGNRA
The *Danthonia californica* alliance was once more widespread in the area prior to introduction of non - native annual and perennial grasses. *Aira caryophyllea* is a diminutive non - native annual species native to Europe. This association is indicative of the relatively dry well - drained sites within this alliance.

Plots used to define this association (n=3): PRNS197, PRNS136, PRNS019

PURPLE NEEDLEGRASS ALLIANCE

Purple Needlegrass *(Nassella pulchra)* Alliance - pi code 67030

This alliance is represented by a single association in the study area. This association is closely related to the *Baccharis pilularis / Nassella pulchra* association of the *B. pilularis* alliance. However, it is not dominated by *B. pilularis*. Additional variation is represented by a single *Nassella pulchra - Melica californica* plot (GGNRA281). This alliance is restricted to Cismontane California from Shasta County to San Diego County.

Nassella pulchra - Baccharis pilularis Association

COMMON NAME	Purple needlegrass and Coyote Brush Grassland Association
SYNONYM	None
PHYSIOGNOMIC CLASS	Herbaceous Vegetation
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation
PHYSIOGNOMIC GROUP	Temperate or Subpolar Grassland
PHYSIOGNOMIC SUB GROUP	Natural / Semi Natural
FORMATION	Medium - tall sod temperate or subpolar grassland
ALLIANCE	*Nassella pulchra* Grassland Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
A few stands of *Nassella pulchra - Baccharis pilularis* grassland association are found throughout the Sweeney Ridge portion of GGNRA and are common in the Marin Headlands portion of GGNRA. Data collected by Cort Johnson (San Jose State University 1998 in California Vegetation Information System CNDDB 2001) is also available on this association south in the Santa Cruz Mountains. Plot data were collect from within the Pt. Bonita 7.5 minute topographic quad.

ENVIRONMENTAL DESCRIPTION

Globally
This association is known from the Point Reyes National Seashore and from the Santa Cruz Mountains of San Mateo and Santa Cruz Counties. The few stands sampled in the Santa Cruz Mountains suggest a similar composition, environment, and cover of the dominant species to samples from PRNS / GGNRA. Stands may occur further north and south along the California Coast. Parent material may also be marine sediments or granitic.

PRNS / GGNRA
This vegetation is found at low elevations (281 - 237 ft.), on undulating lower to upper parts of southeast to west - southwest facing slopes (18 - 32 degree angles). It is found on medium silt loam to moderately fine sandy loam often with Chert parent material derived from the Franciscan Formation.

MOST ABUNDANT SPECIES
Globally
Santa Cruz Mountains stands herbaceous: *Nassella pulchra, Danthonia californica, Lolium perenne, Aira caryophyllea,* and *Vulpia bromoides*.

PRNS / GGNRA
Herbaceous: *Nassella pulchra, Plantago lanceolata, Anagallis arvensis*
Shrub: *Baccharis pilularis*

CHARACTERISTIC SPECIES
Globally
This association is known from the Point Reyes National Seashore and Golden Gate National Recreation Area and the adjacent Santa Cruz Mountains to the south. Unpublished information on the presence of this association suggests it occurs southward in the Coast Ranges to at least Central Santa Cruz County (C. Johnson personal communication 1998). Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Herbaceous: *Nassella pulchra*
Shrub: *Baccharis pilularis*

VEGETATION DESCRIPTION
Globally
This association is only known from the Point Reyes National Seashore and from the Santa Cruz Mountains. No systematic survey of its global range has been attempted. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Stands of *Nassella pulchra - Baccharis pilularis* grassland association form an intermittent to continuous herbaceous layer of 20 - 50% cover at 0 - 25 cm tall, and 25 - 45% cover at 25 - 50 cm tall and an open shrub layer of with 0 - 10% cover at 0.5 - 1 m tall. It is dominated by *Nassella pulchra* and *Baccharis pilularis consanguinea.* A variety of other herbaceous species that may be present include *Plantago lanceolata, Anagallis arvensis, Vulpia bromoides, Plantago erecta, Dichondra donelliana, Melica californica, Artemisia californica, Achillea millefolium, Eriogonum latifolium, Lolium multiflorum, Mimulus aurantiacus* and *Toxicodendron diversilobum.* It is often adjacent to *Baccharis pilularis - Artemisia californica* communities.

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK G2S2.2?

RANK JUSTIFICATION Stands are likely to be small and restricted to coastal areas of Central and Northern California. Invasive exotic grasses and grazing pressure has probably reduced the extent and the quality of this association in many areas.

DATABASE CODE

COMMENTS
Globally

PRNS / GGNRA
This association may represent a seral stage between open *Nassella pulchra* grassland and *Baccharis pilularis* alliance shrubland. The stands typically occur on upper slopes and ridges many were grazed by cattle in the early half of the 20th century. *Baccharis* may be colonizing or re - colonizing on these formerly pure grasslands. Long - term monitoring will demonstrate the validity of this hypothesis.

Plots used to define this association in addition to plots from Johnson (1999), (n=2): GGNRA300, GGNRA311

EUROPEAN DUNEGRASS ALLIANCE

European Dunegrass (*Ammophila arenaria)* Alliance - pi code 47010

This alliance is represented by a single association in the study area. It is distinguished by a non - native invasive species that was intentionally planted to stabilize dunes on the coast of California. On the Pacific coast of North America it now ranges from Washington to southern California.

Ammophila arenaria - Cardioniema ramosissimum Grassland Association

COMMON NAME	European Beach Grass - none Grassland Association
SYNONYM	None
PHYSIOGNOMIC CLASS	Herbaceous Vegetation
PHYSIOGNOMIC SUBCLASS	Perennial Graminoid Vegetation
PHYSIOGNOMIC GROUP	Temperate or Subpolar Grassland
PHYSIOGNOMIC SUB GROUP	Natural / Semi - Natural
FORMATION	Medium - tall sod temperate or subpolar grassland

ALLIANCE *Ammophila arenaria* Grassland Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory. It is suspected that this association is representative of many of the non - native stands of Ammophila arenaria up and down the Pacific coast of North America. Ammophila arenaria has been planted and colonized most dune systems in coastal California. *Cardioniema ramosissimum* is a common dune associate from Baja California to Washington.

PRNS / GGNRA
This association is restricted to the dune systems of The Point Reyes Peninsula including North Beach, Abbots Lagoon, and Drakes Beach.

ENVIRONMENTAL DESCRIPTION
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory. However, it is suspected to occur throughout much of the dune grassland stands of northern California and perhaps south to Baja California and north to Washington State.

PRNS / GGNRA
Stands of the *Ammophila arenaria - Cardioniema ramosissimum g*rassland association is found on undulating southeast to north slopes of sand dunes. Slopes are 2 - 18 degrees. Soil textures are medium sand.

MOST ABUNDANT SPECIES
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Herbaceous: *Ammophila arenaria*
Shrub: *Baccharis pilularis*

CHARACTERISTIC SPECIES
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Herbaceous: *Ammophila arenaria, Cardioniema ramosissimum*
Shrub: *Baccharis pilularis*

VEGETATION DESCRIPTION
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Stands of the *Ammophila arenaria - Cardioniema ramosissimum g*rassland association forms an intermittent to continuous canopy with 40 - 86% cover at 0.5 - 1 m. This vegetation is dominated by *Ammophila arenaria* and *Baccharis pilularis. Gnaphalium sp,, Sonchus sp., Carpobrotus edulis, Vulpia sp., Pteridium aquilinum, Rubus ursinus* and a variety of other herbaceous species may contribute to minor cover. The herbaceous perennial *Cardioniema ramosissimum* occurs in virtually all stands at low cover. This association is found on undulating southeast to north slopes of sand dunes. Slopes are 2 - 18 degrees. Soil textures range from medium sand.

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK Non - native G5S5

RANK JUSTIFICATION Non - native invasive exotic

DATABASE CODE

COMMENTS
Globally

PRNS / GGNRA
This association is widespread on the main Point Reyes beaches wherever *Ammophila* has become established but has sufficient openings to allow some native vegetation cover. It is a non - native association composed of a non - native dominant with scattered native dune land species.

Plots used to define this association locally (n=3): PRNS018, PRNS054, PRNS110

Dune Vegetation (in part)

DUNE SAGEWORT ALLIANCE

Dune Sagewort *(Artemisia pycnocephala)* Alliance - pi code 62064

This alliance is represented by a single association in the study area. It has been formerly considered as part of the Dune mat (*Ambrosia chamissonis*) Herbaceous Alliance The *Artemisia pycnocephala* "alliance" is considered a phase of this alliance by Sawyer & Keeler - Wolf (1995), It likely deserves full alliance consideration and is treated accordingly herein. Although occasionally considered a "scrub", this alliance is by definition, an herbaceous alliance, dominated by herbaceous perennial dune species. The range of this alliance is so far as known from Northern Coastal California (Humboldt Co.) to San Diego County.

Artemisia pycnocephala - Cardioniema ramosissimum Association
- pi code 62062

COMMON NAME	Beach Wormwood - Sandcarpet Shrubland
SYNONYM	None
PHYSIOGNOMIC CLASS	Shrubland
PHYSIOGNOMIC SUBCLASS	Evergreen Shrubland
PHYSIOGNIMIC GROUP	Microphyllous Evergreen Shrubland
PHYSIOGNOMIC SUB GROUP	Natural / Semi - natural
FORMATION	Microphyllous Evergreen Shrubland
ALLIANCE	Artemisia pycnocephala Alliance (New and not in National Vegetation Classification

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Upland

RANGE

Globally

This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global range is not available without additional inventory. Other stands of *Artemisia pycnocephala* dominated coastal dune vegetation occur from Humboldt county to at least Monterey County in California. This is a newly described alliance as well as association and further data is needed on distribution and composition throughout its range. Previously it was considered a phase of the Ambrosia chamissonis alliance (Sawyer and Keeler - Wolf 1995, Pickart and Sawyer 1999), however, the general absence of *A. chamissonis* from many stands in the PRNS / GGNRA mapping area suggests that this alliance should be segregated.

PRNS / GGNRA

This association is found in dune fields and on sandy beaches within the PRNS / GGNRA mapping area.

ENVIRONMENTAL DESCRIPTION

Globally

This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Stands of this association are found on sandy substrates along beaches and in dune fields. Slopes are gentle, and aspects are generally northwest. Stands are currently small, usually less than 2 acres in size. They occupy dune slopes and ridges most commonly along North Beach on the Point Reyes Peninsula. The non - native invasive *Ammophila arenaria* alliance grassland and the *Carpobrotus edulis* alliance (Ice plant) are threatening to invade many stands of this association.

MOST ABUNDANT SPECIES
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Shrub: *Artemisia pycnocephala*
Forb: *Carpobrotus edulis* (exotic)

CHARACTERISTIC SPECIES
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Shrub: *Artemisia pycnocephala*
Forb: *Cardioniema ramosissimum*

VEGETATION DESCRIPTION
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
This short shrub association is dominated by *Artemisia pycnocephala* which consistently contributes about 20% cover to the subshrub canopy. *Carpobrotus edulis* (exotic) dominates the herbaceous layer with about 15% cover, while *Cardioniema ramosissimum* is present at 3 - 4% cover. Emergent individuals of *Ericameria ericoides* up to 1 meter in height usually contribute minor cover. Other common subshrub associates may include *Lotus scoparius, Eriogonum latifolium, Grindelia stricta* var. *stricta* and / or *Grindelia stricta* var. *platyphylla.*

OTHER NOTEWORTHY SPECIES The rare *Monardella undulata* (CNPS list 4) occurs in some stands

CONSERVATION RANK G3S3?

RANK JUSTIFICATION A. pycnocephala stands similar to the local stands are probably distributed in the major dune systems in northern and central California. However, many such stands are of small extent and of low quality due to invasive exotics.

DATABASE CODE To be determined

COMMENTS
Globally

PRNS / GGNRA
Exotics are threatening most stands of this association in the mapping area.

Plots used to define this association (n=3): PRNS135, PRNS199, PRNS134, PRNS198

DUNE SAGEWORT - GOLDENBUSH COMPLEX MAPPING UNIT - pi code 62060

ICE PLANT ALLIANCE

Iceplant (*Carpobrotus* species) Herbaceous Alliance - pi code 62040

This alliance is not defined at the association level locally. The following general description will serve to distinguish the local stands

COMMON NAME	Iceplant Mats
SYNONYM	None
PHYSIOGNOMIC CLASS	Herbaceous
PHYSIOGNOMIC SUBCLASS	Perennial Forb
PHYSIOGNOMIC GROUP	Temperate or Subpolar Perennial Forb
PHYSIOGNOMIC SUB GROUP	Natural / Semi - natural
FORMATION	Low Temperate or Subpolar Perennial Forb

ALLIANCE *Carpobrotus* species Herbaceous Alliance

CLASSIFICATION CONFIDENCE LEVEL

USFWS WETLAND SYSTEM Upland

RANGE

Globally

Iceplant mats occur along the Northern, Central, and Southern California Coasts, the Central Valley, and on the Channel Islands.

PRNS / GGNRA

Iceplant stands occur in disturbed areas throughout the Pt. Reyes National Seashore and Golden Gate National Recreation Area. Almost all of the extensive stands are on dunes and coastal bluffs immediately adjacent to the ocean.

ENVIRONMENTAL DESCRIPTION

Globally

Occurs on bluffs, disturbed land and sand dunes of the immediate coastline from sea - level to 100meters elevation.

PRNS / GGNRA

Occurs on bluffs, disturbed land and sand dunes of the immediate coastline from sea - level to 100meters elevation.

MOST ABUNDANT SPECIES

Globally

Herbs: *Carpobrotus, Mesembryanthemum species; Malephora crocea*

PRNS / GGNRA

Carpobrotus edulis, Baccharis pilularis, Artemisia pycnocephala, Ammophila arenaria, Amsinckia spectabilis spectabilis, Bromus diandrus, Phacelia distans

CHARACTERISTIC SPECIES

Globally

Herbs: *Carpobrotus, Mesembryanthemum species; Malephora crocea*

PRNS / GGNRA

Carpobrotus edulis

VEGETATION DESCRIPTION

Globally
Carpobrotus, Mesembryanthemum species or *Malephora crocea* are is the sole or dominant herb in the ground canopy; *Abronia latifolia, Ambrosia chamissonis, Eriogonum latifolium, and / or Poa douglasii* may be present. Emergent shrubs may be present. Herbs < 50 cm; canopy continuous.

PRNS / GGNRA
Carpobrotus edulis is significant in the ground layer. *Ammophila arenaria, Bromus diandrus, Artemisia pycnocephala, Phacelia distans, Amsinckia spectabilis spectabilis* may be present. Emergent *Baccharis pilularis consanguinea* may be present. Herbs < 50cm; canopy continuous.

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK

RANK JUSTIFICATION

DATABASE CODE

COMMENTS
Globally
This treatment is broadly defined to recognize the importance of these introduced species in California's vegetation. The invasive character of several taxa in the *Aizoaceae* is well appreciated in California, especially on coastal dune habitats. Three genera are included in this series. *The Jepson Manual* includes five taxa in the genera *Carpobrotus, Malephora*, and *Mesembryanthemum* as having naturalized in the state. These taxa have historically been placed in *Mesembryanthemum*, but now referred to as *Carpobrotus chinensis, C. edulis, Malephora crocea, Mesembryanthemum crystallinum, M. nudiflorum.* All are invasive and replace native dune species particularly members of the *Ambrosia chamissonis* and *Lupinus chamissonis - Ericameria ericoides* alliances.

Status Regionally
Northern California Coast (263A) *Carpobrotus edulis* is the most common invader of dune habitats and is widespread on most dune systems
Central California Coast (261B) *Mesembryanthemum* sp. and *Carpobrotus edulis* are both common on dune systems
Southern California Coast (261B) *Mesembryanthemum* sp. and *Carpobrotus edulis* are both common on dune systems. In the Channel Islands (Bc) *Mesembryanthemum* sp. Have crowded out many native herbaceous and subshrub stands on the northern Channel islands. Salt build up from the leaves has effectively changed the soil chemistry of some of these stands and effectively excludes native species from recolonizing (Vivrette & Muller 1977).
Great Valley (262A): stands occur in Suisun marsh and in other Delta areas of the Sacramento - San Joaquin delta (Keeler - Wolf *et al.* 2000)

Management Implications:
Widely planted as a soil binder on embankments and as an ornamental in coastal districts (Prescott and Venning, 1984) iceplants (especially *Carpobrotus edulis*) Can form impenetrable mats that crowd out other species. For years, local southern California fire departments has recommended Ice plant to people with houses in fire prone areas. Ice plant is also often used to control erosion. However, during years with lots of rain, the succulent Ice plant swells with water and can cause entire slopes to slide from the increased weight. *Carpobrotus edulis* is considered one of the most invasive wildland plants in California by the California Exotic Plants Pest Council (CalEPPC List of Exotic Pest Plants of Greatest Ecological Concern 2002 http: / / www.caleppc.org / info / 99lista.html). Iceplant stands are being removed to restore native vegetation on the coastal dunes and enhance populations of rare species (Pickart & Sawyer 1998). Removal of these species is time - consuming by hand - pulling (Large mats can be removed by rolling them up like a carpet) and yet is easier and more cost effective that removal of *Ammophila arenaria* (Albert, 1996). Many California state park, and National Park lands along the coast are actively removing iceplant and replacing it with native dune species such as members of the *Ambrosia chamissonis* and *Lupinus chamissonis - Ericameria ericoides* alliances.

PRNS / GGNRA
Ice Plant has been established at North Beach, Marin Headlands, and other portions of the PRNS - GOGA area for many years. Where unchecked, it continues to expand and overwhelm native dune and coastal bluff stands. However, active suppression has been occurring with exotic plant species control projects over the past several years. Successful eradication elsewhere in California has been demonstrated and the effort to eradicate is less than certain other coastal dune species such as *Ammophila arenaria* (Pickhart and Sawyer 1998).

Plots used to describe this association (n=0): no plots sampled

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COAST BUCKWHEAT ALLIANCE (preliminary)

-pi code 62050 Insufficient relevé plots to describe this alliance, currently rolled into classification hierarchy with Dune Sagewort - Goldenbush Complex Mapping Unit - pi code 62060)

SALT MARSH

Salt Marsh

SALTGRASS ALLIANCE
Saltgrass (*Distichlis spicata)* Alliance - pi code 51010
A single association represents this alliance locally.

Distichlis spicata - Frankinia salina - Jaumea carnosa Association
- pi code 51011

COMMON NAME	Saltgrass - Frankinia - Alkali Heath - Jaumea Grassland Association
SYNONYM	None
PHYSIOGNOMIC CLASS	Herbaceous Vegetation
PHYSIOGNOMIC SUBCLASS	Perennial Grassland
PHYSIOGNOMIC GROUP	Temperate of Subpolar Grassland
PHYSIOGNOMIC SUB GROUP	Natural / Semi - Natural
FORMATION	Intermittently flooded temperate or subpolar grassland
ALLIANCE	*Distichlis spicata* Grassland Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Wetland, Estuarine, Intertidal, Emergent Wetland

RANGE
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory. Similar tidal brackish marshes with *Distichlis spicata* occur from Humboldt County to Monterey County, CA. It is likely that this association ranges throughout this area.

PRNS / GGNRA
Stands of *Distichlis spicata - Frankinia salina - Jaumea carnosa g*rassland association are found throughout the mapping area of PRNS within brackish to haline tidal wetlands.

ENVIRONMENTAL DESCRIPTION
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory. Similar stands of tidal wetland *Distichlis spicata* alliance occur at Suisun Marsh, Solano County CA (Keeler - Wolf *et al.* 2000) and in San Francisco Bay. All stands occupy brackish estuarine environments.

PRNS / GGNRA
This association is found on slopes of 0 - 4 degrees with generally flat or neutral aspects in the lower to upper parts of wetlands / basins. Soil textures range from fine silty clay to medium sand. Parent materials are sandstone, mixed alluvium and other.

MOST ABUNDANT SPECIES
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Herbaceous: *Distichlis spicata, Salicornia virginica, Jaumea carnosa, Frankinia salina*

CHARACTERISTIC SPECIES
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Herbaceous: *Distichlis spicata, Salicornia virginica, Jaumea carnosa, Frankinia salina, Triglochin maritima*

VEGETATION DESCRIPTION
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory. In Suisun Marsh (Keeler - Wolf *et al. 2000*) a very similar if not identical vegetation was called *Distichlis spicata - Triglochin maritima* association. It did not have as high a constancy of *Frankinia* as the PRNS association, but was very similar in most other respects including the commonness of *Jaumea carnosa* , *Triglochin maritima*, *Glaux maritima*, and *Limonium californicum*.

PRNS / GGNRA
This association is dominated by *Distichlis spicata*, *Frankinia salina* and *Jaumea carnosa* forming a continuous herb layer of 90 - 99 percent cover at 0 - 25 cm tall and 1 - 10 % cover at 25 - 50 cm tall. *Triglochin concinna* and *T. maritima*, *Grindelia stricta*, and *Limonium californicum* are also commonly found in this association. This association is often adjacent to *Salicornia* associations. It is found on 0 - 4 degree slopes facing south - southeast to south - southwest in the lower to upper parts of wetlands / basins. Soil textures range from fine silty clay to medium sand. Parent materials are sandstone, mixed alluvium and "other" (including muck).

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK G3S 2.2

RANK JUSTIFICATION Unmanaged tidal wetlands are rare in CA due to landfill, marsh levees, and intensive wildlife management

DATABASE CODE

COMMENTS
Globally

PRNS / GGNRA
Stands are generally small to moderate size (from 0.5 to 5 acres) and may form "salt meadows" adjacent to more low lying *Salicornia* stands. Small matrix stands of *Grindelia stricta* and *Juncus balticus* may represent additional associations not considered locally due to their small size. Such vegetation was identified at Suisun Marsh (Keeler - Wolf *et al.* 2000) where smaller minimum map units were defined.

Plots used to define this association (n=6): PRNS014, PRNS007, PRNS079, PRNS020, PRNS006, PRNS 202

CORDGRASS ALLIANCE

Cordgrass *(Spartina foliosa)* Alliance - pi code 56010

This alliance is represented locally by a single association. It is floristically simple, strongly dominated by the nominate species with few, if any other vascular species present. The alliance ranges along the Pacific Coast from Northern California to Northern Baja California.

Spartina foliosa Association
- pi code 56010

COMMON NAME	California Cordgrass Grassland Association
SYNONYM	None
PHYSIOGNOMIC CLASS	Herbaceous Vegetation
PHYSIOGNOMIC SUBCLASS	Perennial Grassland
PHYSIOGNOMIC GROUP	Temperate of Subpolar Grassland
PHYSIOGNOMIC SUB GROUP	Natural / Semi - Natural
FORMATION	Tidal temperate or subpolar grassland
ALLIANCE	*Spartina foliosa* Grassland Association

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Wetland, Estuarine, Intertidal, Emergent Wetland

RANGE

Globally

This association is only known from the Point Reyes National Seashore and from Suisun Marsh (Keeler - Wolf *et al.* 2000). Information about its global characteristics is not available without additional inventory. However, anecdotal information discussing relatively pure stands of *Spartina foliosa* (e.g., Hickman 1993) suggests that this association occurs throughout coastal salt marshes of California south to the Pacific coast of Mexico.

PRNS / GGNRA

Stands of this association are found throughout the mapping area of PRNS in Tomales Bay, Drakes Bay, and Bolinas Lagoon.

ENVIRONMENTAL DESCRIPTION

Globally

This association is known from the Point Reyes National Seashore and from Suisun Marsh (Keeler - Wolf *et al.* 2000). Other anecdotal observations in San Pablo and San Francisco Bay suggest that it regularly occupies the outer edges of tidal mudflats in the areas with deepest tidal water. Salicornia virginica alliance typically occupies the landward edges of the stands.

PRNS / GGNRA

At PRNS / GGNRA the environment is similar to the global description above. This association is found on flat, linear / even basins / wetlands with no slope. It occurs on medium silt soil textures and silty alluvium parent material.

MOST ABUNDANT SPECIES

Globally

Typically stands are monotypes with *S. foliosa* comprising most or all of the vegetative cover, occasionally with some minor cover of *Salicornia virginica*.

PRNS / GGNRA

Herbaceous: *Spartina foliosa*

CHARACTERISTIC SPECIES

Globally

Herbaceous: *Spartina foliosa*

PRNS / GGNRA

Herbaceous: *Spartina foliosa*

VEGETATION DESCRIPTION
Globally
Similar to the PRNS / GGNRA description below.

PRNS / GGNRA
Stands of this association are dominated by an intermittent layer of *Spartina foliosa*, with 34 - 55% cover at 0.5 - 1 m tall. Approximately 25% cover is from algae, 5% is 0 - 25 cm tall, 1 % is 25 - 50 cm tall, and 2 - 11% of the cover is 1 - 2m tall. *Salicornia virginica*, and algae may contribute to minor cover in the understory. This association is found on flat, linear / even basins / wetlands with slopes of zero degrees. This is on medium silt soil textures and silty alluvium parent material.

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK G3S3.2

RANK JUSTIFICATION There are numerous stands, but all are small and many are threatened by dredging, marsh filling, and other development threats.

DATABASE CODE

COMMENTS
Globally

PRNS / GGNRA

Plots used to describe this association (n=0): no plots sampled

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PICKLEWEED ALLIANCE

Pickleweed *(Salicornia virginica)* Alliance - pi code 64050

This alliance is represented by a single association locally. It is ecologically similar to the local representation of the *Distichlis spicata* alliance, but is usually found in more regularly inundated tidal wetlands. A single *Salicornia virginica - Hordeum brachyantherum* plot: (PRNS075) suggests further variation. The alliance's range is from Northern California to Baja California.

Salicornia virginica - Distichlis spicata - Jaumea carnosa Association
- pi code 64031

COMMON NAME	Woody Saltwort - Coastal Saltgrass - Marsh Jaumea Tidal Herbaceous Vegetation
SYNONYM	None
PHYSIOGNOMIC CLASS	Herbaceous vegetation
PHYSIOGNOMIC SUBCLASS	Perennial forb vegetation
PHYSIOGNIMIC GROUP	Temperate or subpolar perennial forb vegetation
PHYSIOGNOMIC SUB GROUP	Natural / Semi - natural
FORMATION	Tidal temperate or subpolar perennial forb vegetation

ALLIANCE *Salicornia virginica (bigelovii)* Tidal Herbaceous Vegetation

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Temporarily flooded hydromorphic rooted vegetation

RANGE

Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global range is not available without additional inventory. Similar associations co - dominated by *Salicornia* and *Distichlis* have been defined for Suisun Marsh, Solano County, CA Keeler - Wolf *et al.* 2000) and have been observed in several tidal marshes of San Francisco Bay (Keeler - Wolf pers. obs. 1998)

PRNS / GGNRA
Stands of this association are found along the brackish , tidally influenced margins of Tomales Bay, Bolinas Lagoon, and Drakes Bay.

ENVIRONMENTAL DESCRIPTION
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
This vegetation grows at the shallow mouths of streams and creeks where the water is brackish. These areas flood with the tides twice daily.

MOST ABUNDANT SPECIES
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Forb: *Salicornia virginica*
Graminoid: *Distichlis spicata*

CHARACTERISTIC SPECIES
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Forb: *Salicornia virginica, Jaumea carnosa*
Graminoid: *Distichlis spicata*

VEGETATION DESCRIPTION
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
This association is dominated by *Salicornia virginica*, which contributes 40 - 100% cover in the subshrub layer. *Jaumea carnosa* contributes minor cover, but is consistently present. The graminoid *Distichlis spicata* is present, and varies from 3 - 40% cover. Other common associates may include *Cordylanthus maritimus* ssp. *palustris, Triglochin maritima, Triglochin concinna, Schoenoplectus maritimus*, and / or *Spartina foliosa*.

OTHER NOTEWORTHY SPECIES None

CONSERVATION RANK To be determined

RANK JUSTIFICATION

DATABASE CODE To be determined

COMMENTS

Globally

At Suisun Marsh, Solano County California (Keeler - Wolf et al 2000) a very similar or equivalent association of tidal wetland was defined as a *Distichlis spicata - Salicornia virginica* association. It was defined by co - dominance of *S. virginica* and *D. spicata* either species may be > or = 30% relative cover. All plots had small numbers of *Jaumea carnosa* and *Triglochin maritima*. We suspect that this is the same association as is currently defined herein. The only difference appears to be the higher cover of *Distichlis* that is reported from Suisun Marsh. Another association defined from Suisun Marsh was called the *Salicornia / Distichlis* association and was characterized by strong dominance of *Salicornia* with *Distichlis* ranging from 4 to 20 % cover. Most plots of this type contained some non - native species and were found in managed wetlands. None of those plots had *Jaumea*.

PRNS / GGNRA

One stand partially burned in the October 1995 Vision fire has much wider plant diversity than other stands. Altered flood and tidal regimes are adversely effecting this association.

Plots used to define this association (n=7): marinsp11, PRNS108, PRNS165, PRNS041, PRNS040, PRNS005, PRNS022

Freshwater Wetland Herb

SPIKERUSH ALLIANCE

Spikerush [*Eleocharis* (*montevidensis, palustris, quinqueflora*)] Seasonally Flooded Herbaceous Alliance

This alliance is poorly represented locally and no associations have been defined. The following general descriptions will serve to characterize it locally. The alliance as is currently defined is very wide ranging throughout much of North America.

COMMON NAME	Spikerush Stands
SYNONYMS	Transmontane Freshwater Marsh, Coastal and Valley Freshwater Marsh, Montane Freshwater Marsh, Wet Montane Meadow, Freshwater Seep (Holland); Coastal and Valley Freshwater Marsh, Great Basin Freshwater Marsh, Valley Alkali Marsh, Great Basin Alkali Marsh (Cheatham & Haller); Alkali Meadow, Freshwater Marsh (Thorne); Fresh Emergent Wetland (WHR)
PHYSIOGNOMIC CLASS	Herbaceous
PHYSIOGNOMIC SUBCLASS	Perennial graminoid
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland
PHYSIOGNOMIC SUB GROUP	Natural / semi - natural
FORMATION	Seasonally flooded temperate or subpolar grassland
ALLIANCE	*Eleocharis* (*montevidensis, palustris, quinqueflora*) Seasonally Flooded Herbaceous Alliance

CLASSIFICATION CONFIDENCE LEVEL

USFWS WETLAND SYSTEM Estuarine, palustrine

RANGE

Globally

Widespread throughout California and much of western North America.

PRNS / GGNRA

A single plot in the project area was located on the Giacomini Ranch.

ENVIRONMENTAL DESCRIPTION

Globally

Habitat permanently flooded, regularly flooded, semipermanently flooded, seasonally, flooded, irregularly flooded, irregularly exposed. Water chemistry: fresh, mixohaline, mixosaline. Bay, estuary, dune swale, backwater, bank, margins of rivers, channel, creek, ditch margins, lake beds; lagoon, pond, reservoir margins, along fault sag ponds. Soils peaty or mucky. Elevation: 45 m - 3500 m

PRNS / GGNRA

Stand located at south side of small pond in fine, silty clay soil, adjacent to *Juncus balticus* stand.

MOST ABUNDANT SPECIES

Globally

Eleocharis spp., Muhlenbergia asperifolia, Aster alpigenus, Carex utriculata, Carex spp., Scirpus americanus, Scirpus spp., Oxypolis occidentalis, Triglochin palustre, Phleum alpinum,

Juncus nevadensis, Mimulus primuloides, Crassula aquatica, Torreyochloea pallida, Callitriche hermaphroditica.

PRNS / GGNRA

Eleocharis macrostachya, Paspalum distichum, Scirpus maritimus, Torreyochloa pallida

CHARACTERISTIC SPECIES

Globally

Eleocharis spp.

PRNS / GGNRA

Eleocharis macrostachya

VEGETATION DESCRIPTION

Globally

Eleocharis montevidensis, palustris, and / or *quinqueflora* sole or dominant in herb canopy; *Muhlenbergia asperifolia, Aster alpigenus, Carex utriculata, Carex spp., Scirpus americanus, Scirpus spp., Oxypolis occidentalis, Triglochin palustre, Phleum alpinum, Juncus nevadensis, Mimulus primuloides, Crassula aquatica, Torreyochloea pallida,* and *Callitriche hermaphroditica* may be present. Herbs < 4 m tall; cover open, intermittent, or continuous.

PRNS / GGNRA

Eleocharis macrostachya important in the ground layer with *Torreyochloa pallida*. *Paspalum distichum, Scirpus martimus* also present. Herbs <1m tall; cover continuous.

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK G5 S3.2

RANK JUSTIFICATION

DATABASE CODE

COMMENTS

Globally

Stands of this western wetland herbaceous alliance are dominated by one or more species of the *Eleocharis* genus. This alliance requires seasonal to permanent saturation with fresh water. Stands cannot tolerate permanent standing water, but often grow on the saturated soils surrounding a permanent water body, or on depressions subject to seasonal flooding.

Vegetation is characterized by short to medium graminoids, which typically range from 0.5 to 1 m. Some stands are heavily dominated by one or two *Eleocharis* species while others have several graminoids common throughout the stand. *Eleocharis species* form stands in many wetlands throughout California. This alliance may occur from coastal brackish marshes to interior valley freshwater marshes, to haline or saline settings adjacent to alkali playas and seeps in the deserts. In the Sierra Nevada, Cascades and Klamath Mountains, stands may occur in saturated meadows and along shores of ponds and lakes, which experience some drawdown of water through the growing season. Some stands occupy the centers of vernal pools where water ponds longer than in surrounding annual dominated alliances. Note taxonomy of Eleocharis by Kartez (1999) differs from Jepson and *E. quinquefolia* is called *E. parviflora.* This alliance is poorly defined. Many alliances will probably be derived from this broadly defined type as more plot data are analyzed.

Eleocharis spp. are rhizomatous and can survive surface fires by resprouting from the underground rhizomes. Seeds are small and are wind born assisted by capillary bristles. Stands are subject to decimation and deteriorization by drought and by modified hydrology.

Eleocharis alliance stands have been considered as part of vernal pools in several parts of California (Keeler - Wolf et al 1997). They are also part of the coastal freshwater marsh and montane freshwater marsh ecosystems (Holland 1986). These stands typically occupy small areas and are often narrow strips between relatively more permanently saturated or flooded ecosystems and adjacent drier ecosystems. As with all narrow wetland alliances, this alliance should be considered sensitive.

PRNS / GGNRA
Note there is some confusion about the alliance identification of these stands. Torreyochloea pallida also may form its own alliance and further sampling is required to define these stands both at the alliance and association level.

Plot used to define this alliance locally (n=1): PRNS178

RUSH ALLIANCE

Coastal Rush *(Juncus effusus - J. patens)* Alliance - pi code 52030

This alliance is currently represented by a single association locally. However, further association level variation is likely to exist with further sampling. Currently several undescribed plots sampled fall into this alliance including:

***Juncus bufonius* (PRNS195)**
***Juncus patens* plots: (PRNS037, PRNS103, GGNRA389)**
***J. patens - Erechtites minima* plot: (GGNRA301)**
***Juncus leisurii - J. phaeocephalus* plot: (PRNS163)**
***Luzula comosa* plot: (PRNS181)**

The alliance is currently poorly defined and ranges from Washington to Southern California mostly along the coast.

Juncus effusus var. brunneus Association
- pi code 52031

COMMON NAME	Common Rush Herbaceous Wetland
SYNONYMS	None
PHYSIOGNOMIC CLASS	Herbaceous vegetation
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation
PHYSIOGNIMIC GROUP	Temperate or subpolar grassland
PHYSIOGNOMIC SUB GROUP	Natural / Semi - natural
FORMATION	Seasonally flooded temperate or subpolar grassland
ALLIANCE	To be determined (Preliminarily, *Juncus effusus* alliance)

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Palustrine

RANGE
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global range is not available without additional inventory. Other stands of Juncus effusus have been identified from Humboldt County, to Monterey County California. However, there has been no systematic sampling of these stands to identify floristic affinities.

PRNS / GGNRA
Stands of this association are scattered throughout the Point Reyes peninsula and Marin Headlands of GOGA.

ENVIRONMENTAL DESCRIPTION

Globally

This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory. Vegetation fitting the general description of this association has been identified in coastal wetlands throughout much of California. *Juncus effusus* var. *brunneus* is the common coastal variety that is likely to compose most of these stands (Hickman 1993).

PRNS / GGNRA

This vegetation grows in seasonally saturated soils on flats, depressions, or gentle slopes of all aspects. Stands prefer basins, bottoms and plains, which are saturated during the rainy season and usually hold have saturated or at least moist soils most of the growing season. Soils are moderately coarse to fine sandy loams. Stands are generally small, under 2 ha. Moisture relations are slightly drier than the permanently saturated herbaceous associations such as *Scirpus microcarpus* and the *Carex obnupta - Juncus patens* associations. *Juncus effusus* stands are often able to persist in a degraded form in heavily grazed pastures where species associates are largely exotic.

MOST ABUNDANT SPECIES

Globally

This association is only positively known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory. *Juncus effusus* often dominates stands of seasonally flooded wetlands along the outer coastal strip of Northern California. However, it is only known quantitatively from the PRNS / GGNRA mapping area.

PRNS / GGNRA

Graminoid: *Juncus effusus* var. *brunneus*, *Lolium perenne*

CHARACTERISTIC SPECIES

Globally

This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Graminoid: *Juncus effusus var. brunneus*, *Potentilla anserina var. pacifica*

VEGETATION DESCRIPTION

Globally

This association is only known from the vicinity of the Point Reyes National Seashore and Golden Gate National Recreation Area. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Stands of this vegetation are normally dominated by *Juncus effusus var. brunneus*, which can contribute up to 60% cover (range 15 - 60% n=4) in the canopy. *Potentilla anserina* var. *pacifica* is present in all stands but usually contributes only minor cover. Other species that may cover greater than 4% may include, *Lolium perenne* (exotic) and *Holcus lanatus* (exotic), *Trifolium wormskioldii*, *Trifolium repens* (exotic), *Equisetum telmateia braunii* , *Vicia sp* (exotic) and / or *Vulpia* sp (exotic). The canopy is between 1 - 2 meters in height.

OTHER NOTEWORTHY SPECIES None

CONSERVATION RANK G4 S4?

RANK JUSTIFICATION Stands are of limited extend, are limited to within a few km of the coast, but are expected to be found to be common and range more widely than just the study area, along the outer coast of Northern, central and possibly southern California.

DATABASE CODE To be determined

COMMENTS
Globally

PRNS / GGNRA
Exotics and grazing are impacts on stands of this association. However, *Juncus effusus* is relatively tolerant of grazing.

Plots used to define this association (n=4): PRNS027, PRNS072, PRNS201, PRNS115

Juncus patens Association
- pi code 52032

COMMON NAME	Common Rush - Velvet Grass Herbaceous Wetland
SYNONYM	None
PHYSIOGNOMIC CLASS	Herbaceous vegetation
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation
PHYSIOGNIMIC GROUP	Temperate or subpolar grassland
PHYSIOGNOMIC SUB GROUP	Natural / Semi - natural
FORMATION	Intermittently flooded temperate or subpolar grassland
ALLIANCE	To be determined (Preliminarily, *Juncus effusus* - *Juncus patens* alliance)

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM	Palustrine

RANGE
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global range is not available without additional inventory. Other stands of *Juncus patens* have been identified from Humboldt County, to San Diego County California. However, there has been no systematic sampling of these stands to identify floristic affinities.

PRNS / GGNRA
Stands of this association are scattered throughout the Point Reyes peninsula and Marin Headlands of GOGA.

ENVIRONMENTAL DESCRIPTION
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory. Vegetation fitting the general description of this association has been identified in coastal wetlands throughout much of California. *Juncus effusus* var. *brunneus* is the common coastal variety that is likely to compose most of these stands (Hickman 1993).

PRNS / GGNRA
This vegetation grows in seasonally moist soils on gentle slopes of all aspects. Stands prefer basins, bottoms and plains, which are saturated during the rainy season and usually dry to moist soils during most of the growing season. Soils are moderately coarse to fine sandy loams. Stands are generally small, under 2 ha. Moisture relations are drier than the *Juncus effusus* var. *brunneus* seasonally flooded association or the more permanently saturated herbaceous associations such as *Scirpus microcarpus* and *Carex obnupta* - *Juncus patens* associations. *Juncus patens* stands are often able to persist in a degraded form in heavily grazed pastures where species associates are largely exotic. They resprout after heavy grazing and may be relatively unpalatable to cattle given their abundance in some heavily grazed moist pastures.

MOST ABUNDANT SPECIES

Globally
This association is only positively known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory. *Juncus patens* often dominates stands of seasonally flooded wetlands along the outer coastal strip of Northern California. However, it is only known quantitatively from the PRNS / GGNRA mapping area.

PRNS / GGNRA
Graminoid *Juncus patens*

CHARACTERISTIC SPECIES
Globally
This association is only known from the vicinity of the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Graminoid *Juncus patens*

VEGETATION DESCRIPTION
Globally
This association is only known from the vicinity of the Point Reyes National Seashore and Golden Gate National Recreation Area. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Stands of this vegetation are normally dominated by *Juncus patens*, which can contribute up to 60% cover (range 15 - 60% n=4) in the canopy. The introduced perennial grass *Holcus lanatus* is present in all stands and varies from 10 to 50% cover. Other species that may cover greater than 4% may include, *Erechtites minima*, (exotic), *Lolium multiflorum* (exotic) *Mentha pueligium* (exotic), *Plantago lanceolata*(exotic), *Mimulus guttatus* , *Juncus bufonius, Oenanthe sarmentosa, Trifolium campestre*, (exotic), and / or *Vulpia* sp (exotic). The canopy is between 1 - 2 meters in height.

OTHER NOTEWORTHY SPECIES None

CONSERVATION RANK G4 S4?

RANK JUSTIFICATION
Stands are of limited extend, are limited to within a few km of the coast, but are expected to be found to be common and range more widely than just the study area, along the outer coast of Northern, central and possibly southern California. The characteristic species is tolerant of disturbance and is often found in ditches, moist coastal pastures, and trail sides; all widespread situations along the coast of California..

DATABASE CODE To be determined

COMMENTS
Globally

PRNS / GGNRA
Exotics and grazing are regular impacts on stands of this association. It remains to be seen if there are any stands of *Juncus patens* association that are defined by primarily native associates.

Plots used to define this association (n=4): pore037, pore103, GGNRA389, GGNRA301

BULRUSH - CATTAIL ALLIANCE

Large Bulrush - *Cattail (Scirpus* californicus - Typha latifolia) Alliance - pi code 55020

This alliance is represented locally by one association. It is a widespread North American alliance.

Scirpus californicus - *Typha latifolia* Association
- pi code 55040

COMMON NAME	Bulrush - Cattail Grassland Association
SYNONYM	None
PHYSIOGNOMIC CLASS	Herbaceous Vegetation
PHYSIOGNOMIC SUBCLASS	Perennial Grassland
PHYSIOGNOMIC GROUP	Temperate of Subpolar Grassland
PHYSIOGNOMIC SUB GROUP	Natural / Semi - Natural
FORMATION	Semi permanently flooded temperate or subpolar grassland
ALLIANCE	*Scirpus californicus* - *Typha latifolia* Grassland Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Wetland, Palustrine, Emergent Wetland

RANGE
Globally
This association is known from the Point Reyes National Seashore and from Suisun Marsh, Solano County, California (Keeler - Wolf *et al* 2000). Almost 800 stands covering about 2100 acres were mapped there. It is likely that this association is widespread in California and other western states. However, information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
About 70 stands of this or similar *Scirpus* or *Typha* - dominated vegetation are mapped throughout the PRNS / GGNRA area. Most are small, less than 5 acres.

ENVIRONMENTAL DESCRIPTION
Globally
This association is only known from the Point Reyes National Seashore and Suisun Marsh, Solano County. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
This association is found on flat, linear basins / wetlands. Soil textures range from medium silt loam to moderately fine clay loam of mixed alluvium and Franciscan mélange. Water typically is at the surface throughout the growing season. Water chemistry is typically fresh to brackish.

MOST ABUNDANT SPECIES
Globally
This association is only known from the Point Reyes National Seashore and Suisun Marsh. *Typha latifolia, T. dominigensis,* and *T angustifolia* are common along with *Scirpus californicus*. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
herb: *Scirpus californicus, Lemna minor, Typha latifolia, Typha dominigensis*

CHARACTERISTIC SPECIES
Globally
This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
herb: *Scirpus californicus, Typha latifolia Typha dominigensis*

VEGETATION DESCRIPTION

Globally

This association is only known from the Point Reyes National Seashore and Suisun Marsh (Keeler - Wolf *et al.* 2000). In both areas stands occur in a mixture of fresh and brackish marshes. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Stands of the *Scirpus californicus* - *Typha latifolia* grassland association form an open to intermittent layer of 10 - 44 percent cover at 1 - 2 m tall, and 25 - 40 percent cover at 2 - 5 m tall dominated by *Scirpus californicus* and sometimes *Typha latifolia. Lemna minor* may be common in the understory. *Juncus effuses, Typha domingensis, Calamagrostis nutkaensis,* and *Polygonum amphibium* may also contribute to minor cover in the understory. This association is found on flat, linear basins / wetlands. Water is present on the surface throughout the growing season. Soil textures range from medium silt loam to moderately fine clay loam of mixed alluvium and Franciscan mélange.

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK G5 S4

RANK JUSTIFICATION This association is expected to be widespread in marshes throughout California and the Pacific states

DATABASE CODE

COMMENTS

Globally

The relatively simple association of one to three species of *Typha* and *Scirpus californicus* and / or *Scirpus acutus* has been anecdotally reported throughout many marshes in California from the coast to the inner valleys and deserts. It likely ranges further east throughout much of North America.

PRNS / GGNRA

Typha latifolia, angustifolia, and *dominigensis* are closely related species that often hybridize. Research in Suisun Marsh (Keeler - Wolf *et al. 2000*) suggested that it was not possible to consistently individuate stands with different *Typha* species either taxonomically or environmentally. Thus, though this type is listed as *T. latifolia* - *Scirpus californica*, it also includes other species of *Typha* such as *T. dominigensis*. The alliance should probably be considered as a *Typha* sp. - *Scirpus californicus* alliance, however to remain consistent with the existing alliance classification (Sawyer & Keeler - Wolf 1995).

Plots used to define this association in addition to Keeler - Wolf et al. (2000), (n=2): PRNS127, PRNS116

SCIRPUS - TYPHA - SPIKERUSH MAPPING UNIT - pi code 55040

SMALL FRUITED BULRUSH ALLIANCE

Small - fruited Bulrush (*Scirpus microcarpus)* Temporarily Flooded Alliance - 52070

This alliance is represented by a single association locally. The alliance and the association were defined from the data for this project. The range of the alliance is currently poorly understood, but is probably from Central California to northern coastal California.

Scirpus microcarpus Association
- pi code 52070

COMMON NAME Small Fruited Bulrush Grassland Association

SYNONYM	None
PHYSIOGNOMIC CLASS	Herbaceous Vegetation
PHYSIOGNOMIC SUBCLASS	Perennial Grassland
PHYSIOGNOMIC GROUP	Temperate of Subpolar Grassland
PHYSIOGNOMIC SUB GROUP	Natural / Semi - Natural
FORMATION	Semi permanently flooded temperate or subpolar grassland

ALLIANCE *Scirpus microcarpus* Grassland Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

USFWS WETLAND SYSTEM Wetland, Palustrine, Emergent Wetland

RANGE

Globally

This association is only known from the Point Reyes National Seashore and Suisun Marsh. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Several stands of this association are mapped from the PRNS / GGNRA area. They occur in freshwater marshes in the Marin Headlands, Olema Valley, Abbotts Lagoon, and Inverness Ridge portions of the mapping area.

ENVIRONMENTAL DESCRIPTION

Globally

This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

This association is found on 0 - 5degree slopes with flat to southwestern aspects that are usually on linear / even basins / wetlands. Soil textures range from fine sandy clay to moderately fine sandy clay loam of granitic origin. Most stands occupy saturated ground either adjacent to permanent or temporary ponds or adjacent to springs and seeps. Surrounding vegetation includes *Alnus rubra* alliance stands, Rubus spectabilis association, and stands of non - native perennial grassland, such as *Holcus lanatus*.

MOST ABUNDANT SPECIES

Globally

This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Herbaceous: *Scirpus microcarpus*

CHARACTERISTIC SPECIES

Globally

This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA

Scirpus microcarpus, Oenanthe sarmentosa, Stachys ajugoides, Carex obnupta, Mimulus guttatus, Juncus effusus and *Epilobium sp.*

VEGETATION DESCRIPTION

Globally

This association is only known from the Point Reyes National Seashore. Information about its global characteristics is not available without additional inventory.

PRNS / GGNRA
Scirpus microcarpus forms a continuous canopy in the shrub layer with 70 - 90 percent cover of 1 - 2 m tall with an open herb layer of 2 - 25% cover at 25 cm - 1 m. This association is dominated by *Scirpus microcarpus* with an herb layer of *Oenanthe sarmentosa Stachys ajugoides, Carex obnupta, Mimulus guttatus, Juncus effusus* and *Epilobium sp.* in the understory. Other herbs in the understory may include *Anthyrium filix - femina, Claytonia sibirica, Mimulus moschatus, Calamagrostis nutkaensis, Sonchus oleraceus* and *Scirpus cernuus*.

OTHER NOTEWORTHY SPECIES

CONSERVATION RANK G3S2.2

RANK JUSTIFICATION Few stands occur and all are relatively small, less than 5 acres. Searches elsewhere in the outer north Coast Ranges of California for such stands has not bee fruitful (CNDDB 1993).

DATABASE CODE

COMMENTS
Globally

PRNS / GGNRA

Plots used to define this association (n=2): PRNS123, PRNS193

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APPENDIX A
Accuracy Assessment Matrixes

APPENDIX B
Photo Interpretive Signature Key