

## Key Baylands Habitats

The Science Process adopted by the RMG has called for the Focus Teams to identify and describe the Key Habitats that comprise the baylands ecosystem. This step of the process enables the Focus Teams and the RMG to think about the spatial distribution of species support functions, as required to formulate habitat recommendations. In actuality, the Focus Teams considered species and habitats in an iterative way, such that there was overlap between Step 1, the selection of Key Species, and Step 2, the selection of Key Habitats.

It has been recognized that the “species perspective” and the “habitat perspective” are complementary, not redundant, and that they are both needed for a comprehensive view of ecological form and function.

*It should be acknowledged that the list of Key Habitats is subject to change. The Focus Teams continue to exercise the scientific prerogative to add or delete habitats from the Key Habitat List.*

The start of habitat selection was complicated by unclear ecological definitions of common spatial terms. For example, there was a need to define the project boundary and associated habitats with respect to the distribution of Key Species, rather than by physiography, land use, or infrastructure. With regard to the open bays and straits, it was decided that the boundary would be the limit of shallow subtidal environments, which is approximated by the bottom contour at 20 feet below the zero tidal datum. With regard to the rivers and creeks, it was decided that the boundary of the project would be the usual upstream limit of the physical effects of the tides, as evidenced by aqueous salinity or hydrology. For upland and riparian areas, the operational decision was to view the boundary from the perspective of local bayland populations of Key Species that depend upon these adjacent environments. The upland and riparian boundaries are therefore zones that can extend beyond the historical or modern distribution of the tides, and that can vary in width, depending upon the natural history of associated Key Species.

As habitat selection was completed, it became apparent that the spatial scale of habitat planning varied among the Focus Teams. In general, plants and residential species of small herbivores are associated with smaller habitats patches, and larger predators and migratory animals are associated with larger habitats patches. This has led to a finer grain picture of habitat for some species than others. It was further recognized that the smaller patches were nested within the larger patches. For example, it was recognized that channels and levees and pannes are natural features of tidal marshland that function as different habitats for some Key Species. Recognition of this spatial organization of ecological support function led to the development of a hierarchical typology of baylands habitats. The typology is based upon the habitat definitions, species narratives, and matrices of habitat function provided by the Focus Teams.

## Glossary of Tidal Terms

### *Tidal Epoch*

The tidal epoch is the 19-yr period of time in which the daily schedule of the moon is repeated. In other words, if the moon is full today, then the moon will be full again on this day of the year, 19 years from today. The phrase, current tidal epoch, refers to the last epoch for which official datums have been calculated by the National Ocean Survey.

### *Semidiurnal Mixed Tide*

The tide for San Francisco Estuary is called a semidiurnal mixed tide. It is semidiurnal because the tide cycle is approximately one half of one lunar day (i.e., about 12 hrs). This means that there are usually two low tides and two high tides during each 24-hr solar day. The tide is mixed because the two daily low tides usually have different heights (this is termed the diurnal inequality of the low tide), as do the two daily high tides (i.e., the diurnal inequality of the high tide). In the San Francisco Estuary, the diurnal inequality of the high tide tends to be greater than the diurnal inequality of the low tide.

### *Tidal Datum*

A tidal datum is an average height of the tide during a tidal epoch. For example, the Mean Higher High Water tidal datum (MHHW) is the average of the higher of the two high tides of each lunar day during a tidal epoch. The Mean Sea Level tidal datum (MSL) is the average of all hourly tide heights during a tidal epoch. Tidal datums are local and should not be extended among intertidal areas that are distant from each other or that encompass much topographic variation.

## Hierarchical Arrangement of Habitat Types

The habitat types fit naturally into a hierarchy based upon physical geography. Smaller types are components of larger types. The habitat types can also be arranged along the estuarine gradients of salinity and elevation. The typology thus enables the natural arrangement of the habitat types to be visualized. It also enables the Focus Teams and the RMG to use one lexicon, or set of names, for the places and conditions that the project addresses.

This habitat typology reflects the opinions of the regional community of wetlands experts. Other available typologies that have been produced for national or state surveys are evidently less able to represent the important details of wetlands ecology that are particular to this region. For example, no other typology highlights the “cracked ground” of the “vegetated plain” of “ruderal baylands,” as important mosquito sources, or the “pannes on the drainage divides” of “high intertidal salt marsh,” as feeding habitats for shorebirds and refuge for endangered snails, or the “man-made structures” such as power poles and fence posts that stand alongside a freshwater “adjacent upland seasonal pond” as essential roosts for raptors.

These are the important details of regional ecological assessment that can only be identified by people who know the regional landscape best.

The hierarchical format of the typology is not intended to indicate the relative value of different habitat types. For example, the use of the term, “level,” is not intended to indicate level of importance. It only indicates the level of spatial scale or landscape organization. Similarly, the terms, “major habitat type” and “minor habitat type,” only refer to the position of the types in the hierarchy. They do not refer to the relative importance of any habitat types.

#### *Major Types (levels 1-4)*

- ?? Level One is the Baylands Ecosystem as a whole.
- ?? Level Two separates the Baylands Ecosystem into two parts, along the line of the current maximum extent of the tides, based upon tidal elevations of the ground. Everything below the line is referred to as “baylands.” Everything above the line is referred to as “adjacent lands and waters.” The phrase, “current maximum extent of the tides,” stands for the area that would be wetted by the highest tide of the current tidal epoch, if there were no unnatural obstructions to the tides. The exact boundary of this area has not been determined. However, the historical upland boundary of tidal influence is a reasonable illustration of current maximum possible extent of the tides, local alterations of ground surface topography notwithstanding.
- ?? Level Three separates the baylands into “tidal or subtidal,” or “diked,” depending on exposure to the tides, and separates the adjacent lands and waters into “uplands” and “rivers and creeks.”
- ?? Level Four of the Habitat Typology separates the tidal baylands, subtidal baylands, diked baylands, and the adjacent lands and waters into twenty-three “Key Habitats,” based upon differences in physiographic condition and dominant land use. Field reconnaissance may be required to identify these Key Habitats, but thereafter they can usually be mapped using aerial photography. Most of the Key Habitats of the baylands are mapped in the Bay Area EcoAtlas as the base map for visualizing the ecological goals and for landscape planning.

For the tidal or subtidal baylands, the eight Key Habitats are “unvegetated shore,” “lagoon,” “muted tidal marsh,” “high tidal marsh,” “mid tidal marsh,” “low tidal marsh,” “intertidal flat” and “shallow bay or strait.”

For the diked baylands, the nine Key Habitats are “farmed bayland,” “grazed bayland,” “low salinity salt pond,” “medium salinity salt pond,” “high salinity salt pond,” “inactive salt pond,” “managed marsh,” “diked marsh,” “ruderal bayland,” and “treatment or storage pond.”

For the adjacent uplands, the three Key Habitats are “farmed upland,” “grazed upland,” and “managed upland.”

For the adjacent rivers and creeks, the two Key Habitats are “tidal reaches” and “riparian zones.”

*Minor Types (levels 5-7)*

Levels Five through Seven consist of “minor habitat types.” With only a few exceptions, these habitat types were identified by one or more Focus Teams. However, the distribution of minor types among the Key Habitats is due in part to the parallel construction of the Typology as required for its application to both the historical and modern conditions, and because the parallel construction facilitates a standard structure for data files linked to the EcoAtlas.

Geographic Definitions of Habitat Types and Plant Communities

*LEVEL ONE*

*Baylands Ecosystem*

The Baylands Ecosystem consists of the baylands plus some adjacent uplands and waters that are above the maximum extent of the tides during the current tidal epoch.

*LEVEL TWO*

*Baylands*

The Baylands consist of the historical and modern tidal or subtidal habitats of the San Francisco Estuary.

*Adjacent Lands and Waters*

The Adjacent Lands and Waters consist of habitats that are higher than the maximum extent of the tides during the current tidal epoch, but that are required to maintain populations of plants and animals that mainly inhabit the baylands. The geographic extent of adjacent uplands or waters varies among baylands populations of plants and animals, and varies among the physical processes that control the distribution and abundance of baylands habitats.

*LEVEL THREE*

*Tidal or Subtidal Bayland*

The Tidal or Subtidal baylands consist of the habitats that are subject to direct tidal action.

*Diked Bayland*

The Diked baylands occur in places that were previously subject to tidal action, but that since then have become completely isolated from the direct actions of the tides.

*Adjacent Upland*

The Adjacent Uplands consist of terrestrial habitats and areas of standing water that are away from any creek and that are located higher than the maximum extent of the tide during the current tidal epoch.

*Adjacent Rivers or Creeks*

The adjacent Rivers or Creeks consist of natural or artificial features that convey surface runoff or ground water from adjacent uplands to the baylands ..

*LEVEL FOUR*

*Unvegetated Shore*

The Unvegetated Shores mostly occur within the intertidal zone, including its uppermost part that is only occasionally or sporadically subject to direct actions of the tides, and support less than 10% cover of vascular plant growth.

*Lagoon*

A Lagoon is an impoundment of surface water that is subject to at least occasional or sporadic connection to full or muted tidal action The impoundment may or may not receive a creek or other form of uplands runoff. It can be natural ., or artificial.

*Muted Tidal Marsh*

The Muted Tidal Marshes (also called damped tidal marshes) occur within the local tidal range for the current tidal epoch, and are subject to regular daily or monthly tidal action, but to an extent that is lessened by natural or unnatural controls on the tide. The concept of a muted or damped tide does not pertain to lands that are purposefully irrigated or inundated by the tide on either a regular or quasi-regular seasonal or annual schedule, such as some duck clubs, or that are only occasionally and infrequently subject to tidal action, such as lagoons or diked lands or waters that are subjected to unplanned breaches in tidal barriers. For example, “Marta’s Marsh” in Marin County is muted tidal marsh, whereas the Grizzly Island Unit of the Suisun Marsh is not muted tidal marsh.

*High Tidal Marsh*

The High Tidal Marshes occur between the Mean High Water (MHW) tidal datum and the maximum extent of the tides, based upon the current tidal epoch, and support at least 10% cover of vascular vegetation. Examples of high intertidal marshland include the highest areas of the vegetated plain at Petaluma Marsh, Rush Ranch, and Browns Island.

*Mid Tidal Marsh*

The Mid Tidal Marshes mostly occur between the Mean High Water (MHW) tidal datum and the Mean Tide Level (MTL) tidal datum, based upon the current tidal epoch, and support at least 10% cover of vascular vegetation. Mid tidal marsh mostly supports emergent monocot species, such as cordgrass, tules, and bulrush.

### *Low Tidal Marsh*

The Low Tidal Marshes mostly occur between the Mean Tide Level (MTL) tidal datum and the Mean Lower Low Water (MLLW) tidal datum, based upon the current tidal epoch, and support at least 10% cover of vascular vegetation, excluding eelgrass.

### *Intertidal Flat*

The Intertidal Flats mostly occur between the Mean Tide Level (MTL) tidal datum and the Mean Lower Low Water (MLLW) tidal datum, based upon the current tidal epoch, and support less than 10% cover of vascular vegetation, other than eelgrass.

### *Shallow Bay or Strait*

The Shallow Bays and Straits comprise the areas of the estuary where the substrates are entirely between the Mean Lower Low Water (MLLW) tidal datum and the approximate bathymetric contour 20 feet below MLLW, based upon the current tidal epoch.

### *Farmed Bayland*

The Farmed Baylands consist of diked habitats that are actively managed for some form of agricultural yield, including hay or grapes.

### *Grazed Baylands*

The Grazed Baylands consist of diked habitats that are actively managed as pasture for livestock, including cattle, sheep, or horses.

### *Managed Marsh*

The Managed Marshes consist of diked habitats where the distribution of surface water is actively controlled to support a natural community of plants and wildlife. Managed Marshes can include duck clubs and public wildlife refuges.

### *Diked Marsh*

Diked Marshes consist of diked habitats that are not actively managed for plants or wildlife, salt production, or agricultural products, although they might have been subject to such management in the past, and that support at least 10% cover of vascular vegetation.. Saline or brackish conditions can persist because the ground surface is poorly drained.

### *Ruderal Bayland*

Ruderal baylands are similar to the Diked Marshes except that in all cases upland grasses are a dominant component of the plant community for the vegetated plain.

### *Low Salinity Salt Pond*

The Low Salinity Salt Ponds consist of non-tidal habitats that are actively managed for salt production, and that usually have an aqueous salinity range less than 60 parts per thousand. Most of these salt ponds are usually flooded, but they can be drained for periods of weeks.

*Medium Salinity Salt Pond*

The Medium Salinity Salt Ponds consist of non-tidal habitats that are actively managed for salt production, and that usually have an aqueous salinity range between 60 and 120 parts per thousand.

*High Salinity Salt Pond*

The High Salinity Salt Ponds consist of non-tidal habitats that are actively managed for salt production, and that usually have an aqueous salinity range greater than 120 parts per thousand, but that are less saline than Crystalizers.

*Inactive Salt Pond*

The Inactive Salt Ponds consist of non-tidal habitats that were previously used as high, medium, or low salinity salt ponds or Crystalizers for commercial salt production, but that have been abandoned in that regard. The Inactive Salt Ponds typically include seasonal ponds, and support less than 10% cover of vascular plant growth.

*Treatment or Storage Pond*

Treatment or Storage Ponds are diked habitats that support less than 10% cover of vascular vegetation, and that have been constructed as perennial aquatic habitat and/or to treat or store industrial discharges, sewage, or runoff.

*Farmed Upland*

The Farmed Uplands consist of habitats that are above the maximum extent of the tides, based upon the current tidal epoch, and that are actively managed for some form of agricultural yield, including hay or grapes.

*Grazed Upland*

The Grazed Uplands consist of habitats that are above the maximum extent of the tides, based upon the current tidal epoch, and that are actively managed as pasture for livestock, including cattle, sheep, or horses

*Managed Upland Habitat*

The Managed Upland Habitats consist of habitats that are managed at least in part to conserve natural living resources, other than agriculture. Managed Uplands include some farm ponds, wildlife refuges, water treatment ponds, and flood management basins.

### *Tidal Reach*

The Tidal Reaches are segments of rivers or creeks that are subject to the physical effects of the tides. Examples of tidal effects include the average aqueous salinity in the reach, which the tides might increase, and the average water surface slope, which the tides might decrease, at least during high tide.

### *Riparian Canopy*

The Riparian Canopy is part of the riparian zone along some rivers and creeks. An adjacent Riparian Canopy can be delimited in length and width by the extent of trees and/or large shrubbery, as viewed from above, that is directly and usually influenced by the river or creek hydrology. Riparian Forests are mainly restricted to the terraces, flood plains, and levees of rivers and creeks. The dominant native species vary among subregions but include *Quercus agrifolia*, *Quercus lobata*, *Umbellularia californica*, *Salix lasiolepis*, *Alnus oregona*, *Populus fremontii*, *Fraxinus latifolia*, *Juglans californica*, *Acer macrophyllum*, and *Platanus racemosa*. Commonly associated native species include *Aesculus californica*, *Toxicodendron diversilobum*, and *Rubus ursinus*. The Riparian Canopy can include introduced as well as native species.

## *LEVELS FIVE -SEVEN*

### *Channel*

Channels are natural or artificial features through which flow the tides surface runoff, or emergent ground water.

### *Bank*

Bank substrate is subject to the actions of water that is conveyed by a channel. It extends upward from the edge of the bottom to the bankfull stage of rivers and creeks, or to the Mean High Water (MHW) tidal datum of tidal channels (based upon the current tidal epoch), or to the usual high water line of seasonal or perennial ponds

### *Bottom*

Bottom habitats occur between the bases of the opposing banks of a channel, or as the benthic surface of subtidal shallow bays and straits, lagoons, or benthic surface of perennial or seasonal surface waters.

### *Water Column*

The Water Column is the volume of water existing at any moment in time between the water surface and the bottom of any part of a channel, or salt pond, or a treatment or storage pond, or any area of perennial or seasonal surface water. The water column should not be confused with flow or tidal prism, which are volumetric measures of water passing through a channel or breach over time.



*Open Water*

Open water consists of the uppermost 12 inches of the water column of channels and surface waters with less than 10% cover of emergent plant growth.

*Clay-silt Substrate*

Clay-silt Substrate comprises the fine-grain bottom of some adjacent rivers and creeks, lagoons, and subtidal bottom of some shallow bays and straits.

*Sand Substrate*

Sand Substrate comprises the ground surface of some areas of adjacent riparian zones and adjacent hillslopes, and the subtidal bottom of some lagoons, rivers and creeks, and shallow bays and straits.

*Rock Substrate*

Rock Substrate consists of either bedrock or unconsolidated gravel, cobble, or boulder, and comprises the bottom of some adjacent rivers and creeks, lagoons, and the subtidal bottom of some shallow bays and straits.

*Shell Substrate*

Shell Substrate consists of unconsolidated shell fragments as the subtidal bottom of some shallow bay and straits, and lagoons.

*Mudflat*

Mudflats are low intertidal habitats that mostly consist of unconsolidated silts or clays, with less than 10% cover of vascular plant growth.

*Sandflat*

Sandflats are areas of low intertidal habitats consisting mostly of unconsolidated sand, and that support less than 10% cover of vascular plant growth.

*Rocky Flat*

Rocky Flats are areas of low intertidal habitats that mostly consist of unconsolidated gravel, cobble, or boulder, and that support less than 10% cover of vascular plant growth.

*Shellflat*

Shellflats are areas of low intertidal habitats that mostly consist of unconsolidated fragments of shell.

*Levee*

Levees are natural or artificial embankments that mostly consist of natural sediments (although they might be imported), are either adjacent and parallel to channels or extend across perennial or seasonal surface waters, and that extend upwards above the usual

high water line, meaning the bankfull stage of rivers and creeks, the Mean High Water (MHW) tidal datum of tidal channels, or above the usual high water line of other surface waters.

*Vegetated Levee* (see *Levee* above)

A Vegetated Levee supports at least 10% cover of vascular plant growth for at least 20 feet of levee length.

*Unvegetated Levee* (see *Levee* above)

An unvegetated levee does not support at least 10% cover of vascular plant growth for at least 20 feet of levee length.

*Panne*

A panne is an intertidal habitat that tends to naturally store surface water. Most pannes have an average depth over time or space that is less than 12 inches deep, and they usually support less than 10% cover of vascular plant growth.

*Drainage Divide Panne* (see *Panne* above)

Drainage Divide Pannes occur between drainage systems in tidal marshlands.

*Transitional Panne* (see *Panne* above)

Transitional pannes occur in tidal marshes, at their boundary to adjacent uplands. In saline tidal marshlands, transitional pannes are sometimes called salinas.

*Islet*

Islets are areas less than 1 acre in size that are usually surrounded by water along a shoreline or within a river, creek, lagoon, salt pond, or in an area of perennial or seasonal surface water.

*Vegetated Islet* (see *Islet* above)

A Vegetated Islet is any islet that supports more than 10% cover of vascular plant growth, or supports plant growth that is mostly more than 2 inches tall.

*Unvegetated Islet* (see *Islet* above)

An Unvegetated Islet does not support more than 10% cover of vascular plant growth, or does not supports plant growth that is mostly more than 2 inches tall.

*High Tidal Ecotone*

The High Tidal Ecotone consists of the ecological boundary between adjacent uplands and the upper limits of muted marsh or high tidal marsh. The high tidal ecotone is subject to irregular, or sporadic actions of the tides.

*Vegetated Plain*

The Vegetated Plain consists of baylands or riparian substrate, excluding pannes, channels, and levees, that supports at least 10% cover of vascular plant growth.

#### *Cracked Ground*

Cracked Ground consists of fissures that, at least during the wet season, extend from the ground surface into the subsurface water in the vegetated plain of diked baylands.

#### *Perennial Pond*

Perennial Ponds are naturally or artificially impounded and uncovered bodies of standing water in diked baylands, adjacent uplands, or in ephemeral creeks or rivers, where the impoundment lasts throughout the year during most years.

#### *Seasonal Pond*

Seasonal Ponds are naturally or artificially impounded and uncovered bodies of standing water in diked baylands, adjacent uplands, or in ephemeral creeks or rivers, where the impoundment does not last throughout the year during most years, and usually corresponds to some portion of the wet season. Seasonal ponds are typically surrounded by a zone of saturated soils. The amount of seasonal ponding and the size of saturation zones are locally variable.

#### *Emergent Vegetation*

Emergent Vegetation refers to vascular plant growth of seeps and wet soils, as well as such growth that extends above the usual water level of any channel or surface waters.

#### *Vernal Pools*

Vernal Pools are usually surface depressions less than 6 inches deep that are underlain by an impervious substrate of natural materials in adjacent uplands. They tend to be wetted by direct rainfall or nearby runoff during the wet season, and desiccated by evapotranspiration early in the dry season.

#### *Artifactual Vernal Pools (see Vernal Pools above)*

Artifactual Vernal Pools occur in diked baylands as a result of human land uses. They can be ecologically similar to vernal pools.

#### *Seeps and Wet Soils*

Seeps and Wet Soils are areas of persistently saturated soils near places of natural ground water discharge, spring boxes, livestock watering stations, well heads, etc.

#### *Rocky Shore*

Rocky Shores are areas of high or mid intertidal habitats that mostly consist of bedrock or unconsolidated gravel, cobble, or boulders, and that support less than 10% cover of vascular plant growth, although there may be extensive algal cover.

### *Beaches*

Beaches are areas of mid or high intertidal habitats that mostly consist of sand or shell fragments, and that support less than 10% cover of vascular plant growth. Examples of natural beaches exist at Point Pinole.

### *Cliffs*

A Cliff is a hillslope of more than 60% slope that consists mostly of bedrock or unconsolidated gravel, cobble, or boulder, is above the maximum extent of the tides, and does not support at least 10% cover of vascular plant growth.

### *Man-made Structures*

Man-made Structures include any submergent, emergent, or above-ground structures, such as power poles, piers, bridges, etc., that are used by one or more populations of plants or animals that mainly inhabit the baylands.

### *Eelgrass*

The Eelgrass community is restricted to saline and brackish-saline, low intertidal and subtidal sand or clay-silt substrates in the Central Bay. The community includes only one vascular plant species, *Zostera marina*.

### *Sausal or Willow Marsh*

Sausals are stand-alone patches of willow trees in areas that are not directly associated with any riparian zones, including the channels or levees or floodplains of creeks or rivers, although they may be associated with areas of ground water discharge, perennial ponds, or seasonal ponds. The dominant species is *Salix lasiolepis*. Associated species include *Rubus ursinus* and *Potentilla anserina*.

### *Valley Grassland*

Valley Grasslands occur on the interior valleys surrounding the baylands, on the unforested hillslopes with southwest aspect, and on the alluvial plains. The dominant species include *Nassella pulchra*, *Nassella lepida*, *Calamagrostis nutkaensis*, *Festuca californica*, *Leymus triticoides*, *Hemizonia congesta* ssp. *Luzulifolia*, *Carex barbarae* and *Danthonia californica*.

### *Northern Coastal Grassland*

Northern Coastal Grasslands occur on the alluvial plains, valleys, and piedmonts adjacent to baylands, mainly in the Central Bay area. Dominant species include *Festuca rubra*, *Calamagrostis nutkaensis*, *Danthonia californica*, *Deschampsia cespitosa*, *Nassella pulchra*, *Pteridium aquilinum*, and *Carex barbarae*.

### *Ruderal Grassland*

Ruderal Grasslands consist of pastures, vacant lots, and areas of disturbed or imported soil in the adjacent upland, where the plant cover is dominated by introduced species of grasses.

### *Coast Live Oak Woodland*

Coast Live Oak Woodland occurs on hillslopes with thin soils and moderate to large amounts of rainfall (average annual rainfall total is more than about 15 inches). The dominant species is *Quercus agrifolia*. Associated species include *Heteromeles arbutifolia*, *Holodiscus discolor*, *Rubus ursinus*, *Symphoricarpos mollis*, and *Toxicodendron diversilobum*.

### *Valley Oak Woodland*

Valley Oak Woodland occurs on areas of the alluvial plains, valleys, and piedmonts adjacent to baylands. The dominant species is the valley oak, *Quercus lobata*. The associated species include *Nassella pulchra*, *Nassella lepida*, *Danthonia californica*, *Salix lasiolepis*, *Calamagrostis nutkaensis*, *Hemizonia congesta* ssp. *luzulifolia*, and *Festuca californica*, and *Leymus triticoides*.

### *Foothill Oak Woodland*

Foothill Oak Woodland occurs on hillslopes with deep soils and small to moderate amounts of rainfall (average annual rainfall total is less than about 20 inches). The dominant species is *Quercus douglasii*. The associated species include *Pinus sabiniana*, *Arctostaphylos manzanita*, *Ceanothus cuneatus*, *Rhamnus californica*, and *Ribes sanguineum*.

### *Northern Coastal Scrub*

Northern Coastal Scrub occurs on steep hillslopes with thin soils and moderate to large amounts of rainfall (average annual rainfall total is more than about 15 inches). The dominant species is *Baccharis pilularis*. Associated species include *Eriophyllum staechadifolium*, *Mimulus aurantiacus*, *Nassella pulchra*, *Rubus ursinus*, and *Toxicodendron diversilobum*.

### *Southern Coastal Scrub*

Southern Coastal Scrub occurs on steep hillslopes with thin soils and moderate to small amounts of rainfall (average annual rainfall total is less than about 20 inches). The dominant species is *Artemisa californica*. Associated species include *Baccharis pilularis*, *Lupinus albifrons*, *Mimulus aurantiacus*, *Nassella pulchra*, *Rubus ursinus*, and *Toxicodendron diversilobum*.

### *Mixed Evergreen Forest*

Mixed Evergreen Forest is mostly restricted to north-facing hillslopes in the North Bay and Central Bay areas. The dominant species include *Quercus agrifolia*, *Umbellularia*

*californica*, *Arbutus menziesii*, and *Aesculus californica*. *Quercus kelloggii*, *Baccharis pilularis*, *Vaccinium ovatum*, *Toxicodendron diversilobum*, *Heteromeles arbutifolia*, and *Ceanothus thyrsiflorus*.