

## 3. SETTING

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### 3.1 CLIMATE

The climate of the San Francisco Bay Area is characterized by a Mediterranean pattern of cool and mild temperatures along the coast, dry summers, and small fluctuations in seasonal temperatures. The “Pacific High,” a mass of cold air situated somewhere between San Francisco and Hawaii, dominates much of the year. In the winter, the Pacific High moves southward, bringing wet stormy weather into the Bay Area (Gilliom 1966). In the summer, it moves northward, blocking the rains and causing an upwelling of cold off-shore water along the central coast of California. This upwelling produces a thick layer of coastal fog that is drawn inland through San Francisco Bay when temperatures in the Central Valley rise.

San Francisco receives approximately 21 inches of precipitation a year, with most of it falling between October and April (Table 3-1). More rain falls on the western portion of the City (21.8 inches) than on its eastern side (19.7 inches). Average monthly temperatures range from 50.3°F in January to 62.3°F in September, with the western part of the City being approximately 1 to 2 degrees cooler, on average, than the eastern portion. The cold moist fog characteristic of San Francisco summers evaporates as it contacts warmer inland air, producing spectacular displays of fog falls over the City’s central hills. These east/west gradients of fog, precipitation, and temperature, coupled with the highly variable topography in the City, produce strong microclimatic effects. Not only do weather conditions vary from one side of the City to the next but from block to block, depending on the terrain and the degree of exposure.

### 3.2 GEOLOGY, SOILS, AND HYDROLOGY

San Francisco’s parks lie within the seismically active Bay Area of the Coast Ranges geomorphic province of Northern California. The San Andreas Fault Zone is a primary feature of the regional geology in this area, forming the northwest-trending boundary between the North American and Pacific plates. The Franciscan Assemblage is the dominant geologic formation on the San Francisco Peninsula. San Francisco is the type locality for the formation first described in 1895 (Norris and Webb 1976). Sharp Park is the only Natural Area on the Pacific Plate. All parks surveyed are supported by Franciscan bedrock.

Franciscan rocks consist primarily of various types of sandstone. Other common rock types in the assemblage include chert (often found near weathered volcanic rocks), shale, and conglomerate. Smaller amounts of greenstone (weathered basalt) and serpentine, an ultramafic rock from deep within the San Andreas Fault Zone, also are present. Greenstone, a weathered pillow lava (i.e., volcanic flow rock deposited in water) is exposed on the north side of Billy Goat Hill along 30th Street. Greenstone also is exposed at Corona Heights in the quarry along Museum Way and near the tennis courts. A belt of bedrock hills from Fort Point to Hunters Point

contains most of the City's serpentinite exposures, but this official state rock of California also can be seen in a few outcrops in McLaren Park south of Mansell Drive near the eastern intersection of Shelley Drive (Wahrhaftig 1984). Several parks surveyed can be considered erosion-resistant bedrock knolls or ridges (e.g., Mount Davidson and Twin Peaks). The central portion of the City known as the San Miguel Hills contains Mount Davidson, Twin Peaks, Buena Vista Park, and Mount Sutro. Other Natural Areas exhibit a greater influence of coastal sand dune deposition, as described below.

Soils in the parks reflect local bedrock conditions; in many of the parks thin, rocky residual soils over bedrock (the Franciscan Formation) are predominant. The Barnabe-Candlestick soil complex, a mixture of very gravelly sandy loam and fine sandy loam, is common and has been mapped at Twin Peaks, Bayview Park, and Glen Canyon Park. The surveys also encountered disturbed soils (e.g., cut and fill material) in portions of many parks, where roads or other features, such as golf courses, have been constructed. Some areas have thicker loamier soils that are mapped as Candlestick-Kron-Buriburi complex, which consists of a mixture of fine sandy loam, sandy loam, and gravelly loam. Areas in which this soil type is found include McLaren Park and Mount Davidson. The serpentine outcrops of McLaren Park occur in this complex, but do not form large enough areas to have been mapped as a soil variant (USDA 1991). Another common soil type is the Sirdrak sand, which formed on coastal dunes and is found at Golden Gate Park, Buena Vista Park, and Golden Gate Heights, among others. The area around Lake Merced and south to Colma Creek Valley (now the City of San Mateo) is underlain by aeolian wind-deposited sandstones from earlier in the Pleistocene than the northern dune system. Serpentine inclusions in both of these dune fields support thickets of maritime chaparral dominated by what are now rare manzanitas.

Erosion is a significant physical process affecting Natural Areas and the plant and animal communities supported by them. Although many erosion areas do not appear active year round because of the seasonal nature of water input, such problems persist and are exacerbated by steep slopes, road cuts, other unnatural surfaces, and heavy year-round foot traffic at many of the parks. For example, most of the City west of Twin Peaks is underlain by dune sand—a relatively clean, fine- to medium-grained, wind-blown deposit. On flat to gently undulating topography, the sand is deep, allows rapid infiltration of rainfall, supports a variety of plant communities with deep roots, and is not especially erosion-prone in its undisturbed state, or when well vegetated. On steep topography, such as that at Grandview Heights, the sand is shallowly underlain by relatively impermeable bedrock, supports plant communities with fairly shallow root systems, and is easily disrupted by foot traffic. Under these conditions, runoff is more rapid, and the soils and root systems holding them in place can be damaged or removed by natural or human-caused erosion. Inadequately retained road cuts or heavily used trails can create soil slips in the loose sand. Sandy soils that contain some silt and/or clay are more tightly bound than soils composed only of sand. These types of loamy soils, like those on the lower slopes of Brooks Park, are less permeable than sandy soils, but tend to hold water longer and develop deeper deposits, thereby allowing sturdier plant communities to form, even on moderately steep slopes. Consequently, they are less easily eroded than clean-sand soils.

### 3.3 BIOLOGY - THE FRANCISCAN LANDSCAPE

San Francisco comprises an integral component of the Franciscan landscape, a distinct biogeographic area of the northern San Francisco Peninsula (Peninsula) that ranges from Montara Mountain and Coyote Point to the Golden Gate. This unique landscape forms the northernmost reach of the Santa Cruz Mountains subregion within the much larger Bay-Delta Region. Roof (1989) called attention to the north Peninsula as the smallest distinct biogeographic region in California. He dubbed it the “Franciscan” bio-region. Given the landscape ecology definition offered by Forman (1995), this area is called the Franciscan landscape in this Final Draft. As pointed out by Roof (1989), the Franciscan landscape shares some clear affinities with other nearby landscape units, such as the Marin Headlands, the Tiburon Peninsula, and Point Richmond, all of which are low, narrow peninsulas that are strongly shaped by maritime conditions. Historically, the biogeographic heart of this landscape was in the hills and along the shores of San Francisco Bay and nearby San Bruno Mountain. Southern ridges such as Sweeney Ridge and Cahill Ridge in Pacifica, as well as Montara Mountain, gradually grade into coniferous-dominated landscapes that characterize the rest of the Santa Cruz Mountains.

The Bay Area has long been recognized as containing a large number of native species (Stebbins and Major 1965; Raven and Axelrod 1978). It hosts both relict species and those that evolved during the climatic oscillations of the Pleistocene (1.6 million years ago to 11,000 years ago). The Franciscan landscape provided habitat for many species of northern affinity that require cool and moist conditions, as well as for species of southern affinity adapted to more arid and dry conditions. Southern-affinity species inhabited the open exposures of the dune “desert” that formed San Francisco’s interior slopes. This combination of diverse environments, and San Francisco’s physical and climatic isolation from the rest of the Santa Cruz Mountains, provided ample opportunity for evolutionary processes to operate and many distinctive plants and animals originated in this northern peninsular landscape.

The Franciscan landscape hosted a number of rare and endemic (i.e., indigenous—occurring only within the landscape area) species as well as disjunct (i.e., isolated) species and species at their southern or northern range limit. Species such as the San Bruno elfin butterfly (*Incisalia mossii bayensis*), mission blue butterfly (*Icaricia icarioides missionensis*), and San Francisco silverspot butterflies (*Speyeria callippe callippe*) (and the now extinct Xerces blue butterfly (*Glaucopsyche xerces*)) are (or were) largely endemic to this area. Five manzanita species (*Arctostaphylos* spp.) and some dune annuals (such as *Lessingia germanorum*) are endemic. Pacific reed grass (*Calamagrostis nutkaensis*) is near the southern limit of its distribution, while the California croton (*Croton californica*), a dune perennial, is at the northern end of its distribution. The Peninsula endemic San Francisco garter snake (*Thamnophis sirtalis elegans*) was more abundant in the wetlands of this area than anywhere else. On San Bruno Mountain, the dwarf huckleberry (*Vaccinium caespitosum*) is disjunct from its next closest population to the north by more than 200 miles.

Morita (1992) illustrates the extent to which the Franciscan landscape has been converted into a built environment in which more than 95 percent of the natural lands, wetlands, and shorelines have been destroyed or broken into small remnant fragments. Furthermore, many of the “natural” areas in this landscape that remain have been converted to non-indigenous conifer and eucalyptus forests. Others have been used as grazing land and subsequently heavily over-grazed. Today, these areas are dominated by non-native invasive annual forbs and grasses. Yet, despite the extent of habitat destruction and habitat fragmentation, a remarkably high diversity of remnant habitats and some of the rarest species persist. With active, focused habitat management and restoration, some or all of the remnant ecosystems and species that characterize this landscape can persist for future generations. The 31 Natural Areas managed by the San Francisco Recreation and Park Department (SFRPD) are a primary key to realizing this goal.

## VEGETATION

### Historic Vegetation

The historic San Francisco landscape was dominated by an extensive area of sand dunes in the western part of the City, one of the largest active dune systems along the Pacific Coast (Howell et al. 1958). The northern dune ecosystem was of late Pleistocene age and swept north from Lake Merced to Point Lobos, then east over a gap between the San Miguel Hills and Presidio uplands (the area today occupied in part by Golden Gate Park) to San Francisco Bay (Morita 1992). These dune fields supported a sparse cover of sand-adapted shrubs and herbs (Ramaley 1918).

The area around Lake Merced and south to Colma Creek Valley (now the City of San Mateo) is underlain by dune-generated sandstones from earlier in the Pleistocene than the northern dune system. Prior to urbanization, dune ecosystems supported a form of maritime chaparral similar to that found today around Monterey Bay. More densely vegetated stands of coastal scrub and rich perennial grasslands covered the hill slopes and summits. Serpentine inclusions within both of these dune fields supported thickets of maritime chaparral dominated by rare manzanitas.

Also conspicuous in historic San Francisco were vast grasslands and grassland/shrub mosaics. In the central southeastern portions of the peninsula, grasslands composed of native annual and perennial species of grasses and forbs likely dominated the higher (and drier) Franciscan rock hilltops and south-facing slopes. In more protected and moist sections of these hilltops, scrub communities, similar to those in the Marin Headlands and the north side of Twin Peaks, were more common.

Freshwater marsh, willow scrub, and fringed back-dune depressions could be found in the western and northeast part of the City (e.g., Lake Merced, Pine Lake, Laguna Honda, Chain of Lakes, and Mountain Lake). Large expanses of tidal salt marsh were found along the northern shoreline.

Trees were not a conspicuous component of the landscape. The earliest botanical descriptions mention coast live oak (*Quercus agrifolia*) and dwarf California buckeye (*Aesculus californica*)

scattered on slopes on the northeastern section of the City, and California laurels (*Umbellularia californica*) were described as occurring along the northern shoreline (Howell et al. 1958). Small groves of coast live oak woodland likely occurred on north-facing slopes in moist drainages. Remnants of this oak woodland community can still be found in the City and are among the defining features of the Significant Natural Areas.

## Existing Vegetation

### Methods

Vegetation of the Natural Areas was mapped and sampled for this project to identify which types of vegetation are present, how extensive each type is, and to identify the dominant vascular plant species of each vegetation. This information was used to develop guide management recommendations presented in this document, and will be used to interpret future monitoring results. In addition, several reference sites were identified and sampled to provide future guidance on revegetation activities and determine restoration success criteria (Appendix B). Natural Area vegetation was mapped as discrete patches based on structural features (herbaceous vs. scrub vs. mosaic vs. forest) and on dominant floristic features (blackberry scrub vs. coyote brush scrub). These patches were digitized as “polygons” to create a Geographic Information System (GIS) database. For each patch, the dominant plant species were identified and absolute plant cover was estimated using six cover classes following California Native Plant Society (CNPS) categories (CNPS Vegetation Committee, 1998):

1. less than 1 percent;
2. 1 to 5 percent;
3. 6 to 25 percent;
4. 26 to 50 percent;
5. 51 to 75 percent; and
6. greater than 75 percent.

Using this approach, plant cover within a single polygon or quadrat can exceed 100 percent.

In order to assess percent cover and distribution characteristics of each species, vegetation also was sampled using circular quadrats positioned at the nodes of a randomly positioned 100-foot grid system. Quadrats were 1 meter in diameter in grassland and 3 meters in diameter in scrub and forest. Nodes were selectively sampled to represent a variety of vegetation types. For each quadrat, percent cover of each species present was estimated using the same six cover classes. A total of approximately 650 quadrats were sampled for this effort between spring 1999 and summer 2000 (Appendix B). At Lake Merced, quadrat sampling was performed along cardinal directions at 25-foot intervals from a random starting point. Transect directions were selected to ensure quadrats within the polygon of interest. This modification was necessary to account for the linear nature of the vegetation features at Lake Merced.

Sampled vegetation was then classified into formations, subformations, and series. Formations are based on the life form of the dominant species: herbaceous is dominated by herbs; scrub<sup>1</sup> is dominated by shrubs; mosaic is a mix of herbs and shrubs; and forest is dominated by trees. Series are based on the identity of the dominant species, and subformations are groups of series that share similar ecological requirements and/or land management histories. Subformation as used here corresponds roughly to the series level used by Sawyer and Keeler-Wolf (1995) and the natural community level of Holland (1986). Series as used in this document are similar to, but more finely divided than, the associations of Sawyer and Keeler-Wolf (1995). Vegetation series are more finely defined here because it was considered important to capture and document the remnant variation in vegetation communities. Moreover, it was decided that this level of detail would better inform revegetation and monitoring activities.

When more than one species co-dominated, which occurred most frequently in the Franciscan scrub subformation, the more uncommon species of the two was preferentially selected for naming of the vegetation type. When only common species were co-dominant, vegetation types were named preferentially for the presence of coyote brush, then poison oak, then California blackberry.

Surveys identified five formations, 12 subformations, and 101 series (Table 3-2). Acreage was calculated by subformation for each site (Table 3-3). A total of 1,105 acres were surveyed and mapped within the Natural Areas. Approximately 836 acres of 1,105 supported vegetation, while the remainder was mostly water. The vegetation maps in this management plan (Sections 6.1 through 6.26) present vegetation data based on the series classifications of dominant species, not percent cover for a particular species. The percent of cover may be a more accurate description of baseline conditions, especially in terms of percent native versus non-native. Percent native cover and frequency of native species was calculated for eight distinct habitat types where point-count data have been collected (Table 3-4).

Percent cover provided by all native species within a quadrat ranged from a low of 11 percent in the grasslands of Kite Hill, to a high of 99 percent within the scrub habitats of O'Shaughnessy Hollow. Frequency of native species within a quadrat ranged from a low of 28 percent in the non-native forests at McLaren Park to a high of 99 percent in the tule thickets of Lake Merced. Vegetation surveys and work conducted by SFRPD staff for other projects resulted in the documentation of 645 species of plants within this area (Appendix C). These range from the very common blue gum to many species known from only one occurrence within the Natural Areas System.

Reference ecosystems or sites are critical for restoration planning and evaluation. Reference sites provide land managers and the public with a scientific and visual understanding of what the end state of a restoration project should be. Reference sites sampled for this management plan include: (1) slopes on south side of Brotherhood Way, and Junipero Serra Park in San Mateo

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<sup>1</sup> For purposes of this document, the scrub formation includes willow dominated vegetation that exhibits a shrubby (multiple trunk) growth habit. Occasional emergent trees, such as shining willow and wax myrtle, may be present.

County for oak woodlands; (2) west end of Brotherhood Way for willow scrub; (3) slope above Laguna Honda reservoir for coastal scrub; (4) Baker Beach in the Presidio for dune scrub; and (5) three sites at San Bruno Mountain in San Mateo County for native grasslands. These reference sites were sampled as described above for vegetation sampling with percent cover recorded for each species present within one meter and three meter circular plots. In addition to these sampled reference sites, other nearby publicly accessible reference sites which can give the reader an understanding of future site conditions in Natural Areas are provided in Appendix B.

Vegetation quadrat data have been sorted by vegetation type for native plant species (Appendix B). Species are arranged by life form (tree, shrub, herb) in decreasing order of importance or Relative Importance Value (RIV). Relative Importance Value is the relative value (from 0.0 to 1.0) of the frequency a species was encountered within all quadrats for a particular vegetation type, multiplied by the average cover class for that species in all quadrats for the same vegetation type. The purpose of the RIV index is to inform the development of site-specific native species planting plans for restoration work and to describe the possible range of restoration success.

### Herbaceous Formation

Four herbaceous subformations representing approximately 265 acres (32 percent) of the total vegetated area are found within the Natural Areas. Series identified include: annual grassland (20 percent), perennial grassland (1 percent), wetland (8 percent), and other herb (3 percent). Grasslands predominate in the eastern Natural Areas such as McLaren Park, Bayview Park, Bernal Hill, and Corona Heights, while fringing and depressional wetlands predominate at the natural back-dune lakes Pine Lake, Lake Merced, and Laguna Salada at Sharp Park.

Throughout California, native grasslands have been displaced by annual non-native grass species, and San Francisco is no exception. Less than 10 percent of all grasslands, and 1 percent of the total vegetation remaining in the Natural Areas, have a significant native component (25 percent or greater).

### Annual Grassland Subformation

Nine annual grassland series are identified that together total approximately 165 acres. The wild oat series comprises more than 132 acres of this total. All series are dominated by a variety of non-native annual grasses including slender wild oat (*Avena barbata*), wild oat (*Avena fatua*), Italian ryegrass (*Lolium multiflorum*), foxtail barley (*Hordeum murinum*), ripgut brome (*Bromus diandrus*), rattlesnake grass (*Briza maxima*), and annual fescue (*Vulpia bromoides*, *V. myuros*). These grasses were introduced from Europe by various human activities and have displaced much of the native bunchgrass vegetation (CNPS 1996). Other common, weedy, non-native species found in annual grasslands include English plantain (*Plantago lanceolata*), rough cat's ear (*Hypochaeris radicata*), sheep sorrel (*Rumex acetosella*), common chickweed (*Stellaria media*), windmill pink (*Silene gallica*), and common vetch (*Vicia sativa*). Some of these are considered pest plants because of their invasive nature. Native wildflower species often persist in

these degraded grasslands and include California poppy (*Eschscholzia californica*), checkerbloom (*Sidalcea malviflora*), yarrow (*Achillea millefolium*), lomatium (*Lomatium* spp.), blue-eyed grass (*Sisyrinchium bellum*), and soap plant (*Chlorogalum pomeridianum*). Annual grassland typically occurs on drier, south-facing slopes that are, or have been, highly disturbed.

#### Perennial Grassland Subformation

Perennial grassland as defined here contains approximately 25 percent or more cover of perennial grasses, typically occurring within a matrix of invasive annual grasses. A total of seven series are distinguished and total approximately 12 acres. Five are dominated by the native perennial grasses such as California oatgrass (*Danthonia californica*), purple needlegrass (*Nassella pulchra*), red fescue (*Festuca rubra*), Pacific reed grass (*Calamagrostis nutkaensis*), or hybrid wildrye (*Leymus x vancouverensis*), and two are dominated by the invasive perennial grasses like tall fescue (*Festuca arundinacea*) or velvet grass (*Holcus lanatus*) grassland. Purple needlegrass prairie occurs in relatively drier areas with deeper clayey soils. California oatgrass, red fescue, and reed grass prairie occur in more mesic areas on coastal bluffs and terraces that receive abundant coastal fog.

Perennial grasslands support many native species including, on the drier slopes, California melic (*Melica californica*), Junegrass (*Koeleria macrantha*), acaena (*Acaena pinnatifida* var. *californica*), as well as the species described above for annual grasslands. On the wetter slopes, perennial grasslands support tufted hairgrass (*Deschampsia cespitosa* ssp. *holciformis*), Douglas iris (*Iris douglasiana*), coast rock cress (*Arabis blepharophylla*), seaside daisy (*Erigeron glaucus*), coast goldenrod (*Solidago spathulata*), live forever (*Dudleya farinosa*), and San Francisco wallflower (*Erysimum franciscanum*). These remnant native perennial grasslands are critical habitats that are targeted as high conservation and restoration priorities.

#### Wetland Subformation

Eleven wetland series, all dominated by native species, are identified and cover approximately 66 acres. Moisture regimes vary from areas with perennial standing water (permanently ponded or flooded) that support series dominated by emergent vegetation such as bulrush (*Scirpus californicus*) and cattail (*Typha* spp.), to marshy areas at the water-upland interface that support series dominated by swamp knotweed (*Polygonum amphibium* var. *emersum*) and silverfern (*Potentilla anserina* ssp. *pacifica*), to areas that are only seasonally saturated, inundated or flooded that support series dominated by rushes (*Juncus* spp.), valley wildrye (*Leymus triticoides*), and lady fern (*Athyrium filix-femina* var. *cyclosorum*). Giant vetch (*Vicia gigantea*), which occurs in only one Natural Area, Lake Merced, typically grows in moist scrubby areas and tends to dominate the shoreline just upland of the bulrush and swamp knotweed. Saltgrass (*Distichlis spicata*) and pickleweed (*Salicornia virginica*) are typical salt marsh species that codominate several small areas of salt marsh at India Basin and portions of Sharp Park adjacent to Laguna Salada. Willow scrub is a wetland type, but is discussed below under “Scrub Formation.” In general, wetlands represent diverse native habitats that have historically been

removed and severely altered. Because of the relatively high functioning of the remnant wetland ecosystem, particularly with respect to primary productivity and faunal support, they are a high priority for conservation and restoration.

#### “Other” Herb Subformation

Ten “other” herb series are identified and cover approximately 22 acres. Only one of these series is dominated by the native herbaceous species California figwort (*Scrophularia californica*). This species is a common component of mesic scrub habitats and is a codominant of several mosaic series. The nine other series are dominated by the following non-native invasive herbaceous species: Cape ivy (*Delairea odorata*), sweet fennel (*Foeniculum vulgare*), giant pea (*Lathyrus latifolius*), poison hemlock (*Conium maculatum*), iceplant (*Carpobrotus edulis*), pampas grass (*Cortaderia jubata*), wild radish (*Raphanus sativus*), and nasturtium (*Tropaeolum majus*). The mixed exotic herbaceous series is codominated by two or more of these species. All of these species except nasturtium tend to invade aggressively and dominate disturbed areas. They can rapidly also spread into native areas and therefore are identified as priorities for removal.

#### Scrub Formation

The scrub formation is defined here as vegetation dominated by shrubby (i.e., woody, multi-trunked, relatively short) species. Four subformations are identified: northern Franciscan coastal scrub, central dune scrub, central coast riparian scrub, and non-native scrub. These combine to cover approximately 152 acres, 18 percent of the total vegetated area. The first three subformations are dominated by native species and follow the natural community designations described by Holland (1986). The scrub formation comprises a significant component of the vegetation of many of the Natural Areas in the central and western portion of the City as well as Sharp Park.

#### Northern Franciscan Coastal Scrub Subformation

Thirteen native scrub series are identified here as variations of northern Franciscan coastal scrub; they cover approximately 65 acres or 8 percent of the total vegetated areas. Northern Franciscan coastal scrub is usually dense vegetation consisting of low shrubs up to 6 feet tall with scattered grassy openings. This vegetation occurs on windy, exposed slopes with shallow, rocky soils. Series are distinguished by the dominant shrub species present: California sagebrush (*Artemisia californica*), California blackberry (*Rubus ursinus*), coyote brush (*Baccharis pilularis*), redstem dogwood (*Cornus sericea*), holly leaf cherry (*Prunus ilicifolia*), canyon live oak (*Quercus chrysolepis*), oceanspray (*Holodiscus discolor*), poison oak (*Toxicodendron diversilobum*), osoberry (*Oemleria cerasiformis*), red elderberry (*Sambucus racemosa*), thimbleberry (*Rubus parviflorus*), twinberry (*Lonicera involucrata*), and lizard-tail (*Eriophyllum staechadifolium*). California sagebrush and coyote brush can tolerate relatively drier conditions and shallower soils found on south-facing slopes while the other shrub species favor the deeper soils and moister

conditions of north-facing slopes. Northern Franciscan coastal scrub areas typically are rich in diversity and are structurally complex, making them important to support native fauna valuable to wildlife and a focus for conservation and restoration.

#### Central Dune Scrub Subformation

Three native dune scrub series are identified within this document. Two of these are variations of central dune scrub and are dominated by either blue beach lupine (*Lupinus chamissonis*) or yellow bush lupine (*Lupinus arboreus*). The third is a mat-forming vegetation type of mostly open sand that occurs throughout the foredune area at the Balboa Natural Area. Dominant plant species include beach bur (*Ambrosia chamissonis*), sand verbena (*Abronia latifolia* and *A. umbellata*), and beach sagewort (*Artemisia pycnocephala*). Combined, these three series cover approximately 5.7 acres, less than 1 percent of the total vegetation. These tiny remnants are unique in the system and somewhat fragile; they are a focus for restoration and conservation.

#### Central Coast Riparian Scrub Subformation

This subformation contains one series, willow scrub, which is comprised of dense stands of arroyo willow (*Salix lasiolepis*) and occasionally includes shining willow (*Salix lucida* ssp. *lasiandra*) at McLaren Park, Glen Canyon Park, and Impound Lake at Lake Merced. This series covers approximately 50 acres, 6 percent of the total vegetation. Willow-dominated areas provide critical wildlife support functions for migratory and resident wildlife, especially birds, and therefore are a primary focus for conservation and restoration.

#### Non-native Scrub Subformation

Three non-native scrub series are identified and are dominated by one of the following invasive species: French broom (*Genista monspessulana*), Himalayan blackberry (*Rubus discolor*), and mattress vine (*Muehlenbeckia complexa*). Of these, French broom and Himalayan blackberry account for the greatest areas, approximately 28 and 2 acres, respectively, of the approximately 30 acres (4 percent of the total vegetation) covered by this subformation.<sup>2</sup> Because of their invasive nature, these areas are a threat to native plant communities and therefore may be targeted for removal. Because Himalayan blackberry is a significant food source for native wildlife, special actions will be required to mitigate the effects of its removal.

#### Mosaic Formation

Fifteen mosaic series were identified (Table 3-2). These series descriptions are used for areas too sparsely vegetated with shrubs to be classified “scrub” but which contain too many shrubs to be classified grassland. These transitional areas are difficult to define and map in the field. However, mosaics may provide relatively greater wildlife habitat functions than other formations. They are mapped and described as precisely as possible. Most of the series, (10 of 15

<sup>2</sup> This acreage represents only those areas where non-native scrub species dominate. Non-native invasive species are found throughout the system in nearly all series and across the 826 acres of mapped vegetation.

totaling approximately 22 acres or 3 percent of the total vegetation), are a combination of an invasive non-native grass or forb with a native shrub. Four of these series are a combination of a native herb with a native shrub (bee plant/California blackberry, bee plant/coyote brush, reed grass/California huckleberry, and giant vetch/California blackberry) and total approximately three acres. One series (wild oat/French broom) is a combination of invasive non-native herbs and shrubs and amounts to approximately two acres.

### Forest Formation

#### Native Forest Subformation

Two native forest series are identified and are dominated by either coast live oak (*Quercus agrifolia*) or California wax myrtle (*Myrica californica*). These series comprise approximately 17 acres, 2 percent of the total vegetation. Small stands of California wax myrtle forest occur in the eastern portion of Golden Gate Park, but these may be planted trees. However, stands of coast live oak forest within Golden Gate Park are thought to be remnants of the historic vegetation. Stands of coast live oak forest occur at several other Natural Areas, and those at Buena Vista Park and 15<sup>th</sup> Avenue Steps are also likely to be remnant stands of the historic San Francisco vegetation. With possibly the greatest number of bird species associated with oak woodlands, this series is a priority for preservation and restoration.

#### Non-native Forest Subformation

Ten non-native forest series are identified and are dominated by either acacia (*Acacia* spp.), blue gum eucalyptus (*Eucalyptus globulus*), Monterey cypress (*Cupressus macrocarpa*), eucalyptus (*Eucalyptus* spp.), giant sequoia (*Sequoiadendron giganteum*), Monterey pine (*Pinus radiata*), plume acacia (*Albizia lophantha*), coast redwood (*Sequoia sempervirens*), or prunus (*Prunus* spp.). Because giant sequoia, Monterey pine, Monterey cypress, and coast redwood are species native to California but not to San Francisco, they are included as non-native forest series. Blue gum is a serious threat to Natural Areas because it is one of the fastest growing trees in the world, is known to transpire large quantities of water, and its leaves contain allelopathic compounds that can inhibit native plant germination, seedling survival, and growth (Watson no date). Blue gum and other large trees such as cypress and pine are also a threat to native vegetation because their large canopies shade the understory species and capture and drop significant amounts of fog drip, which enables invasive herbaceous species in the understory to out-compete the native vegetation. Of the 363 acres (44 percent of the total vegetation) found within the Natural Areas, blue gum amounts to over half of this habitat, approximately 194 acres. While not always beneficial to native flora, non-native forests can provide important habitat for resident and migrant birds. Large eucalyptus groves at Lake Merced, for example, provide nesting habitat for double-crested cormorants (*Phalacrocorax auritus*), a species of special concern. White-tailed kites (*Elanus leucurus*) are known to nest in windrows of Monterey cypress near favorable foraging areas on the San Mateo Coast.

### Other Formation

The Other Formation category is a “catch-all” category for areas that either are not dominated by vegetation, or are dominated by ornamental plantings. These areas include open water, open sand, bare ground, developed areas such as buildings, roads, and parking lots, ornamental plantings, and rock outcrops. The rock outcrops are mostly exposed bedrock with scattered low-growing herbs and shrubs. Though mostly unvegetated, rock outcrops can support interesting and unusual native plants such as leather-leaf fern (*Polypodium scolieri*), California polypody fern (*Polypodium californicum*), and crevice heuchera (*Heuchera micrantha*). These areas are considered critical habitat preservation and restoration areas.

### **WILDLIFE**

Historically, the San Francisco Peninsula supported a relatively diverse fauna. With the extensive urbanization that has occurred over the last 150 years, the habitat available for native wildlife species has been fragmented and reduced in ecosystem function quality. However, the Natural Areas continue to support populations of native vertebrates (Appendix C). Detailed surveys of eight Natural Areas were conducted in 19 Natural Areas by Paquin and Reading (2000). Reconnaissance-level surveys were conducted by EIP biologists, assisted by volunteers. During these surveys, 11 native reptiles and amphibians were observed (Paquin and Reading 2000). Small-mammal trapping efforts resulted in the capture of three of the six native rodent species in the City; the non-native house mouse (*Mus musculus*) also was captured during these surveys (Paquin and Reading 2000). Sharp Park supports the federally threatened California red-legged frog (*Rana aurora draytonii*).

As of 1998, 356 species of birds had been recorded in San Francisco County (Cotter 1998). This count includes resident, migratory, pelagic, and vagrant species. Of most importance to the management of the Natural Areas are the resident breeding birds. Breeding bird surveys conducted at Lake Merced documented 48 species nesting within the area. Similarly, surveys of Glen Canyon Park documented 67 species of birds within the park and documented 14 of these as breeding (WESCO 1993a). In general, the diversity of plant communities in the Natural Areas provide varied avian habitat including foraging, breeding, and roosting habitat (Appendix Table C-4). Habitat restoration and enhancement for migratory and breeding birds are central components of the Final Draft and are discussed in more detail in the site-specific management plans located in Section 6.

The existing San Francisco landscape is not conducive to supporting larger vertebrates such as the deer and tule elk (*Cervus elaphus nannodes*) that historically roamed the Peninsula. Species found in the City today are generally those capable of surviving in a complex urban environment, such as raccoons (*Procyon lotor*), Virginia opossum (*Didelphis virginiana*), striped skunks (*Mephitis mephitis*), etc. Some of the larger parks (e.g., Lake Merced and Sharp Park) support a slightly more diverse fauna. For example, long-tailed weasel (*Mustela frenata*) and gray fox (*Urocyon cinereoargenteus*) have both been reported from Lake Merced (Ely 2000) and 16

species of mammals have been reported from Glen Canyon Park (WESCO 1993a). Recently, coyote (*Canis latrans*) have been observed in San Francisco and are frequently observed on Bernal Hill and Golden Gate National Recreation Area lands (SFRPD NAP 2005). The species that are known to occur in each park and the issues and recommendations concerning their management are discussed in more detail in the management plans for the individual parks (Section 6).

Invertebrates were surveyed in several Natural Areas as part of this inventory and planning process. It was not possible to extensively survey for invertebrates in all parks; therefore, a single sampling method (pit fall traps) was chosen at the recommendation of the Scientific Advisory Board. In addition, native beetles were identified as a target family for sampling. Invertebrate diversity, such as native beetle diversity, may function as an indicator of ecosystem health such that the greater the diversity the more healthy the ecosystem. Pit-fall trapping was conducted at seven Natural Areas (Mount Davidson, Lake Merced, Corona Heights, Bayview Park, McLaren Park, Twin Peaks, and Hawk Hill) by students from San Francisco State University (SFSU) (Low and Conser 2000). Overall, six families of beetles (Coleopteran) were represented in the collections made during this work. Review of background reports indicates that at least 27 species of butterflies have been documented within the City (Appendix C). A study conducted as part of a master's thesis at SFSU found that four of the nine historically recorded species of bumblebees known to occur in San Francisco still survive here (McFrederick 2004).

## **SENSITIVE SPECIES**

Sensitive species (also referred to as special-status species) are defined for this report as species that are 1) federally listed as endangered, threatened, candidate, or are food plants for those species; 2) state-listed as endangered, rare, threatened, California fully protected, species of special concern, or are food plants for these species; 3) listed within the California Native Plant Society *Inventory of Rare and Endangered Vascular Plants* (Tibor 2001); 4) on the National Audubon Society's Watch List; or 5) under threat of local extirpation as determined by the Yerba Buena chapter of the California Native Plant Society or the Golden Gate chapter of the National Audubon Society. Sensitive species known to occur or that have been recorded historically in Natural Areas are listed in Table 3-5. The list of locally sensitive species (LS) from the CNPS and Golden Gate Audubon Chapter are in draft form at this time. All species from these lists were included in this management plan and are important for local conservation efforts. However, the presence of an LS species did not result in the same weighting as the other categories of sensitive species when determining management areas and actions. Because LS species are either extinct from natural areas, or are at high risk of going extinct, these species and their habitat are priorities for restoration and management activities.

## **3.4 RECREATION AND PUBLIC USE**

Natural Areas are used extensively by residents and visitors of San Francisco for passive recreation. The types of passive recreational activities that occur in Natural Areas include

walking, hiking, running, nature watching, dog walking, and other passive recreational activities.<sup>3</sup> All Natural Areas provide trail walking experiences and most provide views of the City. The larger regional parks such as Glen Canyon Park and McLaren Park provide hiking opportunities. Dog walking is popular in many Natural Areas. Key parks for wildlife observation are Bayview Park, McLaren Park, Mount Davidson, Glen Canyon Park, and Lake Merced. Stewardship and volunteering also are popular recreational activities that occur in Natural Areas. Approximately 15 stewardship groups work regularly restoring Natural Areas under the guidance of the Natural Areas Program. Thousands of volunteer hours are spent each year enhancing natural and recreational features in Natural Areas. Development of site-stewardship and recreational uses compatible with natural resource protection are two of the main goals of this Final Draft.

Trails and trail-related experiences, such as nature observation, were identified as one of the most important facility needs by residents in San Francisco. In 2004, SFRPD developed a Recreation Assessment in order to evaluate community program and facility needs. As part of this assessment, a statistically significant number of households (1,035) were surveyed.<sup>4</sup> Of the population surveyed, 24 percent stated they would participate in programs or activities that provided opportunities for visiting Natural Areas if more programming was available. This was the second highest percent of any of 26 activities identified in the survey, following only running and walking (28 percent)—activities supported by trail development in natural areas. Bicycling (12 percent) was the 8th activity on the list, while dog walking (8 percent) was 11th. Most striking was the overwhelming importance of walking and biking trails to residents, with 55 percent stating trails were one of the four most important recreational facilities (and 25 percent stated as the most important) for their household. Currently 61 percent of respondents visit Natural Areas for some form of recreation. Because trails are the fundamental infrastructure for recreation in Natural Areas, this Final Draft makes recommendations on how to improve the existing trail network.

The existing trail network was surveyed for each site as part of the development of site-specific plans (Table 3-6). All trails, pathways, roads, boardwalks, and stairs were surveyed and mapped (see Soils, Land Features, and Trails figures in the park-specific sub-sections of Section 6). Earthen trails were categorized into one of three types: primary, secondary, and social. A primary trail has been officially designated as a main route into a Natural Area from large neighborhoods, main roadways, or parking areas. Often primary trails are the designated formal entrances to a Natural Area that receive the greatest amount of foot traffic and typically are routed through a Natural Areas points of interest (e.g., high points, view areas, connections to

<sup>3</sup> Non-passive recreational activities are those that require substantial development of sites and facilities such as playing fields, stables for horseback riding, rest rooms, indoor recreational centers, and playgrounds. For active recreation, the facility is more important than the natural setting. In general, active recreational uses are not supported by the Natural Areas.

<sup>4</sup> The results of the random sample of 1,035 households have a 95 percent level of confidence with a precision of at least +/-3.0 percent.

other trails). Primary trails are maintained and improved as necessary. Approximately 91,000 feet (17.2 miles) of primary trails exist within the Natural Areas.

Secondary trails are also officially designated and receive a moderate amount of foot traffic. These may or may not be improved or maintained depending on the trail and resources that a secondary trail may effect. Similar to primary trails, secondary trails provide main routes through Natural Areas and to points of interest. However, they may be the entrance from a smaller neighborhood or a non-formal entrance. Often they branch off of a primary trail and provide access to secondary Natural Area amenities. There are about 66,000 feet (12.5 miles) of secondary trails within the Natural Areas.

Social trails are undesignated pathways that have developed through use of a Natural Area. These are all undesignated and candidates for closure, re-routing, or formalization depending on their location, resources affected, and level of use. Social trails often result in impacts to sensitive resources, primarily because vegetation is trampled. Also, erosion problems rapidly develop following destruction of vegetation, which is often exacerbated by the orientation of the trail itself, as many social trails run straight up and down steep slopes, perpendicular to the slope contours. Social trails sometimes provide access to areas where unsanctioned activities occur (rock climbing, camping, etc.) and do not typically connect points of interest or Natural Area amenities. Other times social trails simply are multiple redundant trails all leading to the same destination. At the time trails data were collected for this report, about 54,400 feet (10.3 miles) of social trails existed within the Natural Areas. Individual plans that follow (Section 6) identify areas where trails may be maintained, improved, re-routed, or closed.

The Natural Areas often are located on ridge lines or the tops of hills. Because of this, the existing trail systems often lead to locations where unobscured views of San Francisco and the surrounding Bay are available. These panoramic views also are important socioeconomic values associated with Natural Areas. Site-specific management plans attempt to maintain primary viewsheds from high points within Natural Areas.

Environmental education programs coordinated through the SFRPD's Youth Stewardship Program currently exist in eight Natural Areas: Glen Canyon Park, Lake Merced, McLaren Park, Bayview Park, Corona Heights, Mount Davidson, Pine Lake, and Golden Gate Park Oak Woodlands. A year-long thematic curriculum teaches students about geography, plants, water, soils, animals, and other related topics and includes some hands-on restoration work in the Natural Areas. In addition to year-long programming, student groups visit and work in the park on one-time field trips. Approximately 563 youth received environmental education through SFRPD Programs in 2005. In addition to SFRPD programs, the California Academy of Sciences, San Francisco State University, Kids in Parks, Tree Frog Treks and other local education organizations use the Natural Areas for environmental education. In addition to those listed above, the following Natural Areas provide additional opportunities for environmental programming: India Basin Shoreline Park, Twin Peaks, Sharp Park, and Buena Vista Park.

### 3.5 LAND USE HISTORIES

The San Francisco Peninsula has experienced a long history of human use. The earliest known Native American tribe to colonize the Peninsula were the Ohlone (Margolin 1978). One or two triblets of Ohlone, each made up of perhaps 200 people, were known to settle here (Holzman 2000a). Most of the Ohlone permanent residences were on the shores of San Francisco Bay. Upland areas of the San Francisco Peninsula likely were used for seasonal camps and foraging. Native Americans often subjected areas to seasonal fires that helped maintain grassland and oak savanna habitats.

Settlement of the area by European peoples brought more significant changes to the landscape. Agricultural practices removed the native grasslands as crops were planted. Many native grassland plant species are not particularly resistant to intensive cattle grazing or agricultural practices (Stephens 1996). Both grazing and cropping introduced invasive species to the landscape (e.g., wild radish (*Raphanus sativa*) and Italian fennel (*Foeniculum vulgare*) for culinary purposes and annual grasses as grazing forage) and allowed introduced species adapted to soil disturbance to expand (Barbour and Major 1988). Additionally, urbanization, the introduction of industry, and the gradual growth of the local population led to stabilization of the dune fields, filling of the Bay, and removal of much of the native habitats.

The following sections are summarized from reports prepared by students and faculty in the Geography Department at SFSU (Marcellino and Jebens 2000; Holzman 2000a; Holzman 2000b; Holzman 2000c; Holzman 2001a; Holzman 2001b; Holzman 2001c; Holzman 2002a; Holzman 2002b). These reports, which include a greater level of detail as well as historic land use changes and surrounding development patterns, are available from SFRPD.

#### LAKE MERCED

The existing vegetation communities found at Lake Merced are likely the result of land use practices of early settlers, primarily the Spanish. Although Native Americans were known to be in the area, their land use practices and small populations generally helped maintain native grasslands with seasonal burnings. Early in Spanish history, Lake Merced was considered community property and used for cattle grazing by the Mission of San Francisco (Shoup and Baker 1981).

As the population of the San Francisco area increased, Lake Merced was one of the first sources of fresh water developed to meet the City's growing demand for drinking water. Spring Valley Water Company (SVWC) was incorporated in 1858 to meet those needs and quickly established a monopoly over the City's water supply. The construction of Hetch Hetchy beginning in 1908 led to the eventual collapse of the SVWC. SVWC sold pieces of property around Lake Merced to make golf courses from the 1890s to the 1920s, and the San Francisco Zoo and Stern Grove in the 1930s. The Lake Merced Area, circa 1899, contained few houses and was used primarily for

agriculture, including potatoes, onions, grains cut for hay, and vegetables such as beans, cabbage, broccoli, brussel sprouts, and artichokes (Westfall 1999).

In the 1890s the United States Army purchased approximately 150 acres of land and developed coastal shore batteries during World War I and II in the area now known as Fort Funston (Shoup and Baker 1981). After World War II, Fort Funston was abandoned. Portions of the area were given to the City and County of San Francisco, while the area bounded by Park Road, Skyline Boulevard, and The Great Highway became part of Lake Merced. The 1920 Census of Agriculture found 74 farms with 1,295 acres of farmland in the City as a whole, with many of them in the Lake Merced vicinity (Westfall 1999).

The land use surrounding Lake Merced changed from agricultural to recreational when the Olympic Gold Club purchased 278 acres of land south of the lake in 1920 (Westfall 1999). The next golf course to open was Harding Park Municipal Golf Course, in 1924. In 1948, the jetty on the north shore of Lake Merced was built. This, notes Westfall (1999), was “the beginning of an embankment that would define the new shoreline of the lake and provide for the rerouting of Lake Merced Boulevard.”

## **MOUNT DAVIDSON**

Before European settlement, the vegetation of Mount Davidson likely consisted of native bunch grasses and coastal scrub plant communities. To date no evidence of Ohlone villages has been discovered on Mount Davidson. However, evidence of Ohlone use of nearby Glen Canyon suggests that Mount Davidson was likely used as hunting grounds (Holzman 2000).

In December 1845, Mount Davidson was part of the Rancho San Miguel land grant (Holzman 2001a citing Boyd 1864). During this period as many as 2000 cattle and 200 horses grazed freely within the non-fenced Rancho. The vegetation of Mount Davidson probably began to change from native bunch grasses to introduced European grasslands as a result (Holzman 2001a).

From the mid to late 1800s the vegetation of Mount Davidson changed dramatically as a result of the efforts of landowner Adolph Sutro, who envisioned putting people to work and changing the landscape to look like the Arden forest (Gilliam and Bry, as in Holzman 2001a). Sutro sponsored the planting of eucalyptus, pine, cypress, acacia, ash, beech, and maple trees on his land by the thousands. The eucalyptus were planted as a temporary measure to screen the smaller trees from wind, but Sutro died before they could be removed (*San Francisco Chronicle* 1959, as in Holzman 2001a). These plantings resulted in the dense eucalyptus forest on Mount Davidson’s western slopes.

During the 1930s, the Work Projects Administration widened and resurfaced the Natural Area’s trails, and trees were trimmed to create an amphitheater-like atmosphere (Girod 1936, as in Holzman 2001a). By the early 1970s the surrounding Mount Davidson had been fully developed with residential housing. In 1997, the area containing the cross at the summit of the Mount Davidson Natural Area was sold to the Council of Armenian American Organizations of

Northern California to settle a lawsuit over the separation of “church and state” regarding the cross.

### **GLEN CANYON PARK AND O’SHAUGHNESSY HOLLOW**

As previously discussed, most Ohlone villages appeared to be along the coastline of San Francisco Bay. However, Glen Canyon was noted as being the hunting territory for one of the local groups, and it has been suggested that these groups moved into the hills during the spring. The harvesting of natural resources by the Ohlone likely aided in the distribution of plants and aeration of soils. Additionally, the regular fall burning of grasslands kept the invasion of trees and shrubs to a minimum. Generally, pre-European vegetation probably resembled the present habitats of Glen Canyon Park and O’Shaughnessy Hollow. Grasslands and riparian habitats likely occupied the same area as they do today. The introduced forest species probably replaced native scrub habitats. The species composition of these areas was different, especially on the grasslands where native bunch grasses were historically dominant.

Following settlement of the areas by the Spanish, Glen Canyon and O’Shaughnessy Hollow were part of Rancho San Miguel. Both cattle and horses were grazed on the Rancho and although the exact location of grazing is unknown, these animals probably used the Glen Canyon area because of the access to fresh water in Islais Creek. As is typical in the western United States, the introduction of cattle brought European grasses and likely initiated a major change in the vegetation at Glen Canyon and O’Shaughnessy Hollow. Despite the rapid urbanization of San Francisco in general, the Glen Canyon and O’Shaughnessy Hollow area did not develop as quickly and remained a relatively isolated community completely mostly of small dairies and farms.

In the late 1860s Glen Canyon was the site of the first commercial dynamite factory in the United States (the Giant Powder Company); it exploded in 1869. Construction of an earthen dam across Islais Creek in 1882 allowed the transfer of water to Kite Hill. In the early 1890s, development of the Glen Canyon and O’Shaughnessy Hollow area began in earnest with the area that is now the playground. Although the local population was increasing, the areas that are now Glen Canyon and O’Shaughnessy Hollow were not subject to direct housing development pressures, in part because of the terrain. Cattle and goats continued to graze, probably removing most of the riparian vegetation along Islais Creek. In 1941, O’Shaughnessy Boulevard was completed, effectively dividing Glen Canyon from O’Shaughnessy Hollow (Holzman 2000a and 2000b). The soils from this operation were dumped into Glen Canyon, and invasive non-native species colonized rapidly in cut and fill areas. Eucalyptus, Monterey pine, and Monterey cypress were introduced in this period and led to rapid changes in the forest communities. Vegetable gardens (a.k.a. victory gardens) planted during World War II resulted in the conversion of grassland and pasture areas to row-crops. Urban growth continued to encroach on Glen Canyon through the development of the surrounding communities of Glenridge and Diamond Heights. Soils from the terracing of slopes were dumped into Glen Canyon in the area now known as Radish Hill and non-native species colonized and expanded rapidly.

## SHARP PARK

Sharp Park, in Pacifica, consists of open natural spaces along with the Sharp Park Golf Course that wraps around Laguna Salada. The lake is a natural lake filled with reeds, cattails, and tules. The native Ohlone in the area used the tules as material for homes, fishing nets, and raincapes (City of Pacifica no date). In 1769, the Ohlone helped Portola's first land expedition near the shores of what is now Pacifica (Pacifica Chamber of Commerce no date).

George Sharp, a wealthy lawyer from New York, was the original landowner of the area. When he died in October 1882, his wife inherited the property. Mrs. Sharp died on February 8, 1905, and left her property to Adolph Spreckles and her attorney, Ruben Lloyd. Both Lloyd and Spreckles were millionaires and San Francisco Park Commissioners. In 1916, Spreckles gave up his share of the property on the west side to the City and County of San Francisco. During that time, John McLaren began to plant trees on the west side, which would eventually become Sharp Park Golf Course. After his death, Lloyd left his property to his executor, Samuel Murphy. Murphy passed away in the summer of 1917 and left the property to the City of San Francisco (Pacifica Chamber of Commerce no date).

The Sharp Park Golf Course was designed by Alister McKenzie, the designer of the Pebble Beach Golf Course, and was called a "poor man's Pebble Beach." Construction of the golf course began in 1929 and was completed in 1932. McLaren landscaped the site and planted Monterey cypress trees west of the lagoon in the 1930s. Gray trunks on the course are remnants of trees that died in the winter of 1983 from saltwater flooding. According to the details in Samuel Murphy's will, Sharp Park is to continue to be used for recreational purposes, or it will be turned over to the State. If the State will not meet this requirement, it will be awarded to Murphy's heirs (Pacifica Chamber of Commerce no date).

## 15TH AVENUE STEPS, GRAND VIEW PARK, ROCK OUTCROP, GOLDEN GATE HEIGHTS, AND HAWK HILL

The Ohlone probably did not settle in the Golden Gate Heights area, but it is likely that they visited it. They used many of the plant species that grew there (Holzman 2001b), including bracken fern (*Pteridium aquilinum*), coast live oak (*Quercus agrifolia*) acorns, strawberry (*Fragaria chiloensis*), coffee berry (*Rhamnus californica*), lupine (*Lupinus* spp.), and deerweed (*Lotus scoparius*), and hunted animals such as deer, rabbits, and elk that probably were in the area.

This area was not part of any of the local Spanish or Mexican land grants and settlement did not begin until the late 1800s. At this time, Carl Larsen started a chicken ranch and sought to convert a 4-square-mile area to the "tropics of the San Francisco Hills." Eventually, Larsen purchased and developed the residential community known as Golden Gate Heights.

Development of the slopes surrounding the Golden Gate Heights area did not begin until the 1940s. By 1955, the Natural Areas had been separated from one another by residential

developments. Today these Natural Areas have some native plant species and communities, such as coast live oaks, various native grasslands, and significant populations of sensitive plants.

### **PINE LAKE**

In 1847 George M. Green and his family moved from Maine to California because he received a land grant of 160 acres in the area now known as Pine Lake and Stern Grove. Green and his family raised cattle and hunted on the land. The original landscape was made up of sand dunes and dune scrub vegetation, and it was home to wild cattle, rabbits, and coyotes. The shores of Pine Lake (also known as Laguna Puerca) were filled with ducks, and the lake was much larger than it is today and extended further to the east. His son, George Green, Jr., later planted eucalyptus seeds from Australia to keep the sandy areas stable, as well as bent sea grass, also called “Holland Grass,” to keep the eucalyptus trees from shifting in the sand dunes from the wind. The Greens had legal troubles with their land when David Mahoney secured the original land grant, known as Rancho Laguna de la Merced. In 1887, the Greens were considered squatters on their settlement for three months until the Supreme Court passed a Special Act of Congress that gave them rights to the land (Christianson 1963).

The Trocadero Inn was constructed in 1892 by George Green, Jr. on the east side of the property, and it rapidly became a popular spot for weekend visitors who rented adjacent cabins. The inn was managed first by Adolf Spreckles (in 1903) and soon after by Hiram Cook. During Cook’s time, the Trocadero Inn was at its peak and included a deer park, a beer garden, an open-air dancing pavilion, a lake for rowing, and a prominent trout farm (Christianson 1963). The Trocadero closed down in 1920 after Prohibition because George Green, Jr. did not want a “bootlegger situation” on the property (SFRPD 2001).

Mrs. Rosalie M. Stern bought the property from George Green, Jr. in 1931 to create a memorial for her late husband, Sigmund Stern, a distinguished San Francisco civic leader and businessman in the 1920s. Mrs. Stern turned the property over to the City of San Francisco on June 4, 1932, specifying that it be used for recreational purposes. She became the President of the San Francisco Recreation and Park Commission and formed the Sigmund Stern Grove Festival Association in 1938.

### **BUENA VISTA PARK**

Before European settlement, the Buena Vista Park area was covered in grasslands and wild flowers, including a small grove of coast live oak trees and toyon bushes. The area was probably not used by the Ohlone Indians, who primarily settled along the shoreline areas of San Francisco Bay. The Spanish used the Buena Vista Park area as a resting point on the journey between the Presidio and Mission Dolores to pick strawberries and enjoy the view.

Interest in developing the Buena Vista area as a park began in the 1860s. By the 1880s the grasslands of Buena Vista Park gave way to exotic forest, due in part to Adolph Sutro’s Arbor

Days. In the 1920s, residential development of the area surrounding Buena Vista Park had been completed. (Holzman 2000c)

### **CORONA HEIGHTS**

The Corona Heights area was probably not used by the Ohlone Indians, who primarily colonized the shoreline of San Francisco Bay. The steep sandy slopes of the Corona Heights area were unsuited to agriculture, and the area was largely bypassed during the Spanish-Mexican land grant periods.

The Corona Heights area was not developed until the 1850s, when the Gray Brothers established a quarry and brick factory. Before this, the Corona Heights area was vegetated with grasses and wildflowers, and used for cattle and sheep grazing.

The City of San Francisco purchased a portion of the Corona Heights Natural Area in 1941 after a 13-year crusade by then-director of recreation, Josephine Randall. Today, the Randall Museum is located in the Corona Heights area, and children use the outdoor areas to learn about natural resources. (Holzman 2001c)

### **KITE HILL**

There is evidence that Native Ohlone were present on the Kite Hill site before Europeans settled in the San Francisco Bay Area. The Ohlone would burn the hill to clear the vegetation, an annual effort that prevented encroachment of trees and shrubs while promoting the growth of native grasses. Kite Hill is on the northern part of what was once Rancho San Miguel. After European settlement, routine burning of this area was stopped and the area was used for cattle grazing. As previously discussed, native vegetation was not well suited for extended grazing and many of the native grasses in the area were displaced by invasive species more resistant to grazing pressures. This led to a significant change in the vegetation composition.

There is limited documentation on Kite Hill's land use before it was incorporated into the San Francisco Natural Areas Program in 1977. Before the City acquired the site, it was privately owned. Residential housing was developed on the southeastern side of the hill along 19th Street in the 1950s.

### **TANK HILL**

During the Spanish settlement in the San Francisco Bay Area, the Tank Hill site was part of Rancho San Miguel, which was one-sixth the current size of San Francisco. In 1846, Pio Pico, the Mexican governor of the Californios, granted the land to Jose de Jesus Noe, and the ranch was used as grazing land for cattle and horses (Holzman 2002b). Tank Hill was named for the Clarendon Heights Water Tank that once stood on the site. The water tank, built in 1894 and owned by SVWC, stored water that was pumped from nearby Laguna Honda. In 1930, the hill became City property after SVWC was acquired by the newly established San Francisco Water

Department. The eucalyptus trees on Tank Hill were planted to hide the water tank after the Japanese attack on Pearl Harbor. The tank was later removed in 1957 and all that remains today is a round foundation.

Tank Hill was sold to private development interests in 1960 for \$230,000 (Gaar, no date). When developers proposed housing on the site, the City bought back the hill for \$650,000 because of community opposition to the proposed project. The site was intended to become a part of the new Open Space Program (Gaar no date). Also in 1960, part of the area around Tank Hill was bulldozed to widen Twin Peaks Boulevard, creating steep slopes adjacent to the road. Because of petition from neighborhood advocates and residents, Tank Hill officially became a part of the San Francisco Recreation and Park Open Space System in 1977 after a housing development project was denied (Holzman 2002b).

### **GOLDEN GATE PARK (OAK WOODLAND, WHISKEY HILL, AND STRAWBERRY HILL)**

Before the development of Golden Gate Park, the 1,021-acre site was a sparsely vegetated field of sand dunes. During the late 1800s, the idea of a large urban park—a public space where people of all classes could congregate and enjoy public natural space—became popular across America. While touring California in 1866, prominent landscape architect Fredrick Law Olmstead proposed a public park for the City of San Francisco. In 1871, surveyor and engineer William Hammond Hall won the contract to survey the land and was appointed engineer of the park project and, subsequently, the park's first superintendent (SFRPD 1995b).

Hall's goal was to turn the sandy area into a woodland forest with picnic areas, gardens, and areas for play and recreation. Work began on the eastern edge of the site (the location of Oak Woodland, as described below). Different trees and plants were planted on the grounds for experimentation. Work on the park started in 1871 and consisted of fencing, draining and irrigation, grading, and establishing the park nursery. The next year, 22,000 quick-growing trees were planted, roads were constructed, and the park had thousands of visitors.

John McLaren, an experienced horticulturist and forester, became superintendent of the park in 1890 and remained superintendent for over 40 years. McLaren expanded and developed the park through planning, irrigation, and planting trees and plants. He also performed successful underground water flow experiments, which led to the development and construction of a reservoir near Strawberry Hill (Anonymous 1931).

The park's facilities and uses have developed and changed throughout its history. The California Midwinter International Exposition was held at the park in 1894. The exposition included parades, music, and displays such as the Japanese Tea Garden and the Egyptian-style Fine Arts Building, which was later relocated and developed as the M.H. deYoung Memorial Museum. The fair lasted for six months and had over two million visitors. In 1906, thousands of displaced city residents became squatters in the park after the great earthquake. Voters approved a proposal

to move the California Academy of Sciences from the downtown area to the park in 1910. During the 1920s and 1930s, more facilities were added to the park, including the Kezar Stadium and pavilion (1926), Willis Polk's Beach Chalet (1925), and the Shakespeare Garden (1928). Steinhart Aquarium and the Simpson African Hall were added to the Academy of Sciences in 1923 and 1931, respectively. The golf course was developed after World War II. During the 1960s, flower children from the Haight-Ashbury community came out to the park and held events on "hippie hill" and the panhandle (SFRPD 1995b). From the latter half of the 20<sup>th</sup> century till today, emphasis on the park has been to renew and restore children's play areas and to reforest areas (SFRPD 1995b).

Golden Gate Park has no natural forest. Today, indigenous oak preserves known as Oak Woodland are on the eastern edge of Golden Gate Park. These planted areas include native and non-native varieties of trees and other vegetation. Oak Woodland encompasses several acres of forest and is the only sizable natural oak woodland left in the City. Hall realized the value of these trees when they were first planted in the 1870s. Today the trees grow in a horizontal twisting fashion (they rarely grow vertically) and are unique because they form hyperbolic shapes. The preservation of Oak Woodland is important because it is one of the last sizable areas of native oak that once spread along the California Coast (Anonymous no date).

### **BAYVIEW PARK**

The Ohlone lived at Bayview Hill, and the area was an important hunting ground filled with deer, elk, and other mammals. Acorns from coast live oak trees were harvested in the fall, and grassland was burned periodically to clear the land for seeds, bulbs, and berries to scatter and grow (SFRPD no date).

Cattle ranching was a major industry in the region after the arrival of the Spanish in 1770. Most of the Bayview area was part of two large Spanish ranchos called Bernal's Rancho and Ridley's Rancho. Native annual grasses were replaced by European annual grasses, and large animals such as grizzly bears, wolves, and elk were hunted and became extinct (SFRPD no date).

A few developments were proposed for Bayview Hill but they were never carried out. George Hearst and the Bay View Land Company proposed making the area an exclusive district for the wealthy but plans were stopped because the location was too far from downtown San Francisco. An isolation hospital was proposed near land owned by Charles Crocker but was dropped because "Charles Crocker didn't want a pest house that close to his other properties." In exchange, Crocker donated the land to the City of San Francisco on the condition that the hospital would not be built. The City declared the hilltop a park in 1915. An additional 16 acres of open space was acquired, creating the 42-acre park. Originally Bayview Park had more gradual slopes and was much larger. A waste disposal company owned part of the south slope and used part of the hillside to cover a landfill. The north and east sides were quarried to develop the site of Candlestick Park (SFRPD no date).

## **INDIA BASIN SHORELINE PARK**

India Basin Shoreline Park is distinguished from other Natural Areas because it is the only park located along the bay. It was a prominent industrial area filled with dry-docks and shipyards in the late 1800s, and is said to be named after the India Rice Mill Company, which docked its ships along the bay. The meat-packing companies of Butchertown were adjacent to the site (Fox no date).

In the 1970s the area was redeveloped into large industrial areas after shipping at India Basin declined. Mayor Willie Brown declared India Basin Shoreline Park a Renaissance Park in August 1999. Plans for improvements to the park include the Bay Trail, improved access to the park, and a survey of additional improvements for the future expansion of the park that will connect this park with other land owned by SFRPD (Fox no date).

## **MCLAREN PARK**

Before the immigration of Europeans to San Francisco, the native Ohlone once lived in the area known as McLaren Park. Abundant resources such as plants, fungi, insects, and other organisms provided them with food and medicine. Two ranchos existed on the site before 1836 when California was a part of Mexico (FOMP no date).

In 1840, architect Daniel Burnham worked with the Association for the Improvement and Advancement of San Francisco and introduced the Burnham Plan. The plan created a subdivision that included two parks on hilltops where McLaren and Bayview Parks are situated (Alexander no date). During the 1860s, homestead associations formed in the southern parts of San Francisco in the Burnham Plan. The Association subdivided the area into a grid formation and sold lots for residential housing. The San Francisco Board of Supervisors proposed to purchase 550 acres. A bond measure to support this purchase failed in 1928; however, land continued to be acquired using general fund monies. In 1946, after several revisions and a lawsuit to stop the project, the park plan was reduced to 318 acres (FOMP no date). The final land purchase was made in 1958 and McLaren Park became the second-largest park in the City (Alexander no date).

Before the present-day boundaries of the park were established, trees had been planted. The WPA made improvements to the park, adding foot paths, hiking, fire, and equestrian trails, culverts, roadways, and a view drive, and planting over 10,000 eucalyptus, cypress, and pine varieties. The park was dedicated to John McLaren, Superintendent of Parks, in 1934. Improvements were suspended in the 1940s, but resumed in the 1950s and have continued up to the present.

## **BERNAL HILL**

The steep slopes of Bernal Hill give a glimpse as to what the northern San Francisco peninsula may have been like 250 years ago. Native grasses and wild flowers include footsteps-of-spring (*Sanicula arctopoides*), farewell-to-spring (*Clarkia rubicunda*), sun cup (*Camissonia ovata*),

blue-eyed grass (*Sisyrinchium bellum*), checkerbloom (*Sidalcea malvaeflora*), and shooting star (*Dodecatheon clevelandii* ssp. *patulum*). Ocean breezes constantly blow native purple needle grass (*Nassella pulchra*) and red fescue (*Festuca rubra*) at Bernal Hill.

The Ohlone people once inhabited the Bernal Hill area. Their small village, located in what is known as Bernal and Mission neighborhoods in the warm fog-free valley, was called *Awaa-te*, and they used plants in the area for food and medicine. In 1775, after the arrival of Spanish settlers to the Mission and Bernal area, Captain Juan Bautista de Anza established the site of Mission Dolores. Many of the Ohlone were forced into the Mission village, where they contracted European diseases and died. Over 5,000 native inhabitants of San Francisco are buried at the Mission Dolores cemetery (SFRPD no date).

Bernal Hill was part of a land grant owned by Jose Cornelio de Bernal, who was a soldier in Anza's expedition. The Bernal region became inhabited by squatters. These squatters eventually became landowners and citizens of the City through the Van Ness Ordinance of 1855<sup>5</sup>. The hill was heavily used for cattle and dairy ranching by the residents. In May 1876, gold rush fever swept the area after a Frenchman, Victor Resayre, claimed to discover gold at the hill's summit. The hill was extensively mined until it was revealed that it was quartz, not gold, that was originally discovered (SFRPD no date).

In 1973, some of the residents of Bernal Hill lobbied the Department of Public Works to cease plans to level the hill for an airplane field. The hill was handed over to SFRPD as designated open space. In 1994, residents also fought a plan to construct a sewer vent on the hill through which noxious gases from the proposed cross-town wastewater tunnel might escape. The Natural Areas Program, the Bernal Hilltop Restoration Project, and the California Native Plant Society are in collaboration to re-establish the native ecosystem through replanting, erosion control, and monitoring of plant and animal species (SFRPD no date).

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<sup>5</sup> Significant areas of San Francisco were settled by squatters. In 1855, the City claimed title to many of these areas (the Mission and Western Addition), but it quickly became clear that eviction of the squatters would not be possible. The Van Ness Ordinance (authored by James P. Van Ness) was passed on September 27, 1855. It allowed title of land to pass to anyone who could prove possession.

**Table 3-1. Monthly Average Temperatures and Precipitation from 1961 to 1990 for Two Locations in San Francisco\***

<b>Average Monthly Temperature</b>	<b>Jan</b>	<b>Feb</b>	<b>Mar</b>	<b>Apr</b>	<b>May</b>	<b>Jun</b>	<b>Jul</b>	<b>Aug</b>	<b>Sep</b>	<b>Oct</b>	<b>Nov</b>	<b>Dec</b>	<b>Annual Average</b>
West Side of GG Park	50.3	52.7	53.2	54.2	55.4	57.3	58.5	59.6	60.5	59.4	55.1	50.8	55.6
Mission Dolores	51.1	54.4	54.9	56.0	56.6	58.4	59.1	60.1	62.3	62.0	57.2	51.7	57.0
<b>Average Monthly Percipitation (Inches)</b>													
West Side of GG Park	4.81	3.43	3.02	1.34	0.29	0.17	0.03	0.10	0.20	1.48	3.39	3.50	21.76
Mission Dolores	4.06	2.95	3.07	1.29	0.25	0.15	0.04	0.07	0.26	1.26	3.21	3.10	19.71

\*Owenby, J. and D. Ezell. 1992. Climatography of the United States No. 8. California. U.S. Department of Commerce.

**Table 3-2. Vegetation formations, subformations, and series for Significant Natural Areas. Dominant species in right parentheses, two letter vegetation abbreviations in left parentheses.**

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### **Herbaceous Formation**

#### **(A) Annual Grassland Subformation**

- (AA) Annual Grassland (unidentified annual spp.)
- (AB) Ripgut Brome Grassland (*Bromus diandrus*)
- (AH) Hairgrass Grassland (*Aira caryophyllea*)
- (AI) Italian Ryegrass Grassland (*Lolium multiflorum*)
- (AO) Orchard Grass Grassland (*Dactylis glomerata*)
- (AP) Purple False Brome Grassland (*Brachypodium distachyon*)
- (AR) Rattlesnake Grassland (*Briza maxima*)
- (AW) Wild Oat Grassland (*Avena* spp.)
- (AX) Wild Oat/rattlesnake Grassland (*Avena* spp./*Briza maxima*)

#### **(P) Perennial Grassland Subformation**

- (PB) Blue Wildrye Prairie (*Elymus glaucus*)
- (PC) California Oatgrass Prairie (*Danthonia californica*)
- (PF) Red Fescue Prairie (*Festuca rubra*)
- (PP) Purple Needlegrass Prairie (*Nassella pulchra*)
- (PR) Reedgrass Prairie (*Calamagrostis nutkaensis*)
- (PS) Wildrye Prairie (*Leymus xvancoverensis*)
- (PT) Tall Fescue Grassland (*Festuca arundinacea*)
- (PV) Velvet Grass Grassland (*Holcus lanatus*)

#### **(W) Wetland Subformation**

- (WB) Bulrush Marsh (*Scirpus californicus*)
- (WC) Cattail Marsh (*Typha* spp.)
- (WD) Bulrush/cattail Marsh (*Scirpus californicus*/*Typha* spp.)
- (WH) Horsetail Meadow (*Equisetum* sp.)
- (WK) Swamp Knotweed Marsh (*Polygonum amphibium* var. *emersum*)
- (WL) Lady Fern Marsh (*Athyrium filix-femina* var. *cyclosorum*)
- (WP) Pondweed Marsh (*Potamogeton pectinatus*)
- (WR) Rush Meadow (*Juncus* spp.)
- (WS) Saltgrass/pickleweed Marsh (*Distichlis spicata*/*Salicornia virginica*)
- (WT) Valley Wildrye Meadow (*Leymus triticoides*)
- (WV) Giant Vetch Marsh (*Vicia gigantea*)
- (WW) Silverweed Marsh (*Potentilla anserina* ssp. *pacifica*)

#### **(H) Other Herb Subformation**

- (HB) Bee Plant (*Scrophularia californica*)
- (HC) Cape Ivy (*Delairea odorata*)
- (HE) Mixed Exotic Herbaceous
- (HF) Fennel (*Foeniculum vulgare*)
- (HG) Giant Pea (*Lathyrus latifolius*)
- (HH) Poison Hemlock (*Conium maculatum*)
- (HI) Iceplant (*Carpobrotus edulis*)

**Table 3-2. (Continued)**

- (HP) Pampas Grass (*Cortaderia jubata*)
- (HR) Wild Radish (*Raphanus sativus*)
- (HN) Nasturtium (*Tropaeolum majus*)

**Scrub Formation**

- (F) Northern Franciscan Coastal Scrub Subformation**
  - (FA) California Sagebrush Scrub (*Artemisia californica*)
  - (FB) California Blackberry Scrub (*Rubus ursinus*)
  - (FC) Coyote Brush Scrub (*Baccharis pilularis*)
  - (FD) Dogwood Scrub (*Cornus sericea*)
  - (FH) Holly-leaf Cherry Scrub (*Prunus ilicifolia*)
  - (FL) Canyon Live Oak Scrub (*Quercus chrysolepis*)
  - (FO) Oceanspray Scrub (*Holodiscus discolor*)
  - (FP) Poison Oak Scrub (*Toxicodendron diversilobum*)
  - (FQ) Osoberry Scrub (*Oemleria cerasiformis*)
  - (FR) Red Elderberry Scrub (*Sambucus racemosa*)
  - (FS) Service Berry Scrub (*Amelanchier pallida*)
  - (FT) Thimbleberry Scrub (*Rubus parviflorus*)
  - (FW) Twinberry Scrub (*Lonicera involucrata*)
  - (FZ) Lizard-tail Scrub (*Eriophyllum staechadifolium*)
- (D) Central Dune Scrub Subformation**
  - (DB) Blue Beach Lupine Scrub (*Lupinus chamissonis*)
  - (DY) Yellow Bush Lupine Scrub (*Lupinus arboreus*)
- (R) Central Coast Riparian Scrub Subformation**
  - (RW) Willow Scrub (*Salix lasiolepis*)

**Table 3-2. (Continued)**

- (I) Non-native Scrub Subformation**
  - (IC) Cottoneaster Scrub (*Cotoneaster* spp.)
  - (IE) Mixed Exotic Scrub
  - (IF) French Broom Scrub (*Genista monspessulana*)
  - (IH) Himalayan Blackberry Scrub (*Rubus discolor*)
  - (IM) Mattress Vine Scrub (*Muehlenbeckia complexa*)
  - (IP) Pyracantha Scrub (*Pyracantha* spp.)

**Mosaic Formation**

- (M) Mosaic Subformation**
  - (MA) Bee Plant/California Blackberry Mosaic (*Scrophularia californica/Rubus ursinus*)
  - (MB) Bee Plant/Coyote Brush Mosaic (*Scrophularia californica/Baccharis pilularis*)
  - (MC) Italian Ryegrass/California Blackberry Mosaic (*Lolium multiflorum/ Rubus ursinus*)
  - (MD) Italian Ryegrass/Poison Oak Mosaic (*Lolium multiflorum/Toxicodendron diversilobum*)

**Table 3-2. (Continued)**

- (ME) Italian Ryegrass/California Sagebrush Mosaic (*Lolium multiflorum/Artemisia californica*)
- (MF) Wild Oat/Coyote Brush Mosaic (*Avena spp./Baccharis pilularis*)
- (MG) Wild Oat/French Broom Mosaic (*Avena spp./Genista monspessulana*)
- (MH) Wild Oat/Service Berry Mosaic (*Avena spp./Amelanchier pallida*)
- (MI) Wild Oat/Poison Oak Mosaic (*Avena spp./Toxicodendron diversilobum*)
- (MJ) Wild Oat/Blue Beach Lupine Mosaic (*Avena spp./Lupinus chamissonis*)
- (MK) Exotic Herb/Coyote Brush Mosaic (*Baccharis pilularis*)
- (ML) Exotic Herb/French Broom Mosaic (*Genista monspessulana*)
- (MM) Rattlesnake grass/Coyote Brush Mosaic (*Briza maxima/Baccharis pilularis*)
- (MN) Reedgrass/California Huckleberry Mosaic (*Calamagrostis nutkaensis/Vaccinium ovatum*)
- (MO) Iceplant/Coffeeferry Mosaic (*Carpobrotus edulis/Rhamnus californica*)
- (MP) Iceplant/Coyote Brush Mosaic (*Carpobrotus edulis/Baccharis pilularis*)
- (MQ) Giant Vetch/California Blackberry Mosaic (*Vicia gigantea/Rubus ursinus*)

**Forest Formation****(T) Native Forest Subformation**

- (TB) California Bay Forest (*Umbellularia californica*)
- (TC) Coast Live Oak Forest (*Quercus agrifolia*)
- (TW) California Wax Myrtle Forest (*Myrica californica*)

**(E) Non-native Forest Subformation**

- (EA) Acacia Forest (*Acacia spp.*)
- (EB) Blue Gum Forest (*Eucalyptus globulus*)
- (EC) Cypress Forest (*Cupressus macrocarpa*)
- (EE) Eucalyptus Forest (*Eucalyptus spp.*)
- (EG) Giant Sequoia Forest (*Sequoiadendron giganteum*)
- (EM) Mixed Exotic Forest
- (EP) Pine Forest (*Pinus radiata*)
- (EQ) Plume Acacia Forest (*Albizia lophantha*)
- (ER) Coast Redwood Forest (*Sequoia sempervirens*)
- (ES) Prunus Forest (*Prunus spp.*)

**Other Formation****(O) Other Subformation**

- (OB) Bare Ground
- (OD) Developed
- (OO) Ornamental
- (OR) Rock Outcrop
- (OS) Sand
- (OW) Open Water

Table 3-3. Vegetation series and acreage found within San Francisco Significant Natural Areas.

	Natural Area																												Total Acreages				
	Southwest					Southeast					Central West					Central								North									
	BP	LV	LM	PL	SP	VP	BH	IB	MP	PP	BV	GV	GH	HH	RO	FI	BG	CH	DP	DC	EM	FP	GC	IG	KH	MD	OW	OH	TK	TP	BA		
<b>Annual Grassland Subformation</b>																																	
Annual Grassland								2.96																				0.10					
Ripgut Brome Grassland		0.31	5.77		0.38																						0.15						
Hairgrass Grassland						0.05																											
Italian Ryegrass Grassland	1.13					0.29			0.31									0.20	0.09				0.14										
Orchard Grass Grassland					5.45																												
Purple False Brome Grassland					3.00																												
Rattlesnake Grassland						1.25																						0.76		0.01			
Wild Oat Grassland			0.78			5.80	19.27		79.22	0.99							2.46	3.49		0.25		0.10	12.53		1.86		0.21		1.55	3.76			
Wild Oat/rattlesnake Grassland						0.45			4.69																	4.45	0.18		0.31				
<b>Preceding subformation total:</b>	<b>1.13</b>	<b>0.31</b>	<b>6.55</b>	<b>-</b>	<b>8.84</b>	<b>7.85</b>	<b>19.27</b>	<b>2.96</b>	<b>84.22</b>	<b>0.99</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>2.46</b>	<b>3.69</b>	<b>0.09</b>	<b>0.25</b>	<b>-</b>	<b>0.10</b>	<b>12.67</b>	<b>-</b>	<b>1.86</b>	<b>4.45</b>	<b>0.46</b>	<b>0.93</b>	<b>1.55</b>	<b>4.08</b>	<b>-</b>	<b>-</b>	
<b>Perennial Grassland Subformation</b>																																	
California Oatgrass Prairie*									0.54																								
Red Fescue Prairie*									0.09						0.14																0.78		
Purple Needlegrass Prairie*	0.01		0.46			3.08	0.07		5.10	0.04								0.03					0.40							0.47			
Reedgrass Prairie*																										0.26		0.01		0.40			
Hybrid Ryegrass Prairie*			0.02																														
Tall Fescue Grassland									0.25																								
Velvet Grass Grassland									0.16																								
<b>Preceding subformation total:</b>	<b>0.01</b>	<b>-</b>	<b>0.48</b>	<b>-</b>	<b>-</b>	<b>3.08</b>	<b>0.07</b>	<b>-</b>	<b>6.13</b>	<b>0.04</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>0.14</b>	<b>-</b>	<b>-</b>	<b>0.03</b>	<b>-</b>	<b>0.05</b>	<b>-</b>	<b>-</b>	<b>0.40</b>	<b>-</b>	<b>-</b>	<b>0.26</b>	<b>-</b>	<b>0.01</b>	<b>-</b>	<b>1.65</b>	<b>-</b>	<b>-</b>	
<b>Wetland Subformation</b>																																	
Bulrush Marsh*			34.89	0.26																													
Cattail Marsh*			0.03						0.33																								
Bulrush/cattail Marsh*					18.11																												
Horsetail Meadow*					0.02																												
Swamp Knotweed Marsh*			6.93	0.10																													
Lady Fern Marsh*					0.04																												
Pondweed Marsh*					0.67																												
Rush Meadow*			0.71		0.02	0.03			0.14																								
Saltgrass/pickleweed Marsh*					0.75			0.53																									
Giant Vetch Marsh*			1.12																														
Silver Weed Marsh*					1.58																												
<b>Preceding subformation total:</b>	<b>-</b>	<b>-</b>	<b>43.68</b>	<b>0.36</b>	<b>21.20</b>	<b>0.03</b>	<b>-</b>	<b>0.53</b>	<b>0.47</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>66.26</b>	
<b>Other Herbaceous Subformation</b>																																	
Bee Plant Herbaceous*			0.44																														
Cape Ivy			1.36																						0.03								
Mixed Exotic Herbaceous			2.91		0.42							0.01						0.77		0.09	0.12												
Fennel							0.09		2.92																								
Giant Pea																		0.03					0.03										
Poison Hemlock			0.33		0.09																												
Iceplant Herbaceous	0.05		7.27		1.45									0.15	0.87																0.75		
Pampas Grass			0.03						0.21																								
Wild Radish							0.24					0.00						0.23						0.87						0.12			
Nasturtium			0.02																														
<b>Preceding subformation total:</b>	<b>0.05</b>	<b>-</b>	<b>12.36</b>	<b>-</b>	<b>1.96</b>	<b>-</b>	<b>0.33</b>	<b>-</b>	<b>3.13</b>	<b>-</b>	<b>0.00</b>	<b>0.01</b>	<b>-</b>	<b>0.15</b>	<b>0.87</b>	<b>-</b>	<b>-</b>	<b>1.03</b>	<b>-</b>	<b>0.09</b>	<b>0.12</b>	<b>-</b>	<b>0.90</b>	<b>0.03</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>0.12</b>	<b>0.75</b>	<b>21.90</b>	
<b>Northern Franciscan Coastal Scrub Subformation</b>																																	
California Sagebrush Scrub*			0.65		4.19																												
California Blackberry Scrub*			5.02	0.53	0.20											0.12							0.11							0.31			
Coyote Brush Scrub*	0.18		1.47		11.49	0.13			1.85								0.18						1.12				0.48		1.89		5.84		
Dogwood Scrub*					1.86																												
Holly-leaf Cherry Scrub*						0.25																											
Canyon Live Oak Scrub*			0.11																														
Oceanspray Scrub*					10.07																												
Poison Oak Scrub*			1.15		0.33	1.40												0.17					5.40		0.03	0.50		0.21		0.27			
Osoberry Scrub*		0.00																															
Red Elderberry Scrub*					3.57																						0.60						
Thimbleberry Scrub*					0.46																												
Twinberry Scrub*			0.08																														
Lizard-tail Scrub*			0.41																														
<b>Preceding subformation total:</b>	<b>0.18</b>	<b>0.00</b>	<b>8.90</b>	<b>0.53</b>	<b>32.17</b>	<b>1.78</b>	<b>-</b>	<b>-</b>	<b>1.85</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>0.12</b>	<b>0.18</b>	<b>0.17</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>8.12</b>	<b>-</b>	<b>0.03</b>	<b>1.58</b>	<b>-</b>	<b>2.10</b>	<b>0.01</b>	<b>7.69</b>	<b>-</b>	<b>65.41</b>	

Notes:  
 \* Indicates vegetation type is dominated by native species.  
 Shaded cells indicate acreages <0.01 acre

<b>Southwest</b> BP = Brooks Park LV = Lakeview/Ashton Mini Park LM = Lake Merced PL = Pine Lake SP = Sharp Park	<b>Southeast</b> VP = Bayview Park BH = Bernal Hill IB = India Basin Shoreline Park MP = McLaren Park PP = Palou/Phelps	<b>Central West</b> BV = Buena Vista GV = Grandview Park GH = Golden Gate Heights HH = Hawk Hill RO = Rock Outcrop	<b>Central</b> FI = 15th Avenue Steps BG = Billy Goat Hill CH = Corona Heights DP = Dorothy Erskine Park DC = Duncan-Castro EM = Edgehill Mountain	<b>Central</b> FP = Fairmount Park GC = Glen Canyon Park IG = Interior Green Belt KH = Kite Hill MD = Mount Davidson OW = Golden Gate Park (Oak Woodland and Strawberry Hill)	<b>North</b> OH = O'Shaughnessy Hollow TK = Tank Hill TP = Twin Peaks BA = Balboa Natural Area
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Table 3-3 continued. Vegetation series and acreage found within San Francisco Significant Natural Areas.

	Natural Area																												Total Acreages			
	Southwest					Southeast					Central West					Central								North								
	BP	LV	LM	PL	SP	VP	BH	IB	MP	PP	BV	GV	GH	HH	RO	FI	BG	CH	DP	DC	EM	FP	GC	IG	KH	MD	OW	OH	TK	TP	BA	
<b>Central Dune Scrub Subformation</b>																																
Blue Beach Lupine Scrub*														3.69																		
Beach Bur Sand Verbena*																													1.09			
Yellow Bush Lupine Scrub*			0.20																							0.72						
<b>Preceding subformation total:</b>	-	-	<b>0.20</b>	-	-	-	-	-	-	-	-	-	-	<b>3.69</b>	-	-	-	-	-	-	-	-	-	-	-	-	<b>0.72</b>	-	-	-	<b>1.09</b>	
<b>Central Coast Riparian Scrub Subformation</b>																																
Willow Scrub*			27.96	1.68	7.23	0.12	0.12		2.86					0.04	0.07			0.00					10.03									
<b>Preceding subformation total:</b>	-	-	<b>27.96</b>	<b>1.68</b>	<b>7.23</b>	<b>0.12</b>	<b>0.12</b>	-	<b>2.86</b>	-	-	-	-	<b>0.04</b>	<b>0.07</b>	-	-	<b>0.00</b>	-	-	-	-	<b>10.03</b>	-	-	-	-	-	-	-		
<b>Non-native Scrub Subformation</b>																																
Cottoneaster Scrub																																
French Broom Scrub			0.77		4.25	8.06		2.55										0.78				5.52			0.56		0.77	0.43	3.91			
Himalayan Blackberry Scrub			0.06				0.29	0.61			0.01						0.10							0.07	1.17			0.02				
Mattress Vine Scrub																										0.02						
<b>Preceding subformation total:</b>	-	-	<b>0.83</b>	-	<b>4.25</b>	<b>8.06</b>	<b>0.29</b>	-	<b>3.16</b>	-	<b>0.01</b>	-	-	-	-	-	<b>0.10</b>	<b>0.78</b>	-	-	-	-	<b>5.52</b>	-	<b>0.07</b>	<b>1.72</b>	<b>0.02</b>	<b>0.77</b>	<b>0.45</b>	<b>3.91</b>	-	
<b>Mosaic Subformation</b>																																
Bee Plant/California Blackberry Mosaic*			0.21																				0.00									
Bee Plant/Coyote Brush Mosaic*			0.33																										0.60			
Italian Ryegrass/California Blackberry Mosaic																0.01																
Italian Ryegrass/Poison Oak Mosaic			0.21																													
Italian Ryegrass/California Sagebrush Mosaic																										0.43						
Wild Oat/Coyote Brush Mosaic*								2.97	0.04			2.96	0.42										0.83					6.00				
Wild Oat/French Broom Mosaic						1.01			0.42									0.27														
Wild Oat/Poison Oak Mosaic*												0.09																	0.59			
Wild Oat/Silver Bush Lupine Mosaic*																													0.59			
Exotic Herb/Coyote Brush Mosaic								0.08															1.02							1.10		
Rattlesnake Grass/Coyote Brush Mosaic*																												3.14				
Reedgrass/California Huckleberry Mosaic*																										1.16						
Iceplant/Coffeeberry Mosaic			0.10																											0.10		
Iceplant/Coyote Brush Mosaic			2.69																											2.69		
Giant Vetch/California Blackberry Mosaic*			0.73																											0.73		
<b>Preceding subformation total:</b>	<b>0.21</b>	-	<b>4.06</b>	-	-	<b>1.01</b>	-	-	<b>3.05</b>	<b>0.46</b>	-	<b>3.05</b>	<b>0.42</b>	-	-	<b>0.01</b>	-	<b>0.27</b>	-	-	-	-	<b>1.85</b>	-	-	<b>1.59</b>	-	-	-	<b>10.33</b>	-	
<b>Native Forest Subformation</b>																																
Coast Live Oak Forest*			0.13			0.05		0.30			3.30					0.12		0.16					0.11				12.92			17.09		
California Wax Myrtle Forest*																										0.04				0.04		
<b>Preceding subformation total:</b>	-	-	<b>0.13</b>	-	-	<b>0.05</b>	-	-	<b>0.30</b>	-	<b>3.30</b>	-	-	-	-	<b>0.12</b>	-	<b>0.16</b>	-	-	-	-	<b>0.11</b>	-	-	-	<b>12.96</b>	-	-	-	<b>17.13</b>	
<b>Non-native Forest Subformation</b>																																
Acacia Forest			3.96																								0.16			4.12		
Blue Gum Forest			14.73	4.00	66.07	17.11	0.56	25.67	0.49			0.22					0.11	0.25	0.52		1.87		15.36	16.37	0.35	29.96	0.23	0.52	0.00	194.41		
Cypress Forest			7.68	0.10	11.81			0.89			0.84	0.37		0.01				0.10					0.16		0.03	0.10		0.34	22.44			
Eucalyptus Forest			0.09					0.55																			0.25			0.90		
Giant Sequoia Forest								0.25																					0.25			
Mixed Exotic Forest	0.30		12.01		70.72		0.77	29.42		1.66		0.38	0.11			0.38	2.01	0.86			0.60	0.87			10.07	0.02	0.01	1.05	131.23			
Pine Forest			3.55		2.20			0.87	0.00				0.08	0.02		0.04	0.06		0.02			0.72		0.00		0.25			7.81			
Plume Acacia Forest			1.12																										1.12			
Coast Redwood Forest											0.15																		0.15			
Prunus Forest			0.11																										0.11			
<b>Preceding subformation total:</b>	<b>0.30</b>	-	<b>43.25</b>	<b>4.10</b>	<b>150.80</b>	<b>17.11</b>	<b>1.33</b>	-	<b>57.66</b>	<b>0.49</b>	<b>2.65</b>	<b>0.59</b>	<b>0.38</b>	<b>0.19</b>	<b>0.03</b>	-	<b>0.53</b>	<b>2.43</b>	<b>1.38</b>	<b>0.02</b>	<b>1.87</b>	<b>0.60</b>	<b>17.11</b>	<b>16.37</b>	<b>0.39</b>	<b>30.06</b>	<b>10.97</b>	<b>0.02</b>	<b>0.53</b>	<b>1.39</b>	-	
<b>Other Subformation</b>																																
Bare Ground			0.44			0.11																						0.25		0.80		
Restoration Area*						1.28		2.61																					3.90			
Developed	0.00		1.17	0.13	6.73	2.34	1.46	0.08	1.91	0.01	0.17	0.02					0.02	0.01			0.28	0.03	1.67		0.12	1.04	0.07	0.87	18.13			
Ornamental				0.01		0.92		0.36						0.30			0.05			0.01			0.31		0.05		0.05		2.06			
Rock Outcrop	0.11	0.18				0.06	1.25		0.03	0.05		0.05	0.02	0.07	0.47		0.11	0.97		0.08	0.05	0.01	1.30		0.03	0.16	0.43	0.18	0.75	6.35		
Sand												0.19																	0.19			
Open Water			244.89	1.69	3.93																								250.51			
<b>Preceding subformation total:</b>	<b>0.11</b>	<b>0.18</b>	<b>246.50</b>	<b>1.83</b>	<b>10.67</b>	<b>4.71</b>	<b>2.71</b>	<b>2.69</b>	<b>2.30</b>	<b>0.05</b>	<b>0.17</b>	<b>0.26</b>	<b>0.02</b>	<b>0.37</b>	<b>0.47</b>	-	<b>0.16</b>	<b>0.99</b>	<b>0.01</b>	<b>0.09</b>	<b>0.32</b>	<b>0.04</b>	<b>3.28</b>	-	<b>0.08</b>	<b>0.28</b>	<b>1.09</b>	<b>0.43</b>	<b>0.25</b>	<b>1.87</b>	-	
<b>Total Acreages</b>	<b>2.00</b>	<b>0.50</b>	<b>394.88</b>	<b>8.50</b>	<b>237.12</b>	<b>43.81</b>	<b>24.12</b>	<b>6.17</b>	<b>165.14</b>	<b>2.03</b>	<b>6.13</b>	<b>3.92</b>	<b>0.82</b>	<b>4.44</b>	<b>1.59</b>	<b>0.25</b>	<b>3.43</b>	<b>9.55</b>	<b>1.47</b>	<b>0.50</b>	<b>2.31</b>	<b>0.74</b>	<b>59.99</b>	<b>16.40</b>	<b>2.44</b>	<b>39.94</b>	<b>26.22</b>	<b>4.26</b>	<b>2.80</b>	<b>31.05</b>	<b>1.84</b>	<b>1,104.35</b>

Notes:

\* Indicates vegetation type is dominated by native species. Shaded cells indicate acreages <0.01 acre

**Southwest**

BP = Brooks Park  
 LM = Lake Merced  
 PL = Pine Lake  
 SP = Sharp Park  
 LV = Lakeview/Ashton Mini Park

**Southeast**

VP = Bayview Park  
 BH = Bernal Hill  
 IB = India Basin Shoreline Park  
 MP = McLaren Park  
 PP = Palou/Phelps

**Central West**

BV = Buena Vista  
 GV = Grandview Park  
 GH = Golden Gate Heights  
 HH = Hawk Hill  
 RO = Rock Outcrop

**Central**

FI = 15th Avenue Steps  
 BG = Billy Goat Hill  
 CH = Corona Heights  
 DP = Dorothy Erskine Park  
 DC = Duncan-Castro  
 EM = Edgemoor Mountain

FP = Fairmount Park  
 GC = Glen Canyon Park  
 IG = Interior Green Belt  
 KH = Kite Hill  
 MD = Mount Davidson  
 OW = Golden Gate Park (Oak Woodland and Strawberry Hill)

OH = O'Shaughnessy Hollow  
 TK = Tank Hill  
 TP = Twin Peaks

**North**  
 BA = Balboa Natural Area

Table 3-4. Summary of species richness, percent cover, and frequency of plants for seven habitat types within San Francisco Significant Natural Areas.  
(Data calculated from point sampling data and provided by Lisa Wayne, SFRPD, 2002).

Habitat	Natural Area	Species Richness			% Cover Native	% Cover Non-native	Frequency native	Frequency non-native
		Richness Native	Richness Non-native	Proportion native / non				
<b>Scrub</b>								
	Glen Canyon	52	34	1.53	47%	53%	68%	32%
	O'Shaugnessy Hollow	35	5	7.00	99%	1%	90%	10%
	Twin Peaks	36	21	1.71	59%	41%	61%	39%
<b>Grasslands</b>								
	Billy Goat	27	31	0.87	51%	49%	35%	65%
	Corona Heights	30	29	1.03	28%	72%	38%	62%
	Glen Canyon	82	44	1.86	42%	58%	37%	63%
	Kite Hill	30	24	1.25	11%	89%	45%	55%
	Mt. Davidson	43	23	1.87	48%	52%	47%	53%
	Rock Outcrop	42	29	1.45	44%	56%	54%	46%
	Tank Hill	37	23	1.61	22%	78%	55%	45%
	Twin Peaks	50	34	1.47	57%	43%	52%	48%
	Bernal Hill	42	33	1.27	51%	49%	36%	64%
	Bayview Hill	63	39	1.62	41%	59%	53%	47%
	McLaren Park	63	55	1.15	33%	67%	34%	66%
	Palou-Phelps	30	34	0.88	22%	78%	44%	56%
<b>Tule</b>								
	Lake Merced	9	7	1.29	75%	25%	92%	8%
<b>Willow</b>								
	Glen Canyon	28	23	1.22	36%	64%	55%	45%
	Lake Merced	23	16	1.44	82%	18%	78%	22%
<b>Non-oak forest</b>								
	Bayview Hill	28	30	0.93	24%	76%	49%	51%
	Mt. Davidson	21	29	0.72	36%	64%	35%	65%
	McLaren Park	40	58	0.69	25%	75%	28%	72%
<b>Dune scrub</b>								
	Golden Gate Heights	20	14	1.43	28%	72%	53%	47%
	Grandview Park	36	24	1.50	52%	48%	57%	43%
	Hawk Hill	31	19	1.63	51%	49%	65%	35%
	Lake Merced	65	35	1.86	65%	35%	83%	17%
<b>Oak Woodland</b>								
	15th Ave. Steps	13	15	0.87	84%	16%	56%	44%
	Golden Gate Park	17	33	0.52	34%	66%	53%	47%
				Minimum	11%	1%	28%	8%
				Maximum	99%	89%	92%	72%
				Average	46%	54%	54%	46%

**Table 3-5. Sensitive species presently and historically known to occur at Significant Natural Areas.**

Species	Common Name	Status Federal, State, CNPS, Local	Local Significance
<b>Birds</b>			
<i>Aechmophorus clarkii</i>	Clark's Grebe	SLC	Few breeding records from Lake Merced. Also occurs at Sharp Park and India Basin on occasion.
<i>Podilymbus podiceps</i>	Pied-billed Grebe	SLC	Breeds at Lake Merced and Pine Lake. Also present at Sharp Park
<i>Phalacrocorax auritus</i>	Double-crested Cormorant	CSC (rookeries)	Presently nests at Lake Merced
<i>Phalacrocorax penicillatus</i>	Brandt's Cormorant	SLC	Found only at India Basin.
<i>Phalacrocorax pelagicus</i>	Pelagic Cormorant	SLC	Found only at India Basin.
<i>Nycticorax nycticorax</i>	Black-crowned Night Heron	-	Locally uncommon, may breed at Lake Merced. Observed at Sharp Park, India Basin, and McLaren Park.
<i>Butorides striatus</i>	Green Heron	SLC	Presently occurs at Golden Gate Park and Pine Lake. Presently nests at Lake Merced.
<i>Ardea herodias</i>	Great Blue Heron	Sens	Presently nests at Lake Merced
<i>Anas strepera</i>	Gadwall	SLC	Historically bred within San Francisco. Now a winter resident at Lake Merced, Pine Lake, Sharp Park, India Basin, and McLaren Park.
<i>Rallus limicola</i>	Virginia Rail	SLC	Presently occurs at Lake Merced
<i>Porzana carolina</i>	Sora	SLC	Presently occurs at Lake Merced
<i>Laterallus jamaicensis coturniculus</i>	Black Rail	SLC	Historically reported, not recently observed in the City
<i>Haematopus bachmani</i>	Black Oystercatcher	SLC	Occurs in India Basin only
<i>Charadrius alexandrinus</i>	Snowy Plover	FT, CSC	Presently occurs at Ocean Beach
<i>Cephus columba</i>	Pigeon Guillemont	SLC	Occurs in India Basin only
<i>Buteo lineatus</i>	Red-shouldered Hawk	SLC	Lake Merced, Pine Lake, Palau Phelps, Golden Gate Heights, Billy Goat Hill, and Dorothy Erskine Park. Breeds at Sharp Park, Bayview Hill, McLaren Park, Buena Vista Park, and Glen Canyon.
<i>Buteo jamaicensis</i>	Red-tailed Hawk	SLC	Found in most Natural Areas. Breeds at Sharp Park, Bayview Hill, McLaren Park, Buena Vista Park, Dorothy Erskine Park, Glen Canyon Park, Mt. Davidson, Tank Hill, and Twin Peaks.
<i>Pandion haliaetus</i>	Osprey	SLC	Observed at Lake Merced, India Basin, and McLaren Park.
<i>Falco sparverius</i>	American Kestrel	SLC	Lake Merced, Sharp Park, Bayview Hill, India Basin, and Mt. Davidson. Breeds at McLaren Park.
<i>Falco peregrinus</i>	Peregrine Falcon	SLC	Likely forages in most Natural Areas. No breeding habitat in any of the Natural Areas.
<i>Callipepla californica</i>	California Quail	SLC	Presently occurs at the Presidio and the Arboretum in Golden Gate Park
<i>Columba fasciata</i>	Band-tailed Pigeon	SLC	Sharp Park, Buena Vista. Breeds in Glen Canyon, Mt. Davidson, and Twin Peaks
<i>Bubo virginianus</i>	Great Horned Owl	SLC	Found in Sharp Park. Breeds at Lake Merced, Pine Lake, McLaren Park, and Glen Canyon.
<i>Tyto alba</i>	Barn Owl	SLC	Presently occurs at Lake Merced. Historically reported from Golden Gate Park.
<i>Otus kennicottii</i>	Western Screech Owl	SLC	Presently occurs at Oak Woodlands (Golden Gate Park)

**Table 3-5. Sensitive species presently and historically known to occur at Significant Natural Areas.**

Species	Common Name	Status Federal, State, CNPS, Local	Local Significance
<i>Aeronautes saxatalis</i>	White-throated Swift	SLC	Found at Edgehill Mtn, Fairmount Park, Glen Canyon, Interior Greenbelt, Kite Hill, and Mt. Davidson.
<i>Picoides villosus</i>	Hairy Woodpecker	SLC	Found in Sharp Park.
<i>Contopus borealis</i>	Olive-sided Flycatcher	SLC	Currently nests at Lake Merced, Golden Gate Park, Buena Vista, and the Presidio
<i>Sayornis saya</i>	Say's Phoebe	SLC	Winter resident at Sharp Park, Bayview Hill, Bernal Heights, India Basin, McLaren Park, and Mt. Davidson.
<i>Empidonax difficilis</i>	Pacific-slope Flycatcher	SLC	Found in Sharp Park, Bayview Hill, McLaren Park, Billy Goat Hill, Corona Heights, Duncan-Castro, Glen Canyon Park, Mt. Davidson, Oak Woodlands, Tank Hill, and Twin Peaks.
<i>Eremophila alpestris</i>	Horned Lark	SLC	Occurs during migration only. Historic breeding records.
<i>Tachycineta bicolor</i>	Tree Swallow	SLC	Found in Sharp Park, Bayview Hill, and Golden Gate Heights. Breeds in Glen Canyon Park and McLaren Park.
<i>Tachycineta thalassina</i>	Violet-green Swallow	SLC	Found in Sharp Park, Bayview Hill, Golden Gate Heights, Glen Canyon Park, Kite Hill, Mt. Davidson, and Twin Peaks.
<i>Riparia riparia</i>	Bank Swallow	ST	Currently nest at Fort Funston and forage over Lake Merced
<i>Hirundo pyrrhonota</i>	Cliff Swallow	SLC	Currently nests at Lake Merced and Golden Gate Park
<i>Hirundo rustica</i>	Barn Swallow	SLC	Found in most Natural Areas. Breeds at Lake Merced, Pine Lake, McLaren Park, Buena Vista Park, Billy Goat Hill, Corona Heights, Glen Canyon Park, and Mt. Davidson.
<i>Cyanocitta stelleri</i>	Steller's Jay	SLC	Found at Sharp Park, Buena Vista, Glen Canyon Park. Breeds at Mt. Davidson and Oak Woodlands.
<i>Chamaea fasciata</i>	Wrentit	SLC	Presently occurs at McLaren Park, and Bayview Hill.
<i>Sitta canadensis</i>	Red-breasted Nuthatch	SLC	Winter resident at Lake Merced, Pine Lake, Bayview Hill, McLaren Park, Golden Gate Heights, Corona Heights, Dorothy Erskine Park, Glen Canyon Park, Mt. Davidson, and Oak Woodlands.
<i>Sitta pygmaea</i>	Pygmy Nuthatch	SLC	Breeds at Brooks Park, Lake Merced, Pine Lake, Bayview Hill, McLaren Park, Buena Vista, Golden Gate Heights, Corona Heights, Dorothy Erskine Park, Edgehill Mtn, Fairmount Park, Glen Canyon, Interior Greenbelt, Mt. Davidson, Oak Woodland, Tank Hill, and Twin Peaks. Also found at Kite Hill.
<i>Thryomanes bewickii</i>	Bewick's Wren	SLC	Presently nests at Lake Merced and Fort Funston
<i>Catharus ustulatus</i>	Swainson's Thrush	SLC	Breeds at Sharp Park. Also found at Buena Vista, Golden Gate Heights, Glen Canyon, McLaren Park, Oak Woodlands, and Twin Peaks.
<i>Lanius ludovicianus</i>	Loggerhead Shrike	SLC	Occurs during migration only. Historic breeding records.
<i>Vireo huttoni</i>	Hutton's Vireo	SLC	Found at Sharp Park, Bayview Hill, McLaren Park, Pine Lake, and Buena Vista. Likely breeds in San Francisco.

**Table 3-5. Sensitive species presently and historically known to occur at Significant Natural Areas.**

Species	Common Name	Status Federal, State, CNPS, Local	Local Significance
<i>Vermivora celata</i>	Orange-crowned Warbler	SLC	Found at Lake Merced, Pine Lake, Bayview Hill, McLaren Park, Buena Vista, Billy Goat Hill, Edgehill Mt., Glen Canyon Park, Mt. Davidson, Oak Woodlands, and Twin Peaks. Likely breeds in San Francisco at Mt. Davidson.
<i>Dendroica petechia</i>	Yellow Warbler	CSC (nesting)	Observed at Lake Merced in spring 2000, breeding undocumented
<i>Wilsonia pusilla</i>	Wilson's Warbler	SLC	Found at Bernal Heights, Bayview Hill, McLaren Park, Buena Vista, Golden Gate Heights, Corona Heights, Dorothy Erskine, Glen Canyon Park, Oak Woodlands, and Twin Peaks. Breeds at lake Merced, Pine Lake, and Mt. Davidson.
<i>Geothlypis trichas</i>	Common Yellowthroat	CSC	Presently occurs at Lake Merced and Sharp Park
<i>Pipilo maculatus</i>	Spotted Towhee	SLC	Presently occurs at Mount Davidson, Presideo, Oak Woodlands (Golden Gate Park), McLaren Park, Glen Canyon Park, and Twin Peaks.
<i>Junco hyemalis</i>	Dark-eyed Junco	-	Breeding population limited, wintering birds widespread in parks and yards of San Francisco
<i>Zonotrichia leucophrys</i>	White-crowned Sparrow	-	Breeding population limited, wintering birds widespread in parks and yards of San Francisco
<i>Icterus cucullatus</i>	Hooded Oriole	SLC	Breeds at Lake Merced and Glen Canyon Park. Also found at McLaren Park, Buena Vista, and Mt. Davidson.
<i>Carduelis tristis</i>	American Goldfinch	SLC	Breeds at Lake Merced, Sharp Park, Bayview Hill, and McLaren Park. Also found at Glen Canyon, Mt. Davidson, and Twin Peaks.
<i>Carduelis psaltria</i>	Lesser Goldfinch	SLC	Breeds at Bayview Hill, McLaren Park, Gilly Goat Hill, Corona Heights, Glen Canyon Park, Mt. Davidson, and Twin Peaks. Also found at Brooks Park, Dorothy Erskine Park, and Farimount Park.
<i>Loxia curvirostra</i>	Red Crossbill	SLC	Winter resident found at Lake Merced, McLaren Park, Buena Vista, Golden Gate Heights, Oak Woodlands, and Twin Peaks.
<i>Carpodacus purpureus</i>	Purple Finch	SLC	Breeds at Lake Merced, Glen Canyon, Mt. Davidson, Oak Woodlands, and Twin Peaks. Also found at Pine Lake, Sharp Park, Bayview Hill, McLaren Park, Buena Vista, Golden Gate Heights, Corona Heights, and Dorothy Erskine Park.

**Table 3-5. Sensitive species presently and historically known to occur at Significant Natural Areas.**

Species	Common Name	Status Federal, State, CNPS, Local	Local Significance
<b>Fish</b>			
<i>Eucyclogobius newberryi</i>	Tidewater Goby	FPD (FE), CSC	Historically collected (1895), not recently observed in the City
<b>Reptiles and Amphibians</b>			
<i>Clemmys marmorata</i>	Western Pond Turtle	CSC	Presently occurs at Lake Merced. Presumed extant at Pine Lake but not recently observed.
<i>Rana aurora draytonii</i>	California Red-legged Frog	FT	Historically observed at Lake Merced. Recently observed at Sharp Park.
<i>Thamnophis sirtalis elegans</i>	San Francisco Garter Snake	FE, SE, SFP	Historically reported from Sharp Park
<b>Invertebrates</b>			
<i>Caecuditea tomalensis</i>	Tomales Isopod	FSC	Collected in 1984 from Lake Merced (CNDDDB 2000)
<i>Euphydryas editha bayensis</i>	Bay Checkerspot Butterfly	FT	Reported from Mt. Davidson and Twin Peaks in 1980. Not currently present at either Natural Area.
<i>Icaricia icarioides missionensis</i>	Mission Blue Butterfly	FE	Reported at Sharp Park and McLaren Park in 1988 and from Bayview Park in 2001. Currently breeds on Twin Peaks
<i>Incisalia mossii bavensis</i>	San Bruno Elfin Butterfly	FE	
<i>Ischnura gemina</i>	San Francisco Forktail Damselfly	-	Not observed since 1989, presumed present in Glen Canyon. Presently occurs in McLaren Park.
<i>Lichnanthe ursina</i>	Bumblebee Scarab Beetle	FSC	1980 report from dunes near Laguna Salada, presumed present
<i>Speyeria callippe callippe</i>	San Francisco Silverspot Butterfly	FE	
<b>Plants</b>			
<i>Amsinckia menziesii</i> var. <i>intermedia</i>	Common Fiddleneck	LS	Presently occurs at Bayview Park, and Twin Peaks
<i>Aquilegia formosa</i>	Red Columbine	LS	Presently occurs at Glen Canyon, O'Shaughnessy Hollow, and Mount Davidson
<i>Arabis blepharophylla</i>	Coast Rock Cress	CNPS List 4	Presently occurs at Mt. Davidson, O'Shaughnessy Hollow, and Twin Peaks
<i>Arctostaphylos hookeri</i> ssp. <i>franciscana</i>	Franciscan manzanita	CNPS List 1A	Historically occurred at Mt. Davidson
<i>Arctostaphylos hookeri</i> ssp. <i>ravenii</i>	Raven's manzanita	FE, SE, CNPS List 1B	Historically occurred at Mt. Davidson
<i>Aristolochia californica</i>	California Pipevine	-	Presently occurs at occur at Lake Merced
<i>Aster radulinus</i>	Broadleaf Aster	LS	Presently occurs at Bayview Park
<i>Astragalus nutalli</i> var. <i>virgatus</i>	Nuttall's Milk Vetch	LS	Historically occurred at Lake Merced
<i>Blennosperma nanum</i>	Common Stickyseed	LS	Presently occurs at Bayview Park
<i>Calamagrostis nutkaensis</i>	Pacific Reed Grass	LS	Southern range limit, presently occurs at Mt. Davidson, Twin Peaks, and Edgehill Mtn.
<i>Castilleja exserta</i>	Purple Owl's Clover	LS	Presently occurs at Mount Davidson and Glen Canyon
<i>Castilleja wightii</i>	Paintbrush	LS	Presently occurs at Hawk Hill, Lake Merced, and Balboa Natural Area.

**Table 3-5. Sensitive species presently and historically known to occur at Significant Natural Areas.**

Species	Common Name	Status Federal, State, CNPS, Local	Local Significance
<i>Cerastium arvense</i>	Meadow White	LS	Presently occurs at Twin Peaks and Rock Outcrop
<i>Chenopodium californicum</i>	California Goosefoot	LS	Historically occurred at Lake Merced
<i>Chorizanthe cuspidata</i> var. <i>cuspidata</i>	San Francisco Spineflower	FSC, CNPS List 1B	Presently occurs at Ft. Funston, Golden Gate Heights, and Lake Merced
<i>Clarkia rubicunda</i>	Farewell-to-Spring	-	Presently occurs at Tank Hill, Bayview Hill, and Lakeview/Ashton Mini Park
<i>Collinsia multicolor</i>	San Francisco Collinsia	CNPS List 1B	Presently occurs at Bayview Hill
<i>Croton californica</i>	California Croton	LS	Northern distributional limit, presently occurs at Hawk Hill
<i>Delphinium californicum</i>	Larkspur	LS	Presently occurst at Bayview Park
<i>Delphinium decorum</i>	Coast Larkspur	LS	Presently occurs at Bayview Park
<i>Deschampsia danthonioides</i>	Annual Hairgrass	LS	Presently occurs at Corona and Rock Outcrop
<i>Disporum hookeri</i>	Fairy Bells	LS	Presently occurs at Interior Green Belt
<i>Dodecatheon clevelandii</i>	Shooting Star	LS	Presently occurs at Bernal Hill.
<i>Elymus multisetus</i>	Big Squirrel Tail	LS	Presently occurs at Bayview Park, Bernal Hill and McLaren Park
<i>Erigeron foliosus</i>	Leafy Daisy	LS	Presently occurs in O'Shaughnessey Hollow
<i>Erysimum franciscanum</i>	San Francisco Wallflower	FSC, CNPS List 4	Presently occurs at Grandview Park, Golden Gate Heights, Hawk Hill, and Rock Outcrop
<i>Euthamia occidentalis</i>	Western Goldenrod	LS	Historically reported not recently observed in the City.
<i>Festuca californica</i>	California Fescue	LS	Presently occurs at Bayview Park, Edgehill Mtn. and Mt. Davidson
<i>Frankenia salina</i>	Alkali-Heath	LS	Presently occurs at India Basin Shoreline Park.
<i>Fritillaria liliacea</i>	Fragrant Fritillary	CNPS 1B	Presently occurs at Bernal Heights
<i>Gallium porrigens</i>	Climbing Bedstraw	LS	Presently occurs in Bayview Park , O'Shaughnessy Hollow, and Twin Peaks
<i>Garrya elliptica</i>	Silk Tassel Bush	LS	Presently found in Glen Canyon Park
<i>Gilia capitata</i> ssp. <i>chamissonis</i>	Dune Gilia	CNPS List 1B	Presently occurs at Hawk Hill and Lake Merced
<i>Gilia clivorum</i>	Grassland Gilia	LS	Historically reported not recently observed in the City.
<i>Grindelia hirsutula</i> var. <i>maritima</i>	San Francisco Gumplant	FSC, CNPS List 1B	Presently occurs at Mount Davidson, Twin Peaks, Corona Heights, and Balboa Natural Area.
<i>Grindelia stricta</i> var. <i>augustifolia</i>	Marsh Gumplant	-	Presently occurs at India Basin Shoreline Park.
<i>Heuchera micrantha</i>	Alumroot	LS	Presently occurs at O'Shaughnessy, and Glen Canyon
<i>Juncus xiphiodes</i>	Iris Leaf Rush	LS	Historically reported not recently observed in the City.
<i>Layia carnosa</i>	Beach Layia	FE, SE, CNPS List 1B	Historically reported from San Francisco, location not well mapped, presumed extirpated
<i>Lessingia germanorum</i>	San Francisco Lessingia	FE, SE, CNPS List 1B	Only current population found on the Presidio.
<i>Leymus x vancouverensis</i>	Vancouver's Ryegrass	LS	Presently occurs at Lake Merced
<i>Lilaea scilloides</i>	Flowering Quillwort	LS	Presently occurs at McLaren Park (is likely extirpated)

**Table 3-5. Sensitive species presently and historically known to occur at Significant Natural Areas.**

Species	Common Name	Status Federal, State, CNPS, Local	Local Significance
<i>Linaria canadensis</i>	Canadian or Blue Toad-Flax	LS	Presently occurs at Hawk Hill
<i>Lithophragma heterophylla</i>	Prarie Star, Woodland Star	LS	Presently occurs in Bayview Park
<i>Marah oreganus</i>	Wild Cucumber, Man-root	LS	Presently occurs at McLaren Park and Lake Merced
<i>Monardella undulata</i>	Curly-leaved Monardella	CNPS List 4	Not known to occur in the City
<i>Muilla maritima</i>	Common Muilla	LS	Presently occurs at Corona Heights, Tank Hill, Bernal Hill and Mount Davidson
<i>Navarretia squarrosa</i>	Skunkweed	LS	Presently occurs at Hawk Hill and McLaren Park
<i>Osmorhiza chilensis</i>	Sweet Cicely	LS	Presently occurs at Interior Greenbelt.
<i>Pellaea andromedifolia</i>	Coffee Fern	LS	Historically reported not recently observed in the City.
<i>Prunus emarginata</i>	Bitter Cherry	LS	Presently occurs at Bayview and Glen Canyon
<i>Prunus ilicifolia</i>	Holly-leaved Cherry Islais Cherry	LS	Presently occurs at Bayview Park, Glen Canyon
<i>Prunus virginiana var. demissa</i>	Western Choke Cherry	LS	Presently occurs at Tank Hill and Bayview Park
<i>Quercus chrysolepis</i>	Canyon Live Oak	LS	Presently occurs at Lake Merced
<i>Rhamnus crocea</i>	Spiny Redberry	LS	Presently occurs at Glen Canyon
<i>Ribes divaricatum</i>	Coastal Black Gooseberry	LS	Presently occurs at Lake Merced
<i>Ribes menziessi</i>	Canyon Gooseberry	LS	Presently occurs at Bayview Park
<i>Rosa gymnocarpa</i>	Wood Rose	LS	Presently occurs at Bayview Park, O'Shaughnessy and Mount Davidson
<i>Rubus parviflorus</i>	Thimbleberry	LS	Presently occurs at Lake Merced and Interior Green Belt
<i>Salvia spathacea</i>	Hummingbird Sage	LS	Presently occurs at Bernal Hill.
<i>Saxifraga californica</i>	California saxifrage	LS	Presently occurs at Billy Goat Hill
<i>Sedum spathulifolium</i>	Broadleaf Stonecrop	-	Larval food plant for San Bruno elfin butterfly, presently occurs at Glen Canyon, Mt. Davidson, O'Shaughnessy Hollow, Tank Hill, and Twin Peaks
<i>Senecio aronicoides</i>	Groundsel	LS	Presently occurs at Bayview Park and Mount Davidson
<i>Silene scouleri</i> ssp. <i>grandis</i>	Scouler's Large Campion	LS	Presently occurs at Bayview Hill
<i>Silene verecunda</i> ssp. <i>verecunda</i>	San Francisco Campion	FSC, CNPS List 1B	Presently occurs at Mt. Davidson and Rock Outcrop
<i>Sisyrinchium californicum</i>	Yellow-eyed Grass	LS	Only San Francisco population in Glen Canyon
<i>Tanacetum camphoratum</i>	Dune Tansy	-	Southern distributional limit. Presently occurs at Grandview Park, Golden Gate Heights, Hawk Hill, Rock Outcrop, Lake Merced, and Balboa Natural Area.
<i>Triphysaria eriantha</i> var. <i>rosea</i>	Johnny-tuck	LS	Presently occurs at McLaren Park

**Table 3-5. Sensitive species presently and historically known to occur at Significant Natural Areas.**

Species	Common Name	Status Federal, State, CNPS, Local	Local Significance
<i>Vaccinium ovatum</i>	California or Evergreen Huckleberry	LS	Presently occurs at Mount Davidson
<i>Viola adunca</i>	Blue Violet	LS	Presently occurs at Glen Canyon, Twin Peaks and O'Shaugnessy
<i>Viola pedunculata</i>	Johnny-Jump-Up	-	Larval food plant for San Francisco silverspot butterfly, presently occurs at Bayview Hill, McLaren Park, Tank Hill, Duncan-Castro, and Corona Heights
<i>Woodwardia fimbriata</i>	Giant Chain Fern	LS	Presently occurs at Glen Canyon
<i>Zigadenus fremontii</i>	Star Lily	LS	Presently occurs at Bernal Hill

**Status Key:**

- Federal Status**
- FE** Endangered. Species in danger of extinction throughout all or significant portion of its range.
  - FT** Threatened. Species likely to become endangered within foreseeable future throughout all or a significant portion of its range.
  - FPE** Proposed for listing as endangered.
  - FC** Candidate for listing as endangered. Candidate information now available indicates that listing may be appropriate with supporting data currently on file.
  - FSC** Species of Concern. Former Category 2 Candidate for listing as endangered.
  - FPD** Proposed de-listing.

**California State Status**

- SE** Endangered. Species whose continued existence in California is jeopardized.
- ST** Threatened. Species, although not presently threatened with extinction, that is likely to become endangered in the foreseeable future.
- SSC** Species of Concern.
- SFP** State Fully Protected under Sections 3511 and 4700 of the Fish and Game Code.
- Sens** Considered a sensitive species by the California Department of Forestry.

**California Native Plant Society**

- 1A** Plants presumed extinct in California
- 1B** Plants that are rare or endangered in California and elsewhere.
- 2** Plants that are endangered in California, but more common elsewhere.
- 3** Plants about which more information is needed.
- 4** Plants of limited distribution (a watch list).
- LS** Locally Significant.

**Golden Gate Audubon Society**

- SLC** Species of Local Concern

Table 3-6. Lengths of trails by Natural Area and trail type including those to be re-routed or closed and proposed trails. All lengths in feet.

	Trail Type			Proposed	Unimproved to Re-Route or Close	Existing Total	% closed
	Improved/Maintained to Remain	Unimproved to Remain	Total to Remain				
Lake Merced	6,959	828	7,787	365	3,319	11,106	30%
Mount Davidson	11,010	1,579	12,589	0	2,867	15,456	19%
Glen Canyon	15,265	4,324	19,589	0	3,653	23,242	16%
O'Shaughnessy Hollow	0	0	0	0	0	0	0%
Sharp Park	2,258	11,830	15,880	1,792	653	14,741	4%
Golden Gate Heights	169	0	169	188	390	559	70%
Rock Outcrop	0	0	0	0	0	0	0%
Grandview	507	806	1,313	0	409	1,722	24%
Hawk Hill	0	917	917	0	692	1,609	43%
Brooks	424	460	884	0	456	1,340	34%
Lakeview Ashton	395	256	651	0	0	651	0%
Pine Lake	2,144	405	2,549	13	608	3,157	19%
Twin Peaks	3,310	3,128	6,438	501	2,303	8,741	26%
Billy Goat Hill	987	868	1,855	0	745	2,600	29%
Buena Vista	3,221	520	3,741	0	0	3,741	0%
Corona Heights	3,001	1,855	4,856	0	1,845	6,701	28%
Duncan-Castro	0	333	333	0	0	333	0%
Kite Hill	620	939	1,559	0	398	1,957	20%
Tank Hill	1,063	198	1,261	0	1,411	2,672	53%
Oak Woodlands	5,252	7,211	12,463	0	12,381	24,844	50%
15th Avenue Steps	0	0	0	0	0	0	0%
Bayview Park	6,576	481	7,057	1,020	1,439	8,496	17%
India Basin	1,676	209	1,885	0	0	1,885	0%
McLaren Park	20,405	23,099	43,504	0	15,681	59,185	26%
Palou-Phelps	260	262	522	496	527	1,049	50%
Bernal Hill	3,764	3,931	7,695	464	4,544	12,239	37%
Balboa Natural Area	547	0	547	0	90	637	14%
Interior Greenbelt	0	935	935	620	0	935	0%
Dorothy Erskine Park	414	357	771	0	0	771	0%
Edgehill Mountain	682	65	747	438	0	747	0%
Fairmount Park	46	141	187	0	0	187	0%
<b>Total</b>	<b>90,955</b>	<b>65,937</b>	<b>158,684</b>	<b>5,897</b>	<b>54,411</b>	<b>211,303</b>	<b>26%</b>
<b>Total Miles</b>	<b>17.2</b>	<b>12.5</b>	<b>29.7</b>	<b>1.1</b>	<b>10.31</b>	<b>40.0</b>	

**Notes:**

<sup>1</sup> Calculation of percentage of trails to be closed does not include proposed trails and assumes that all social trails will be closed.