

2. Affected Environment

This section summarizes the Project Area's affected environment: land use, geomorphology and soils, water resources, biological resources, cultural resources, recreation and visitor use, transportation, air quality, noise, hazardous substances, and visual resources. Relevant information regarding the regulatory framework for the affected environment is provided as well. Project-specific permitting and regulatory compliance information is summarized in Section 3.5, Permits and Approvals Required to Implement the Proposal.

2.1 LAND USE

The affected environment discussed in this section includes the existing land uses both in the vicinity of Mountain Lake and within the Project Area.

2.1.1 REGIONAL CONTEXT

The 1,480-acre Presidio is at the northern tip of the San Francisco peninsula, immediately south of the Golden Gate Bridge. The Presidio contains natural areas and pockets of military-related buildings and other developed areas. The Presidio is part of the Golden Gate National Recreation Area, a national park. Most of the 14.25-acre Project Area is within the Presidio (13.12 acres) and a small portion (1.13 acres) is within the City of San Francisco (Figure 2). The Presidio Trust has administrative jurisdiction over approximately 80 percent of the Presidio (known as "Area B"), including Mountain Lake. The National Park Service has jurisdiction primarily over the coastal areas (known as "Area A").

The Project Area includes Mountain Lake (4.02 acres) and surrounding wetland, riparian, and woodland, coastal scrub, and disturbed habitat (10.23 acres), (Figure 3). The Project Area is located in the southernmost portion of the Presidio (Figure 1) and has significant recreational, ecological, and historic value. The topography of the area in the vicinity of Mountain Lake is moderately sloping with a southwestern aspect. The Project Area is bounded by the Presidio golf course to the east, by Lake Street to the south, and by Park Presidio Boulevard to the west (Figure 2). City of San Francisco property and residential neighborhoods border the south side of Mountain Lake.

Pedestrian access points to Mountain Lake from city streets are 8th, 9th, 10th, 11th, 12th, and Funston Avenues. From within the Presidio, pedestrians can approach Mountain Lake from the west through the 15th Avenue entrance and from the east on West Pacific Avenue, which runs past the golf course to the Arguello Gate (Figure 2). Automobile

access to the Public Health Service Hospital is through the 15th Avenue entrance, which connects with Wedermeyer Street. Parking is available near the intersection of Wedermeyer and 15th at the Public Health Service Hospital. Automobiles are not allowed on Park Boulevard or West Pacific as they run through the Project Area. These paved roads provide safe pedestrian connections to the south shore of the lake and city-owned Mountain Lake Park.

2.1.2 RELEVANT PLANS AND POLICIES

The following land use policies were analyzed for consistency with the proposed concept plan:

- The Presidio Trust Act and General Objectives of the GMPA
- The GMPA
- The Presidio Trust Implementation Plan
- The Presidio Vegetation Management Plan (Draft)
- The San Francisco Master Plan

2.1.2.1 Presidio Trust Act and General Objectives of the GMPA

The Presidio Trust Act (Title I of Public Law 104-333), as amended, requires the Presidio Trust to manage the property under its administrative jurisdiction, including Mountain Lake, in accordance with the purposes set forth in Section 1 of the Act establishing the Golden Gate National Recreation Area and in accordance with the "general objectives" of the GMPA. The purposes of the GGNRA Act call for preserving the GGNRA in its natural setting and protecting it from development and uses that would destroy the scenic beauty and natural character of the area. The general objectives of the GMPA are not precisely identified either within the text of the GMPA itself (i.e., no list of "general objectives" appears in the document) or in the Trust Act. However, the Presidio Trust set forth the general objectives of the GMPA in Board Resolution No. 99-11, dated March 4, 1999 (General Objectives), which, in part requires the Trust to "preserve and (where appropriate) enhance the historical, cultural, natural, recreational, and scenic resources of the Presidio." Project actions and Proposed Actions in the Mountain Lake Enhancement Plan are consistent with this objective.

2.1.2.2 General Management Plan Amendment, Presidio of San Francisco

The general direction for land use at Mountain Lake was derived from the 1994 GMPA which outlined the importance of Mountain Lake as a historic interpretation site as well a site where natural resource management efforts need to be focused. According to the

GMPA, the natural aquatic system and wildlife habitat in and around Mountain Lake would be protected and enhanced for ecological and recreational values. Project objectives and Proposed Actions in the Mountain Lake Enhancement Plan are consistent with the GMPA.

2.1.2.3 Presidio Trust Implementation Plan (PTIP)

The Presidio Trust is currently updating the 1994 GMPA in a process known as the Presidio Trust Implementation Plan (PTIP). The PTIP will provide a comprehensive planning framework within which projects proposed in Area B of the Presidio would proceed. A proposed planning principle within PTIP calls for identifying, protecting, and enhancing remnant natural habitats especially for rare and endangered species (Presidio Trust, 2000d). Project objectives and Proposed Actions in the Mountain Lake Enhancement Plan are consistent with the proposed PTIP habitat enhancement objective.

2.1.2.4 The Presidio Vegetation Management Plan (VMP)

The Draft Vegetation Management Plan (VMP) identifies Mountain Lake as a native plant community zone. The Mountain Lake Enhancement Plan proposes to enhance existing native plant communities and to increase the footprint of those communities through restoration. It also provides for the retention of some existing non-invasive exotic vegetation in areas not directly threatening native habitat. The Proposed Action and the Alternatives in the Mountain Lake Enhancement Plan are consistent with this designation.

2.1.2.5 San Francisco Master Plan

The Project Area is located on the southern border of the Presidio and a portion of the area is under the jurisdiction of the city of San Francisco. The Presidio is under federal jurisdiction and is not subject to state and local land use plans and policies. Nevertheless, the City and County of San Francisco included a policy concerning the Presidio in the recreation and open space element of the San Francisco Master Plan (1988). Policy 5 reads "preserve the open space and natural, historic, scenic and recreational features of the Presidio" (City and County of San Francisco, 1988). It should be noted that none of the actions proposed by in the Mountain Lake Enhancement Plan take place within the portion of the site administered by the City and County of San Francisco. Ongoing consultation would continue between the Presidio Trust and the City of San Francisco during the planning, design, and implementation phases of the Mountain Lake Enhancement Plan.

2.2 GEOMORPHOLOGY AND SOILS

The affected environment discussed in this section includes the soil and underlying substrate within the Project Area.

2.2.1 HISTORIC AND EXISTING GEOMORPHOLOGY

The San Francisco peninsula is underlain with sandstone, shale, graywacke, greenstone, gneiss, and serpentinite of the Mesozoic-era Franciscan assemblage. In the Presidio, these old rocks are covered by younger deposits of the Colma Formation, and more broadly by sand dune deposits of the late Pleistocene and Holocene, which form one of the most extensive coastal sand dune deposits in California (Reidy, 1999). Mountain Lake is located behind the foredunes of this coastal sand complex, with the sandy Colma Formation near the surface. The lake was likely created from wind erosion of the dunes down to the water table, creating a dune hollow. Recent carbon dating studies indicate that the lake is probably 1700 years old (Reidy, 1999). The elevation of Mountain Lake is approximately 130 feet above Mean Sea Level.

Since about 1750, the natural filling of the lake by sedimentation has been accelerated by human activities. Farming, urban and golf course development contributed to an increase in sedimentation and buildup of organic debris. In the late 1930s, a large amount of fill was introduced into the lake during the construction of Park Presidio Boulevard, which reduced the size of the lake by about 40% (Horne, 2000). Near shore sediment removal has created steep banks in some areas around the lake's periphery. Current lake bathymetry (Figure 5) is significantly altered from its pre-European form.

2.2.2 SOIL AND SUBSTRATE

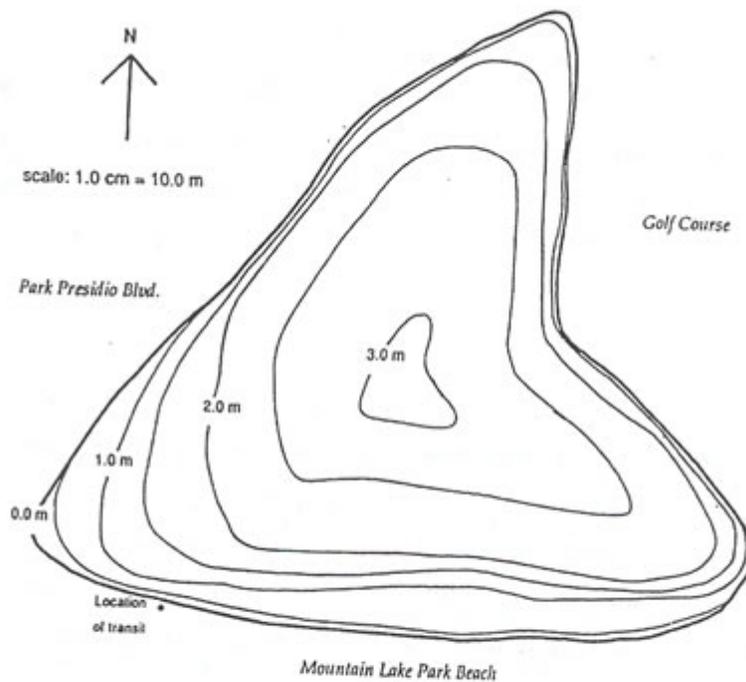
The soil and underlying substrate of the Project Area presently consists of a mixture of natural dune sand, beach sand, and silt. The lake subsurface material is composed primarily of silt and clay to a depth of approximately 6-10 feet. Below this level the subsurface is composed of a mixture of sands, silt, and clay (Erlor and Kalinowski, 1998).

2.3 WATER RESOURCES

The affected environment discussed in this section is comprised of 4.2 acres of year-round open water in Mountain Lake, and 1.7 acres of jurisdictional wetlands surrounding the lake and to the east of the east arm culvert (Figure 3).

Mountain Lake is one of the few remaining natural lakes in San Francisco and is the only lake within the Presidio, making it a unique natural resource (Codemo et al., 1994; Horne, 2000). The watershed area of Mountain Lake is approximately 200 acres, and the drainage basin includes part of the Presidio Golf Course and the residential area south of the lake (Horne, 2000; Dames and Moore, 1997). A part of the housing facility located adjacent to Washington Boulevard in the Presidio also lies within the watershed (Figure 1). Highway 1 enters a tunnel in an area close to the center of the watershed (Dames and Moore, 1997).

Mountain Lake is substantially decreased in size compared to its historic footprint. Approximately 40 percent of Mountain Lake was filled during road construction in 1939, and sedimentation rates continue to be high (Horne, 2000). Sedimentation from highway construction and other sources have decreased the maximum lake depth from approximately 30 feet to 9 feet (Figure 5).



Note: Contour lines indicate depths in 0.5 m increments. All depth measurements were taken relative to the water level of the lake on 9/17/94.

Figure 5: Existing Bathymetry of Mountain Lake

High nutrients (e.g., nitrates and phosphates) and elevated temperatures in the lake increase the abundance of algae, creating "algae blooms" (Codemo, 1996; Horne, 2000; Beutel, 1997). Algae blooms have been associated with mortality of exotic fish in the lake such as carp (*Cyprinus carpio*), channel catfish (*Ictalurus punctatus*), and bass (*Micropterus* spp.; Navarett, 1994). Other urban nonpoint sources of nutrients from runoff and eucalyptus trees have compromised water quality (Horne, 2000).

2.3.1 HYDROLOGY

Mountain Lake is a groundwater-fed lake, filled and drained by subsurface flow through the sandy substrate (Nolte and Associates, 1993). In addition, some runoff from the golf course and the area around Park Presidio enters the lake through wetland areas in the east and north arms of the lake, particularly during large storm events (Dames and Moore, 1994; Horne, 2000). Local groundwater recharge has probably decreased since the planting of eucalyptus and Monterey Pines in the area surrounding the lake; these inhibit rainfall from reaching the ground and infiltrating (Poore and Fries, 1985).

A few historic descriptions imply that surface water may have flowed out of the southwest corner of Mountain Lake at some times in the past (Urban Watershed, 1999). The current uppermost stream flow in Lobos Creek is a few hundred feet west of Park Presidio Boulevard (Urban Watershed, 1999). The lake level may reflect the groundwater table in the area, which is fairly consistent throughout the year. There may be a low-permeability layer (e.g., peat) beneath the lake, which acts as a perching layer, helping to maintain the lake's level. All discharge from the lake appears to be subsurface groundwater flow (Dames and Moore, 1994). It is suspected that this groundwater flows west and feeds Lobos Creek, which supplies water to the Presidio and discharges into the Pacific Ocean at the south end of Baker Beach.

2.3.2 WATER QUALITY

2.3.2.1 Regulatory Framework for Water Quality

The Regional Water Quality Control Board (RWQCB) and the United States Environmental Protection Agency (U.S. EPA) sets water quality standards that are ecologically protective to aquatic systems (RWQCB, 1995; U.S. EPA, 2000). The RWQCB's, "Water Quality Control Plan, San Francisco Bay Basin" (RWQCB, 1995), specifies limits for the chemicals of concern for inland waters within the San Francisco Bay region, such as Mountain Lake. Construction activity involving dredging and sediment reuse within jurisdictional wetlands or waste discharge into wetlands and surface waters may be subject to Section 404 permits issued by the U.S. Army Corps of

Engineers (USCOE). The USCOE requires evaluations of water quality considerations associated with waters of the United States. A Section 404 certification waiver from the RWQCB would be required for the Section 404 permit to be obtained.

2.3.2.2 Mountain Lake Water Quality

The following factors affect the water quality in Mountain Lake:

- Nutrient input from subsurface flows and runoff, which encourages algae blooms
- Oxygen depletion caused by seasonal algae bloom decomposition
- Poor water clarity
- Sedimentation
- Sediment quality
- Potential chemical contaminant runoff

Nutrient Input. Mountain Lake is eutrophic; it has high nutrient levels that can result in low dissolved oxygen levels. Nutrients enter the lake with sediments, stormwater runoff, and groundwater inflow. External sources of nutrients include plant matter, animal feces, and applied fertilizers. Leaves and other plant matter dropping from the large grove of eucalyptus trees along the east shore add nutrients to the lake's water (Horne, 2000). External nutrients enter the lake from urban sources within the drainage basin such as the golf course, Mountain Lake Park, and neighboring residential areas. Relatively high lake water temperatures (18 to 21 degrees Celsius) increase the rate of algae reproduction. Vertical mixing of warmer waters throughout the lake could also contribute to a high density of algae blooms (Codemo, 1996). Summer assemblages composed of cyanobacteria and algae blooms (480,000 cells/milliliter) dominated by the species *Aphanizomenon flosaquae* have been recorded (Codemo, 1996). Subsequent to blooms, algae die-offs occur during the late summer or early fall and deplete the lake's oxygen during decomposition (Codemo, 1996; Beutel, 1997).

Internal loading also causes high nutrient levels. Internal loading occurs when phosphate and ammonia stored in sediment on the lake bottom are released to the overlying waters. Because Mountain Lake is a shallow system (maximum depth approximately ten feet), these nutrients are rapidly circulated to the surface, where they contribute to the rapid growth of algae.

Peaks in these chemicals corresponded to declines in oxygen levels and are immediately followed by a sharp decline in phytoplankton numbers. The fish mortality that has been observed at Mountain Lake has been attributed to this phenomenon (Navarett, 1994).

Oxygen Depletion. When water in lakes has a high level of nutrients and is warm, algae grow rapidly, converting carbon dioxide into oxygen in the water. When the algae die,

their decomposition depletes the water of oxygen and releases toxins. When oxygen levels drop due to the decomposition of algae blooms during the summer at Mountain Lake, increases in ammonia, sulfate, and orthophosphate have been observed in lake water (Codemo, 1996). Fish kills have been attributed to the combined effect of the oxygen depletion and toxins resulting from algae decomposition (Codemo, 1996; Horne, 2000).

Water Clarity. The poor water clarity in Mountain Lake is partly indicative of a eutrophic lake, where the great quantity of suspended algae in the lake reduces its clarity. Humic acids from decaying plants also reduce the clarity of the lake water. The eucalyptus that border much of the lake produce more humic acid than indigenous vegetation (Horne, 2000), creating poor water clarity in the lake.

Sedimentation. Mountain Lake has experienced a high rate of sedimentation for the past century. Sedimentation rates have increased from an estimated "normal" sedimentation rate of 0.1 mm/year to 19 mm/year in the last century. This is two orders of magnitude above normal rates (Horne, 2000) and result from human activity at Mountain Lake. A 1902 record indicates that the southwest-facing slopes between the golf links and the hospital above Mountain Lake were eroding, washing sediment into the lake. The construction of Park Presidio Boulevard in 1939 significantly reduced the size of Mountain Lake, when material excavated to construct the Funston Avenue approach to the Golden Gate Bridge was used to fill approximately 40 percent of the lake to provide a base for Park Presidio Boulevard.

Sedimentation from sources such as the golf course and neighboring residential areas continues to affect water clarity. Previous tests on composite samples revealed that the sediment six feet below the lake bottom is composed primarily of silt (66.1%) and clay (31.5%). The percent of sands increases at a depth of approximately ten feet (39.1% sands; 40.8% silt and 20.1% clay). At approximately fourteen feet, the sediment is composed of a mixture of sands (57%), silt (26.8%) and clay (16.2%) (Erler and Kalinowski, 1998). The percent sands increases with depth in all samples collected. It is possible that at depths of 25-30 feet, Mountain Lake might have supported both a photic (light penetration) zone and an aphotic (cooler, deeper, darker zone), thereby creating a temperature gradient as a function of lake depth. The current lack of a cooler, aphotic (lightless) zone at the lake bottom has exacerbated the effects of nutrient enrichment and temperature increases. With no deeper zone, warm water mixes throughout the lake during the summer. In addition, filling has reduced habitat for smaller fish and zooplankton (e.g., *Daphnia* spp.) in the lake (Horne, 2000).

Sediment Quality. For the purpose of evaluating the dredged sediment disposal options, composite core samples were taken from the lake bottom to depths of 10-20 feet for chemical analysis. The results indicated that the material is not expected to require

special off-site disposal (Erler and Kalinowski, 1998). Based on previous analytical tests, sediment concentrations are likely to be lower than the soluble threshold limits concentrations required for on-site use (Erler and Kalinowski, 1998).

Most metals were detected at concentrations lower than the recommended ecological cleanup criteria for terrestrial soils at the Presidio (e.g., 477 mg/kg for lead). However, lead concentrations detected in some samples exceeded RWQCB wetland cover criteria (e.g.; 50 mg/kg; RWQCB, 1992), or could leach in excess of standards recommended for aquatic environments (e.g., 2.0 ppb for lead; EPA, 2000).

Possible Contaminants in Runoff. Runoff from the area surrounding Mountain Lake, including roadways and the golf course, can enter the lake either directly or through infiltration into the groundwater that feeds the lake. One sample exceeded the surface water quality objective: 2.8 µg/l of mercury was found in an October 1996 sample, compared with the objective of 0.012 µg/l; EPA 2000. (Codemo, et al., 1994; Beutel, 1997). Higher levels of mercury found in golf course runoff may indicate the golf course as a source of the mercury. At this time, the golf course is working on a management plan that addresses fertilizer, herbicide, and pesticide issues. As part of their plan, monitoring would be conducted by the golf course to assess the movement, if any, of herbicides and pesticides applied to the golf course. If during the course of monitoring, information is obtained that suggests that a chemical is leaving the root zone or is dissolved in surface water, appropriate corrective actions would be taken.

Eucalyptus leaf leachate is responsible for a darkening effect on the lake water (Horne, 2000) and may also compromise water quality (Laws, pers. comm.). Turpenoids from eucalyptus leaves are relatively insoluble and adsorb onto soil particles, but phenolics are water-soluble (Moral and Muller, 1969) and can enter water in the lake.

2.4 BIOLOGICAL RESOURCES

The affected environment discussed in this section includes the native and introduced plants and animals that are known to occur within the Project Area.

2.4.1 HISTORY OF VEGETATION AT MOUNTAIN LAKE

During the past 200 years the Presidio's vegetation has dramatically changed, a reflection of the different land management practices employed during the Spanish, military and modern periods. Despite these influences, there remain many small vestiges of surviving native plant communities with remarkably rich plant diversity. Mountain Lake was once very rich floristically; now it is relatively depauperate except for the riparian forest

bordering the eastern section of the lake. This Central Coast Arroyo Willow Forest is the richest existing indigenous wetland community on the Presidio (Vasey, 1993). As described in the Flora of San Francisco, San Francisco's formerly rich freshwater wetlands have largely disappeared, making the rich natural diversity of wetland features on the Presidio of significant regional value.

Paleoecological studies (Reidy, 1999) indicate that the likely assemblage of historic vegetation surrounding Mountain Lake included willows (*Salix* spp.), wax myrtle (*Myrica californica*), red alder (*Alnus rubra*), tules (*Scirpus* spp.), rushes (*Juncus* spp.), and cattails (*Typha latifolia*). Wax myrtles are likely to have dominated the riparian woodland surrounding the lake (Reidy, 1999). The presence of coast live oaks (*Quercus agrifolia*) was recorded in the 1792 journal of Vancouver (Codemo, et al., 1994) and has been confirmed using palynology (Reidy, 1999). Remnant patches of this prehistoric native vegetation still exist around the lake (Figure 3).

Several other native trees and large shrubs have been recorded within the Project Area but are no longer found there. Examples of these flora include Pacific madrone (*Arbutus menziesii*), toyon (*Heteromeles arbutifolia*), holly-leaved cherry (*Prunus ilicifolia*), California bay laurel (*Umbellularia californica*), and California buckeye (*Aesculus californica*) (Jones and Stokes, 1997).

The establishment of weedy exotic species in the Presidio's natural landscape began as early as the Spanish period, when herds of goats, cattle, horses and sheep grazed freely, reducing many of the native vegetation communities to barren landscapes. With grazing came the introduction of exotic grasses for forage. These activities coupled with native tree and shrub removal for timber and fuel, provided opportunities for invasive exotic species to become established. Continued settlement during the American period facilitated the introduction of new Mediterranean, South African and South American species, many of which (including Cape ivy) now dominate portions of the Presidio, including Mountain Lake.

The historic plantations of exotic trees were introduced into the Presidio beginning in 1883 in part as an erosion control measure (Jones and Stokes, 1997). This effort was part of a "Plan for the Cultivation of Trees" under Major W. A. Jones (NPS, 1998). The planting effort continued until the early 1900s (NPS, 1998). The dense, mixed-age stands of eucalyptus that border Mountain Lake to the east and north are likely offspring of the original planting efforts (Jones and Stokes, 1997). Most of the trees in the eucalyptus grove along Mountain Lake's east shore are the offspring of 5 or 6 planted trees. Eucalyptus is the dominant exotic tree species within the Project Area, with smaller stands of Monterey cypress present in upland habitats around the lake (Figure 4).

2.4.2 EXISTING BIOLOGICAL RESOURCES

2.4.2.1 *Plant Communities*

Mountain Lake is surrounded by approximately 10.23 acres of terrestrial habitat within the Project Area (Figure 2). Native plant communities found at Mountain Lake include Coastal Freshwater Marsh and Central Coast Arroyo Willow Riparian Forest (Holland, 1986). The lake's terrestrial habitat can be broadly categorized as wetland and riparian in the lowland areas; woodland and coastal scrub, and disturbed habitat in the upland areas. In addition to native vegetation, a large number of invasive exotic species are present (Figure 4).

Coastal Freshwater Marsh. Wetlands are protected under the Clean Water Act. The USCOE regulates discharge of dredge or fill materials in waters of the US, including wetlands under the Clean Water Act. USCOE permits and/or certifications may be necessary as part of the implementation of the Proposed Action.

Historic and current data indicate that wetlands provide locally important habitat for aquatic organisms and terrestrial wildlife. A wetland delineation and a wetland vegetation mapping project were conducted in the Project Area to determine the extent of USCOE jurisdictional wetlands and to classify wetland vegetation types and extent in accordance with the USCOE and U.S. Fish and Wildlife procedures (Castellini, 2000; Buisson, 1999). The USCOE defines jurisdictional wetlands as areas that are inundated or saturated by surface or groundwater and can support vegetation typically adapted for those conditions. The three criteria used to delineate wetlands in accordance with the USCOE classification system are the presence of (1) hydrophytic vegetation, (2) wetland hydrology, and (3) hydric soils (USCOE, 1987). The USFWS defines wetlands as those areas that have one or more of the following attributes (1) periodic occurrence of wetland vegetation, (2) hydric soils, or (3) saturated with water for part of the year (Cowardin, 1979). In accordance with this system, there are approximately 1.70 acres of jurisdictional wetlands and 0.8 acres of transitional wetlands surrounding the jurisdictional wetlands (Wood, 1999; Figure 3).

Typical native plant species in the wetlands surrounding the lake include tules, sedges, rushes, and willows. Mountain Lake wetlands support waterfowl as well as many passerine and shore birds (Appendix B). The most dense belts of wetland marsh vegetation are present on the north and east arms of the lake (Buisson, 1999). In the remaining areas, the marsh has been significantly degraded by factors like human use (direct access to the lake) and the presence of exotic vegetation (Figure 4).

Central Coast Arroyo Willow Riparian Forest. There are 2.1-acres of existing willow riparian forest at Mountain Lake (Figure 3). This forest contains native plants such as arroyo willow (*Salix lasiolepis*), California blackberry (*Rubus ursinus*), California tule (*Scirpus californicus*), rushes (*Eleocharus* spp.), lady fern (*Athyrium filix-femina*), and American dogwood (*Cornus sericea*).

The highest density of arroyo willow is found on the north and east arms of the lake. There are a few remnant individuals in the seasonal wetland east of the culvert. Remnant individuals of species such as red elderberry (*Sambucus racemosa*), wax myrtle (*Myrica californica*) and red alder (*Alnus rubra*) are present along the north and east riparian areas of Mountain Lake. One blue elderberry (*Sambucus mexicana*) exists in the seasonal wetland east of the east arm culvert (Clark, pers. comm.).

Dune Scrub. In 1992, City of San Francisco Park and Recreation Department staff and volunteers introduced native dune scrub vegetation along the south shore, as a part of a native landscaping effort. Plant species include yarrow (*Achillea millefolium*), yellow-bush lupine (*Lupinus arboreus*), coyote bush (*Baccharis pilularis*), and coast buckwheat (*Eriogonum latifolium*). Other native species added to this landscaping effort in June 2000 include Douglas iris (*Iris douglasiana*), sticky monkey flower (*Mimulus aurantiacus*), coffee berry (*Rhamnus californica*), pink-flowering currant (*Ribes sanguineum* var. *glutinosum*) and coast blue blossom (*Ceanothus thyrsiflorus*).

Exotic Species Stands. The plant communities within the Presidio have been significantly altered by the spread of invasive exotic plants. These alterations have affected ecosystem function, significantly reduced vascular plant species richness, reduced insect abundance in certain plant communities, and reduced habitat for indigenous wildlife. The rapid spread of invasive exotic plant species is one of the most critical threats to the viability of the Presidio's native flora. Of the 389 plant species inventoried within the Presidio's natural areas, 161 are exotic (Vasey, 1993)

Numerous invasive exotic species have been documented around Mountain lake (Figure 4). These plants include eucalyptus, Monterey cypress, Cape ivy, English ivy (*Hedera helix*), Algerian ivy (*Hedera canariensis*), Himalayan blackberry (*Rubus discolor*), and periwinkle (*Vinca major*). Eucalyptus currently dominates upland areas within the Project Area (4.3 acres). Most of the eucalyptus within the Project Area is blue gum (*Eucalyptus globulus*), with the exception of the red river gum (*E. camaldulensis*) along Park Presidio Boulevard. There are also smaller stands of Monterey cypress and Monterey pine (Figure 4). The next most dominant exotic species are English ivy (3.9 acres in both riparian and woodland habitat), and Himalayan blackberry (2.3 acres primarily in riparian habitat). Cape ivy (0.7 acres) is a dense, highly persistent weed that climbs other woody vegetation. Eradication of this weed is a high priority within the GGNRA (NPS, 2000).

2.4.2.2 Wildlife

Both the lake and its surrounding wetland areas are a valuable natural resource for wildlife. Native species in the Project Area include waterfowl and other birds that nest, roost, and/or feed within the site (Appendix B). An early documentation of Mountain Lake described it as a "protected sanctuary for waterfowl." The lake provides both shallow "dabbling" habitat for waterfowl, such as ruddy ducks (*Oxyura jamaicensis*), ring-necked ducks (*Aythya collaris*), and California gulls (*Larus californicus*), as well as deeper diving habitat for birds such as grebes, which are known to occur at Mountain Lake (Murphy, 1999).

Mountain Lake is also home to a number of other bird species. Year-round residents include the Anna's hummingbird (*Calypte anna*), the red-tailed hawk (*Buteo jamaicensis*), and the red-shouldered hawk (*Buteo lineatus*). Dense stands of willow and other riparian plants provide a refuge for a diversity of birds in the north and east arms of Mountain Lake. Commonly seen birds in this habitat include the Swainson's thrush (*Catharus ustulatus*), cedar waxwing (*Bombycilla cedrorum*), pygmy nuthatch (*Sitta pygmaea*), ruby-crowned kinglet (*Regulus calendula*), dark-eyed junco (*Junco hyemalis*), and black phoebe (*Sayornis nigricans*; Clark, pers. comm.; Murphy, 1999).

Native red-legged frogs (*Rana aurora draytoni*) and Western pond turtles (*Clemmys marmorata pallida*) may have once been present at Mountain Lake, but they have not been sighted in recent surveys. Instead, mostly exotic species of amphibian, reptile, and fish have been identified at Mountain Lake. The bullfrog (*Rana catesbeiana*) is an exotic amphibian frequently seen at the lake. Red-eared sliders (*Trachemys scripta elegans*) and the eastern soft-shell turtle (*Apalome spp.*) have also been seen. Only one native Pacific tree frog (*Hyla regilla*) has been recorded up the east arm, beyond the culvert (Laws, pers. comm.). No native fish lived in Mountain Lake (Horne, 2000). However, today several species of exotic fish are found in Mountain Lake. Fish present in Mountain Lake include carp, channel catfish, bass, hitch (*Lavinia exilicauda*), and fathead minnows (*Pimephales promelas*). Exotic crayfish (*Pacifasticus leniusculus*) have also been recorded at Mountain Lake. This preponderance of larger fish probably lower the number of smaller planktivorous fish and zooplankton, thereby contributing to algae blooms that have been recorded in the lake (Horne, 2000).

2.4.2.3 Special Status Species

Regulatory Framework for Special Status Species. The Endangered Species Act and the Migratory Bird Treaty Act protect special status species within the Project Area. Since Mountain Lake is predominately federal land, all actions within the Project Area must

comply with the Endangered Species Act of 1973 and the Migratory Bird Act. Project actions would not jeopardize the continued existence of any endangered or threatened species, and would not result in the destruction or adverse modification of endangered species habitat. Under the Migratory Bird Treaty Act, migratory birds are federally protected.

Special Status Species. Special status species present within the Project Area (Appendix C) include the state endangered willow flycatcher, a summer and fall migrant that uses Mountain Lake on a seasonal basis (Clark, pers. comm.). Dense willow habitat within the north and east arms of Mountain Lake provide summer roosting areas for the willow flycatcher, which has been sighted several times in the area (Clark, pers. comm.).

Species of special concern that are known to occur within the Project Area include the yellow warbler (*Dendroica petechia*), the olive-sided flycatcher (*Nuttallornis borealis*), the sharp-shinned hawk (*Accipiter striatus velox*), Coopers hawk (*Accipiter cooperi*), and merlin (*Falco columbarius columbarius*). The olive-sided flycatcher breeds within the Project Area. The yellow warbler, the sharp-shinned hawk, and the Coopers hawk could breed in the area (Clark, pers. comm.). Other special status species that may occur but have not been documented at Mountain Lake are the Yuma myotis bat (*Myotis yumanensis*; Jones and Stokes, 1997) and the San Francisco forktail damselfly (*Ischnura gemina*; Castellini, pers. comm.). Appendix C provides a more detailed enumeration of special status species at Mountain Lake. In addition, migratory bird species use the lake during their fall and spring migration along the Pacific flyway.

2.5 CULTURAL AND HISTORIC RESOURCES

The affected environment discussed in this section includes both known and potential cultural and historic resources within the Project Area.

2.5.1 REGULATORY CONTEXT

Section 106 of the National Historic Preservation Act (NHPA) requires federal agencies to take into account the effect of dredging and other enhancement actions at Mountain Lake, and to protect existing cultural resources. The State Office of Historic Preservation and the Advisory Council on Historic Preservation (ACHP) would be provided with reasonable opportunity to comment on project related construction activities. Section 106 compliance for this project would be provided through the Presidio Programmatic Agreement.

Cultural resources discussed in this section include Mountain Lake in the context of the

Presidio National Historic Landmark, the Juan Bautista de Anza Historic Trail, and the historic pump located within the tank area (Appendix A).

2.5.2 HISTORY

Native people today referred to as Ohlone/Costanoans were the earliest human inhabitants of the area now called the Presidio. The Ohlone/Costanoans were hunter-gatherers who lived in extended family units and depended on the abundant plant and animal resources of the area for subsistence (Margolin, 1978; Jones and Stokes 1996). As one of the few persistent freshwater lakes in the region, Mountain Lake was probably used by Ohlone/Costanoans Indians during prehistoric times (NPS, 1994; Reidy, 1999).

The earliest written record of Mountain Lake is in the diary of Father Pedro Font, who was part of the Spanish Colonial de Anza expedition, which set up an encampment in the Mountain Lake area on March 27, 1776. Father Pedro Font recorded the "fine lake or spring of very good water near the mouth of the port of San Francisco" (Codemo, et al., 1994). He mentioned the area immediately around Mountain Lake had good pasturage, plenty of firewood, and water (Reidy, 1999). He also noted the presence of certain plants such as manzanita and wild violets. The 1792 journal of George Vancouver documents the extensive pastoral use of San Francisco and an abundance of coast live oaks in the area (Reidy, 1999).

The Presidio was established as a military post in 1776 during Spain's colonial expansion (Haller, 1994). The Mexican government occupied the Presidio from 1821 to 1846. After California became part of the United States as a result of the Mexican-American war, the Presidio was established as a U.S. post. Beginning in 1883, upland areas within the watershed of Mountain Lake were planted with Monterey pine (*Pinus radiata*), Monterey cypress (*Cupressus macrocarpa*) and blue gum (*Eucalyptus globulus*) as part of the Jones plan for the forestation of the Presidio. In 1897, the Army began to use Mountain Lake water for domestic purposes. Construction of the Presidio golf course in the 1890s and subsequent pumping of water from Mountain Lake for irrigation of the golf course affected the hydrology of the lake and surrounding area. The construction of Mountain Lake Park by the city of San Francisco along Mountain Lake's south shore increased visitor activity in the vicinity of the lake. In 1939, nearly 40 percent of the lake was filled with soil excavated during the construction of the Pershing Tunnel to create a roadway for Park Presidio Boulevard. In 1994, the Presidio, including Mountain Lake, was transferred from the U. S. Army to the Golden Gate National Recreation Area.

2.5.3 STATUS OF THE NATIONAL HISTORIC LANDMARK

The Presidio of San Francisco was designated a National Historic Landmark in 1962, and this designation was updated in 1994. Mountain Lake is a contributing feature of the Landmark District and the site is predicted to have prehistoric archeological potential. The Landmark also includes the Juan Bautista de Anza Trail.

2.5.4 CULTURAL RESOURCES PRESENT IN THE PROJECT AREA

The Juan Bautista de Anza Trail runs through the Project Area along West Pacific Avenue. Archeological and historical reviews of the Project Area revealed one historic pump (#316), which contributes to the Landmark District and is located east of the lake. A letter was prepared to the State Historic Preservation Officer and the Advisory Council on Historic Preservation subsequent to the identification of the pump. The historic pump is currently located inside a non-historic structure in a fenced enclosure east of the lake that is closed to the public. The area also contains several other non-historic pump houses and water tanks. All water pump houses and water tanks, except pump #316, are scheduled for removal prior to implementation of this plan (Appendix A). There are no other known Landmark contributing features or cultural resources in the Project Area (Presidio Trust, 2000) though the site is predicted to have prehistoric archeological potential.

2.6 RECREATION AND PUBLIC STEWARDSHIP

The affected environment discussed here includes existing recreational uses, visitor amenities, and community-based stewardship programs in the Project Area.

2.6.1 VISITOR USES

The Project Area is used by the public for wide variety of activities, including hiking, jogging, dog walking, and bird watching, as well as passive contemplative activities (Holtzman and Grosso, 1997). The playground and other developed public access areas corresponding to city property receive the highest level of use. The south end of the lake serves as a popular gathering location for small groups of visitors (Figure 2).

Pedestrians use the paths and trails around the lake heavily. On-leash dog walkers use the north and east perimeter of the lake, mostly on the paved and soft surface trails **(2)**. Cyclists enter the Project Area from the city property, West Pacific Avenue, or Park Boulevard to the west.

(2) - This plan and EA proposes no change to current Presidio-wide regulations.

According to responses to Grosso's questionnaire (Holzman and Grosso, 1997) sent out to frequent park users, the natural setting and tranquility of Mountain Lake are highly valued. Mountain Lake has been described as one of the places that makes San Francisco a more livable place (Holzman and Grosso, 1997).

2.6.2 VOLUNTEER SITE STEWARDSHIP AND PUBLIC INTEREST/SUPPORT

Long-term park and community stewards have been active in restoration efforts, and native plant landscaping efforts within the Project Area. The Friends of Mountain Lake Park (FMLP), a neighborhood association consisting of 263 nearby households, has also participated in stewardship activities. The FMLP has advocated water quality improvements and restoration activities within the Project Area and been active in park planning and management. The FMLP has also obtained grant funds to help encourage community involvement in the park's maintenance, and has had a long-term commitment to the Project Area. Their first FMLP newsletter was distributed in 1991. Presidio Park Stewards and volunteers have guided Mountain Lake restoration efforts on NPS land. Other groups that have worked at Mountain Lake include the California Academy of Sciences, University of San Francisco, San Francisco State University, University of California in Berkeley, Golden Gate Audubon, the City of San Francisco, and the California Native Plant Society. Members of the California Academy of Sciences have been long-term stewards of the Project Area and bring school groups to study the lake.

Visitor surveys indicate that the general public is concerned with maintenance and management issues such as water quality, decreasing depth, and garbage removal (Holzman and Grosso, 1997). Visitors have also been concerned with the preservation of native flora. Overall, 64 percent of the regular visitors agreed that restoration of Mountain Lake and its surrounding natural environment is desirable (Holzman and Grosso, 1997).

2.7 TRANSPORTATION

The affected environment discussed in this section includes traffic on all trails within the Project Area as well as traffic and parking in the vicinity of the Project Area.

2.7.1 ACCESS

There is no direct access to Mountain Lake by car. However, adjacent Park Presidio Boulevard (Highway 1) is a heavily used road. Indirect access to Mountain Lake is via Highway 1, which intersects Lake Street south of the Park Presidio tunnel. Within the

Richmond district, pedestrian access to the park is possible from 8th, 9th, 10th, 11th, 12th, and Funston Avenues, as well as from the Presidio Arguello and 15th Avenue gates.

2.7.2 PARKING

Parking for the Project Area is available at the large parking lot immediately inside the 15th Avenue gate and in a smaller parking lot on Wedemeyer Road, which intersects 15th Avenue as it enters the Presidio. Parking is also available immediately west of the Arguello Gate of the Presidio, immediately south of the Golf course. There is also limited 2 hour parking for the Project Area in the residential area on Lake Street between 8th Avenue and Park Presidio Boulevard.

2.7.3 PEDESTRIAN TRAFFIC

The Project Area gets visitor use throughout the day, with peak use in the mornings and evenings. Originating at the 15th Avenue entrance to the Presidio, Wedemeyer Road leads to a paved footpath (along Park Boulevard), which passes under Park Presidio Boulevard and joins West Pacific Avenue at the northern end of the Project Area (Figure 2). West Pacific Avenue extends southward towards the southern border of the golf course (Figure 2). Both Wedermeyer road and West Pacific Avenue form a part of the Juan Bautista De Anza Historic Trail. Paths and trails within the Project Area are popular routes for joggers, dog walkers, and hikers. Because park safety and maintenance crews are the only vehicles allowed in the Project Area, there is little conflict between pedestrians and vehicles. However, some park users have reported conflicts between pedestrian and high-speed bicycle use on paved roads within the Project Area.

2.8 AIR QUALITY

2.8.1 REGULATORY FRAMEWORK FOR AIR QUALITY

The Bay Area Air Quality Management District (BAAQMD) is the primary agency responsible for enforcing the air quality standards in the Bay Area. State and national ambient air quality standards are mandated under the Clean Air Act, and the California Clean Air Act. Upper limits have been set for ozone, carbon monoxide (CO), nitrogen dioxide (NO₂), sulfur dioxide (SO₂), particulate matter, and lead, and standards for the particulate matter that can be inhaled. The only known exceedance of standards within the Bay Area is the California PM₁₀ particulate standard. Bay Area PM₁₀ concentrations exceed the California standard, but meet the federal standard. Any exceedances within the Project Area are likely to be the product of heavy traffic on Park Presidio Boulevard.

As part of the GGNRA, the air quality designation for the Presidio is Class II, which corresponds to reduced pollutant concentrations relative to San Francisco's Class III designation. Managers at the Presidio must ensure that project activities meet these air quality standards, and that external sources of pollution are controlled or mitigated to the extent possible to protect air quality and resources values (Presidio Trust, 2000).

2.8.2 EXISTING AIR QUALITY CONDITIONS

The affected environment discussed in this section is the air quality within the Project Area. The primary source of air pollution in Mountain Lake originates from neighboring Park Presidio Boulevard, which generates carbon monoxide and other vehicle exhaust products. High traffic volumes and congestion occur frequently on Park Presidio Boulevard, introducing pollutants into the Project Area. Levels of these air pollutants may exceed state and federal standards if traffic congestion coincides with stagnant weather conditions (NPS, 1994).

2.9 NOISE

The affected environment discussed in this section is the noise level that exists within the Project Area. The public often mentions existing high levels of noise from Park Presidio Boulevard as a key issue that needs to be addressed at Mountain Lake. Most effective means for addressing this issue, such as the construction of a sound wall along Park Presidio, are outside the scope of the Mountain Lake Enhancement Plan or would have to be implemented by other agencies (e.g., CALTRANS).

In accordance with the GMPA EIS, projects within the Presidio comply with the City of San Francisco noise ordinance. The local ordinance specifies maximum noise levels during construction and other project related activities within the Presidio. The noise ordinance limits construction noise between 7 a.m. and 8 p.m. to 80 decibels at 100 feet distance and between 8 p.m. and 7 a.m. to 5 decibels above the ambient noise levels. Noise levels within the Project Area are high in areas adjacent to Park Presidio Boulevard (Figure 2).

The Presidio Trust is committed to complying with provisions equivalent to the standards articulated in the San Francisco Noise Ordinance. Noise levels within the Project Area are regulated by the San Francisco Noise Ordinance, Article 29 of the San Francisco Police code. Regulations for construction-related noise include:

- Construction noise limited to 80 dBA at 100 feet from the equipment during daytime hours (7 a.m. to 8 p.m.). Impact tools are exempt from the dBA restrictions provided that they are provided with effective mufflers.
- Nighttime construction (8 p.m. to 7 a.m.) that would increase ambient noise activity by 5 dBA or more is prohibited.

2.10 HAZARDOUS SUBSTANCES

The affected environment discussed in this section is the potential for hazardous substances as defined by law within the Project Area.

2.10.1 REGULATORY FRAMEWORK FOR HAZARDOUS SUBSTANCES

The Presidio Trust is the lead agency conducting the investigation of whether hazardous substances are present in the Project Area. The California Department of Toxic Substances Control (DTSC) is the lead agency for oversight of the Presidio Trust's investigation and remediation activities. The San Francisco Regional Water Quality Control Board (RWQCB) works in conjunction with the DTSC on issues of water quality and contaminants.

Prior to the Presidio Trust's assuming responsibility as lead agency for Presidio-wide remedial investigations and clean up, the U.S. Army conducted a remedial investigation throughout the Presidio of areas that might contain actionable levels of hazardous chemicals. The Army initiated its investigations and studies in 1990 and turned them over to the Trust in 1999 when agreement was reached between the Presidio Trust, NPS and Army to transfer responsibility to complete the required studies and clean-up activities to the Presidio Trust. The investigations were conducted in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the Resource Conservation and Recovery Act (RCRA), and other relevant regulations (Dames and Moore, 1997).

In 1999, the California Department of Toxic Substances Control approved the Trust's request to include remedy selection for Mountain Lake in the planned amendment to the Public Health Service Hospital (PHSH) Record of Decision (ROD). The Trust expects that this amendment or some other satisfactory regulatory decision-document will be completed early 2001. Numerous reports documenting chemicals at the Presidio indicate that hazardous substance cleanup would not be required in the Project Area.

2.10.2 HAZARDOUS SUBSTANCES AT MOUNTAIN LAKE

An investigation of Mountain Lake was included in the Army's Main Installation Remedial Investigation completed by Dames and Moore in 1997. As part of this study, the Army collected and analyzed lake water and sediment samples, as well as sampled soil from two borings installed adjacent to the lake. Using the RWQCB's Basin Plan water quality objectives for surface waters, the U.S. Army reported that cyanide, lead, and heptachlor levels in Mountain Lake exceeded freshwater quality objectives (Dames & Moore, 1997). The Trust has recently collected additional samples at Mountain Lake to confirm the findings from the Army's investigation.

Sediment data collected from Mountain Lake indicate that lead and cadmium is present in one Mountain Lake sediment sample at a concentration slightly greater than the applicable cleanup goal. However, lead was below the detection limit of 7.44 mg/kg in one sediment sample, and below the background lead concentration of 64 mg/kg in six other sediment samples. The report concluded that once the sediment is homogenized during dredging the sediment would likely not exceed hazardous waste criteria or applicable ecological cleanup levels (Erlor and Kalinowski, 1998). Based on these data, elevated lead is not widespread in Mountain Lake sediments.

Low levels of Chemicals of Concern ("COCs") were detected in Mountain Lake water during the Army's RI investigations. The low level concentrations of COC's detected in Mountain Lake were not confirmed during the investigations conducted in 2000. As noted in the RI (Dames & Moore, 1997), Mountain Lake is not considered a potential source of chemicals and is not significantly impacted by other sources. Therefore, no remedial action is expected for Mountain Lake.

2.11 VISUAL RESOURCES

Mountain Lake is a unique and important scenic resource within the Presidio, providing both scenic views and contemplative surroundings to visitors. Currently, the best vista of the lake can be obtained from the south shore access area. The south shore provides a panoramic view of the lake including the golf course in the background to the north, lush riparian vegetation along the east and north wetland arms, and Park Presidio Boulevard to the west. The north and east shoreline also provide open water vistas with a backdrop to the south of the adjoining neighborhood and the active recreation areas of Mountain Lake Park.

As the only natural lake in the Presidio, the open waters of Mountain Lake provide a unique visual resource. The lake's numerous birds, intimate views, and thickly-vegetated shorelines provide an opportunity for quiet contemplation. Dense stands of willow, eucalyptus, and Monterey cypress border the Juan Bautista de Anza Historic Trail, creating a contemplative, woodland setting for walks.

As beautiful as Mountain Lake is, there are a number of elements that detract from the lake's visual quality. Algae blooms are frequent during the summer, reducing water clarity (Navarett, 1994). Sometimes algae blooms result in fish kills, which further compromise the visual and olfactory quality of the lake. Bare, eroding slopes along the south shore and under the eucalyptus trees along the east shore are unattractive. Invasive exotic weeds such as fennel make the slopes around the lake and along the de Anza Trail look unkempt. Passing cars on Park Presidio Boulevard are visible through gaps in the vegetation, and detract from the visual and auditory ambiance of the lake.