



Affected  
Environment

## CHAPTER 3: AFFECTED ENVIRONMENT

### INTRODUCTION

This “Affected Environment” chapter describes the resources of Golden Gate National Recreation Area (GGNRA) that could be affected as a result of implementation of any of the dog management alternatives. The resource descriptions provided in this chapter serve as the baseline against which to compare the potential effects of the management actions considered in this draft plan /environmental impact statement (EIS). The resource topics presented in this chapter and the organization of the topics correspond to the resource impact discussions contained in the “Environmental Consequences” chapter. The general project setting has been included to provide the background necessary to understanding the park resources and environment. The following resource topics are included: soils and geology, water quality, vegetation and wildlife, special-status species, cultural resources, visitor use and experience, park operations, and human health and safety.

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### GENERAL PROJECT SETTING

GGNRA was created from federal lands and state, city, and private lands that together encompass 80,500 acres in three counties: Marin, San Francisco, and San Mateo (see map 1). The northern (Marin County) areas of the park are separated from the southern (San Francisco and San Mateo) park areas by the Golden Gate entrance to San Francisco Bay. GGNRA manages 9,685 acres in Marin County, 942 acres in San Francisco County, and 2,812 acres in San Mateo County. The park lands border on lands with a wide range of ownership type and land use, a mix of private residential and agricultural lands, public watershed, parks, and open space. Forty-eight percent of Marin County is held as park lands, open space, and municipal watershed. GGNRA Marin lands include much of the coastline and southern portion of that county. Park lands in San Francisco border both private and commercial properties as well as City of San Francisco properties. In San Mateo County, GGNRA park lands are primarily located in the northern portion of the county, adjacent to the city of Pacifica. Because of the urban setting of GGNRA, some park parcels may be close but not contiguous to other parcels, resulting in many separate park sites (NPS 2010a, 2). GGNRA supports numerous programs that enhance and/or restore natural resources in different areas of the park and under different contexts. For this chapter and hereafter, these programs will be referred to as park stewardship programs and will encompass such park-sponsored and volunteer programs as the Site Stewardship Program, the Presidio Park Stewards, the Habitat Restoration Team, the Invasive Plant Patrol, the Trails Forever Program, Golden Gate National Parks Conservancy, the Headlands Institute, and the Presidio Trust.

GGNRA is part of the Golden Gate Biosphere Reserve, which was designated by the United Nations and recognized internationally for its importance to the conservation of biodiversity, sustainable development, and relevant education and research. The Golden Gate Biosphere Reserve includes over 2 million acres of protected lands and waters administered by a variety of agencies and organizations (NPS 2005a, 4). In addition, GGNRA lies in the California Floristic Province, a Nature Conservancy biodiversity hotspot. Biodiversity hotspots are identified when a high number of endemic species are found in an area. Of the nearly 3,500 species of plants found in the California hotspot, 61 percent are endemic to the area (CAS 2005, 2).

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This “Affected Environment” chapter addresses the topics that were not dismissed from further consideration as described in the “Purpose and Need for Action” chapter for the planning area. Resources included in the physical environment include soils and geology as well as water quality. A discussion regarding natural resources then follows and includes vegetation, wildlife, and special-status species. Finally, the human environment sections discuss cultural resources, climate change, visitor use and experience, park operations, and human health and safety.

## SOILS AND GEOLOGY

This discussion focuses on a general overview of the location and characteristics of the major soil series that compose GGNRA, a discussion on the rare serpentine soils throughout the park, and soil disturbance. The geologic setting of the park is also presented.

### GEOLOGIC SETTING

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*GGNRA is located on the boundary between two of the earth’s great tectonic plates, the North American and Pacific plates.*

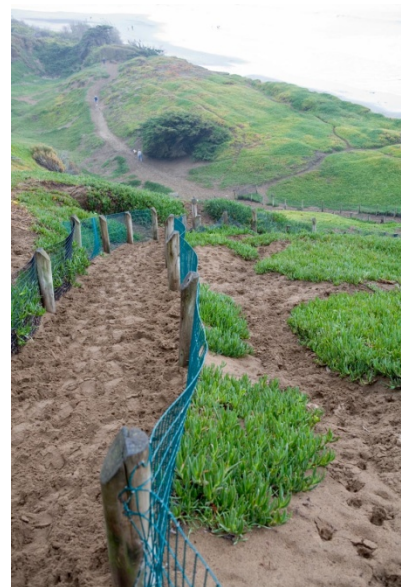
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GGNRA is located on the boundary between two of the earth’s great tectonic plates, the North American and Pacific plates. Today, this plate boundary is formed by the San Andreas Fault Zone. The rocks exposed in the park provide a detailed record of geologic processes going back 200 million years, one of the longest records of its type in the world. The Franciscan Complex forms the bedrock beneath most of the park, and comprises rocks that were deposited on the ocean floor some 100 million years ago, and then deformed and metamorphosed as the ocean floor was thrust under the edge of the North American Plate. Along the central San Mateo coast, west of the San Andreas Fault, the bedrock is Montara Mountain granitic rock.

Ongoing natural processes, including seismic and tectonic activity, weathering, coastal erosion, active dunes, and landslides, contribute to the rich geologic resources of the park. The complex geologic history is represented by a wide variety of features and rock types, including sedimentary, volcanic, and metamorphic rocks. Some of these rocks are very hard and resistant, like the cherts in the Marin Headlands. Others, such as the soft sedimentary rocks of the Merced and Colma formations that form the Fort Funston bluffs and the serpentinite rock exposures in the Franciscan Complex at the Presidio and Lands End, are highly susceptible to natural erosion as well as damage from human and dog use. Dune systems, which rely on natural disturbance regimes for their ecological function, are also very susceptible to artificial disturbance, which can disrupt the natural processes. Dunes and serpentine soils create unique habitats that support some of the park’s rare and endangered plant species (Elder n.d., 11; NPS 2010b).

### OVERVIEW OF SOILS

Overall, the soils in GGNRA belong to the following complexes: Blucher-Cole, Cronkhite-Barnabe, Felton Variant-Soulajule, Rodeo Clay Loam, Tamalpais-Barnabe Variant, Saline Hydraquents, Rock-outcrops-Orthents, Sirdak Sands, and Beach (NRCS 2004a, 9; 2004b, 9). All these soils are susceptible to water erosion when they are disturbed or exposed (e.g., when vegetation is trampled or removed). Some soils in the park are



**Bluffs at Fort Funston**

Credit: NPS

considered Urban Lands, which are lands and soils whose characteristic properties have been modified as a result of development (NRCS 2005, 9).

### **Blucher-Cole Complex**

The Blucher-Cole complex is a hydric soil, which is defined as a soil formed under conditions of flooding, saturation, or ponding extended enough for the soil to develop anaerobic conditions (USACE 1987, 19). The Blucher-Cole complex runs along the Oakwood Valley floor, has a fairly low slope of 2 to 5 percent, and experiences occasional flooding. Silty clay loam characterizes this soil unit and extends deeper than 60 inches in some areas. These soils are located in the Oakwood Valley in Marin County (NRCS 2004a, 7).

### **Cronkhite-Barnabe Complex**

The Cronkhite-Barnabe complex is composed of approximately 50 percent Cronkhite soils, 30 percent Barnabe soils, and 20 percent other minor soils. The Cronkhite series consists of deep, moderately well-drained soils that are found on hills with slopes of 9 to 75 percent. The Barnabe series consists of shallow, well-drained soils that are also found on hills and mountainous uplands with a slope of 9 to 75 percent. Topsoils of this complex consist of loam, gravelly loam, or clay loam, with depths ranging from 13 to 45 inches. These soils are located in Marin County and are found at the following sites: Marin Headlands, including Tennessee Valley, Homestead Valley, Oakwood Valley, Alta Trail/Orchard and Pacheco fire roads, and Rodeo Beach (NRCS 2004a, 12–13).

### **Felton Variant-Soulajule Complex**

The Felton Variant-Soulajule complex is composed of 50 percent Felton Variant soil, 40 percent Soulajule soils, and 10 percent other materials. The Felton series consists of deep, well-drained soils located on uplands. These soils have a slope of 30 to 50 percent. The Soulajule series consists of moderately deep, well-drained soils that are located on hillsides. These soils are located in the Marin Headlands (NRCS 2004a, 12).

### **Rodeo Clay Loam**

Rodeo Clay Loam is a hydric soil that runs along the Tennessee Valley floor with a slope of 2 to 5 percent. These soils are poorly drained and have a high available water capacity (the amount of water soils can store that is available for use by plants). Clay loam and clay extend deeper than 80 inches. These soils are located in the Marin Headlands, including Tennessee Valley (NRCS 2004a, 17).

### **Saline Hydraquents**

Saline Hydraquents are hydric soils located in tidal flats. These soils are flat (0 to 2 percent slope) and very poorly drained. The soils have a very low available water capacity and a moderate to strong salinity. Saline Hydraquents are located slightly inland of the Tennessee Valley in the Marin Headlands (NRCS 2004a, 16).

### **Tamalpais-Barnabe Variant Complex**

The Tamalpais-Barnabe Variant complex is composed of 60 percent Tamalpais soils, 30 percent Barnabe soils, and 10 percent other materials. Tamalpais soils consist of moderately deep, well-drained soils that are located on mountainous uplands. These soils have a slope of 15 to 75 percent and consist of a very gravelly loam. The Barnabe series consists of shallow, well-drained soils that are found on hills and

mountainous uplands and have a slope of 9 to 75 percent. Soils of this complex are located in the following sites: Fort Baker, Alta Trail/Orchard and Pacheco fire roads, and Marin Headlands, including Tennessee Valley (NRCS 2004a, 16).

### **Rock-outcrop-Orthents Complex**

The Rock-outcrop-Orthents complex is composed of bare rock escarpments with slopes from 30 to 75 percent. These soils are composed of 45 percent Rock-outcrop, 45 percent Orthents, and 10 percent other materials. These soils are excessively drained with very low available water capacity. These soils are located in San Francisco County in the Lands End, Fort Miley, Sutro Heights Park, and Ocean Beach sites (NRCS 2004b, 11). Crissy Field contains soils in the Orthents soil series. The Rock-outcrop-Orthents complex is also located in the San Mateo County sites, including Mori Point, Sweeney Ridge/Cattle Hill, Milagra Ridge, and Pedro Point Headlands (NRCS 2004b, 11).



**Tennessee Valley Trail**

Credit: NPS

### **Sirdak Sands**

Sirdak Sands are deposited in dunes with slopes from 5 to 50 percent. These sands can reach a depth of 120 feet. The sands are somewhat excessively drained and have a low available water capacity. These sands are located in the Baker Beach, Lands End, Sutro Heights Park, Ocean Beach, and Fort Funston sites (NRCS 2004b, 12).

### **Beach**

Soils in Baker Beach, Ocean Beach, Fort Funston, Mori Point, Pedro Point, Rodeo Beach, and Muir Beach are characterized as Beach (NRCS 2004b, 12). Muir Beach is a Holocene beach composed of sand deposits at the mouth of Redwood Creek (NPS 2007c, 3–11). The beach is supplied with sand that comes from both Redwood Creek and the longshore transport of sand along the coast. Stinson Beach is supplied with sand material from the sand dunes in the area (SBCWD 1998, 1).

### **Urban Lands**

Urban Lands are lands and soils whose characteristic properties have been modified as a result of development (NRCS 2005, 9). Soils in Fort Point and Upper Fort Mason are considered Urban Lands. Soils at Fort Point consist of 85 percent Urban Lands and 15 percent minor components (NRCS 2004b, 9). Soils in portions of Upper Fort Mason are classified as Urban Lands-Orthents and Urban Lands-Sirdak. Urban Lands-Orthents is composed of 65 percent Urban Lands and 30 percent Orthents. This area is relatively well drained, with a slope of 0 to 2 percent. Urban Lands-Sirdak are somewhat excessively drained soils with a slope of 2 to 50 percent. These soils are composed of 45 percent Urban Lands and 35 percent Sirdak soils. The majority of Upper Fort Mason is considered Urban Lands-Sirdak (NRCS 2004b, 10).



## RARE SOILS AT GOLDEN GATE NATIONAL RECREATION AREA

In the San Francisco Bay Area, rare serpentine soils occur where igneous rocks associated with fault zones have intruded into sedimentary Franciscan formations. The soils are characterized by three essential differences from other soils in the area: They have a low calcium to magnesium ratio, they have high concentrations of other metals, and they lack essential nutrients such as nitrogen, potassium, and phosphorus (NPS n.d.a, 1). Each of these differences makes it less likely that plant life will thrive or even survive in serpentine soils. However, many plants are able to grow in serpentine soils and plant diversity can be quite high. Some species that are presumably unable to compete with other plants also occupy only these harsh environments, where more common species do not grow (USFWS 1998, I-10). At least 28 species of plants and animals occur either exclusively or primarily on serpentine soils in the Bay Area (USFWS 1998, I-14). Of these, half are federally listed as threatened or endangered and the rest are species of concern (USFWS 1998, I-13) (see “Special-status Species” for more detail on threatened or endangered plant species).

In the park, serpentine soils can be found at Muir Beach, Crissy Field, Baker Beach, and Lands End. The serpentine soils at Muir Beach lie outside the study area for this plan/EIS. At Crissy Field, serpentine soils are found only in the study area adjacent to Marine Drive. The serpentine soils at Baker Beach are located on the coastal bluffs between Baker Beach and the Golden Gate Bridge (USFWS 2003, 17). The serpentine soils at Lands End lie at the western end of the site, near Fort Miley.

## ALTERATION OF PARK SOILS

In general, sources of soil disturbance in the park include natural forces, such as wind and weather, and human disturbance, such as development; stream diversion; road or trail creation for cars, bicycles, hiking, running, or horseback riding; and dog walking. On steep slopes, heavy rainfall combined with human disturbance often results in the naturally soft and erodible soils being washed away, leaving gullies in some areas of the park. Improper drainage along roads built prior to the park’s establishment has resulted in concentrations of runoff and accelerated gullying, landslides, and increased sediment yields into creeks and streams. The development of game trails and/or social trails can also lead to slope failures and subsequent disturbance and loss of topsoil. Trampling and digging by dogs can lead to accelerated erosion of cliffs and dunes at GGNRA sites, which can also be exacerbated by high visitor traffic.

Park users can also damage and destroy vegetation and create soil compaction, which reduces infiltration of moisture into the soil and increases the volume of runoff and the potential for loss of topsoil (Joslin and Youmans 1999, 9.3). Soil compaction is common along social trails that have been created by—and are heavily used by—bikers, hikers, runners, and dog walkers. Dogs and dog walkers that do not stay on designated trails and venture off trail create social trails that become denuded of vegetation and result in increased soil compaction. This has occurred at Homestead Valley, Alta Trail/Orchard and Pacheco fire roads, Oakwood Valley, Marin Headlands, Baker Beach, Lands End, Fort Funston, Mori Point, Sweeney Ridge/Cattle Hill, and Pedro Point Headlands.

The natural nutrient levels in the soils throughout the park have also been altered by dog waste (NPS 1999, 40). Dog waste can increase the amount of nitrogen and phosphorus in the soil (CRCCD 2009, 1). Additionally, dog urine can increase the natural salinity of soils. Nutrient addition from pet waste is common anywhere that dogs are allowed, particularly when dog waste is not removed; dog urination also adds nutrients to the soil and cannot be picked up. At sites that are heavily used by dogs, their waste can be a major problem. Nutrient addition



**Alta Trail**

Credit: NPS

to nutrient-poor serpentine soils can alter soil chemistry, which may result in changes to the plants that occur in these soils (USFWS 1998, I-12). Areas where dog use intensity is high may have an elevated nutrient contribution to the soil. Some of these areas include Alta Trail, Oakwood Valley, Muir Beach, Crissy Field, and Fort Funston (see table 9 in the “Visitor Use and Experience” section later in this chapter).

Ongoing projects at the park, including drainage and trail improvements, trail realignments, revegetation, and habitat restoration, are designed to reduce erosion potential.

## WATER QUALITY

This discussion of water quality focuses on a general overview of water quality throughout the park, including the coastal beaches and marine resources.

Water resources at GGNRA include coastal waters as well as brackish lagoons, streams, ponds, seeps, springs, and wetlands. Significant watersheds located completely or partially within the park (from north to south) include Bolinas, Redwood Creek, Tennessee Valley (Elk Creek), Rodeo Creek/Lagoon, Nyhan Creek, Lobos Creek, San Pedro Creek, Milagra Ridge, Sweeney Ridge, West Union Creek, and the San Francisco watershed lands in San Mateo County.

Smaller watersheds drain steep coastal bluffs directly into San Francisco Bay or the Pacific Ocean. Current management actions to improve water quality in GGNRA include water quality monitoring, watershed planning and restoration, habitat restoration and revegetation, drainage improvements, trail realignments, contaminant source identification and remediation, and site planning and design to reduce erosion (Stafford and Horne 2004, 5). Most water quality sampling to date has focused on specific sites with known or suspected water quality impacts, including beach water quality monitoring.

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## OVERVIEW OF WATER QUALITY IN GOLDEN GATE NATIONAL RECREATION AREA

Water quality monitoring has been conducted in several of the park’s water bodies over the years, including areas covered under this plan, such as Redwood Creek, Rodeo Creek, Rodeo Lagoon, Oakwood Valley, Tennessee Valley, Easkoot Creek, Crissy Marsh, and Lobos Creek. Water quality indicators measured included flow, temperature, pH, specific conductance, turbidity, total suspended solids, dissolved oxygen, biochemical oxygen demand, nitrogen, phosphorus, ammonia, metals, and biological indicators such as fecal coliform (Stafford and Horne 2004, 5).



**Rodeo Lagoon**

Credit: NPS

Continued water quality sampling at the park has shown that the quality of the water bodies throughout the park is generally acceptable for sustaining aquatic life (Stafford and Horne 2004, 5). Dissolved oxygen is a concern in the park in the summer (when temperatures rise) and fall (when leaves fall) because flows decrease and the water is stripped of oxygen. Warm water is less able to hold dissolved oxygen, and leaves are coated by a microbial biofilm of bacteria and fungi that use oxygen in their metabolic cycles as they feed on the cellulose in the leaves (Stafford and Horne 2004, 34).

Nitrogen and phosphorus levels may increase due to the decomposition of plants, animal waste, soil,

sewage, and fertilizers (Stafford and Horne 2004 42, 47). Areas that occasionally have exceeded levels of fecal coliform bacteria following storm events include Lobos Creek near Baker Beach and San Pedro Creek near the Pedro Point Headlands in San Mateo County. High bacteria and nutrient levels in the water bodies at GGNRA have been attributed to equestrian operations, pet waste, agricultural operations, stormwater runoff, and seepage or overflow from sewer and septic systems (Stafford and Horne 2004, 5). Naturally occurring wildlife can also contribute low levels of fecal contamination (Stafford and Horne 2004, 53). In 2006, scientists began to look at what was causing water pollution in three local rivers in Maryland. After running tests on the bacteria in the three rivers, scientists found that approximately 50 percent of the bacteria was due to wildlife waste and approximately 15 to 20 percent of the bacteria was due to pet waste (Fahrenthold 2006, 1).

The drainage areas of Oakwood Valley and Homestead Valley feed Nyhan Creek and Coyote Creek, respectively. The pesticide Fipronil was detected in the surface water at Nyhan Creek, and the pesticides Myclobutanil and Tetraconazole were detected in Coyote Creek (USGS 2008, 12). Fipronil is a broad-spectrum insecticide that disrupts the central nervous system of insects and is highly toxic to fish and aquatic invertebrates. The substance is an active ingredient in Frontline, a topical flea and tick control treatment commonly used on dogs and cats; however, it has not been determined whether this is the source of Fipronil in Nyhan Creek (VMD 2004, 1).

The channel downstream of the Muir Beach pedestrian bridge has been identified as having poor water quality under low-flow conditions (NPS 2002c, 24). Where surface flow slowed enough so that only pools were present, dissolved oxygen levels dropped below 1 mg/L, although the concurrent water temperatures remained below 20 degrees Celsius (NPS 2002c, 24). The lagoon at Muir Beach was historically without shading and was shallow, which resulted in conditions that were poor for fish during the dry season; however, the lagoon was restored in 2009. The restoration increased the depth of the lagoon and supplied it with large woody debris and vegetation. These improvements will provide much better conditions for fish during the dry season. Although ammonia levels have been lower since horse management practices were implemented at the Golden Gate Dairy, elevated nitrate levels (greater than 1 to 5 mg/L) attributed to animal and septic wastes continue, and bacterial water quality violations have continued to occur in the ocean at Muir Beach (NPS 2007b, chapter 3, 21). Warning signs that advise visitors to avoid contact with the water have been posted at Muir Beach in the last few years (NPS 2007b, chapter 3, 23). Rodeo Lagoon receives freshwater from Rodeo Creek during most of the year. As a result, salinities at the easternmost edge of the lagoon where the discharge from Rodeo Creek enters the lagoon are lower than in the remainder of the lagoon (NPS 2007c, 100). Water quality concerns in the Rodeo Creek/Lagoon area are high levels of turbidity and sedimentation of area streams. Several of the trails in this area have erosional gullies along much of their surface, and sediment from these trails is transported via overland flow and culverts to Rodeo Creek (NPS 2009d, 108). Rodeo Lagoon was also found to have high pH values, high wet-weather fecal coliform counts, and high algal counts. Rodeo Lagoon exhibits the classic signs of eutrophication (enrichment of a water body with dissolved nutrients): intense algal blooms, depletions in dissolved oxygen, and fish kills (Drake 2008, 1). If algae are abundant, large fluctuations in pH and dissolved oxygen may occur due to algal photosynthesis and respiration (Stafford and Horne 2004, 17). Algal blooms occurring in Rodeo Lagoon are a concern for both humans and dogs. Some species of algae, such as cyanobacteria, or blue-green algae, may produce toxins or poisons that can be harmful to pets, wildlife, livestock, and humans (ODHS n.d., 1).

Beginning in 1997, the NPS and the Golden Gate National Parks Association began restoration of 100 acres at Crissy Field, including construction of 40 acres of habitat (18 acres of tidal marsh and 22 acres of dune and dune swale habitat). Water quality monitoring of the marsh was conducted from 2000 through 2004. This monitoring revealed water quality issues in the marsh, including low dissolved oxygen levels (NPS 2006h, 16). Currently, the eastern third of Crissy Airfield, which drains into Crissy Marsh, receives a moderate to high level of use by off-leash dogs and a substantial amount of pet waste.



## MARINE RESOURCES

The park's legislative boundary extends approximately one-quarter mile offshore into the San Francisco Bay and Pacific Ocean and includes several beaches, coves, and other estuarine and marine areas. Beaches are discussed in this section for impacts on water quality; vegetation and wildlife on beaches are addressed in the "Coastal Communities" section. Named beaches in the study area for this plan/EIS include Ocean Beach, Rodeo Beach, Baker Beach, Muir Beach, and Stinson Beach, which are located on the Pacific Ocean. Fort Point, Fort Baker, and Crissy Field are coastal sites in the study area that front the San Francisco Bay. Runoff from creeks, rivers, or storm drains is the largest source of pollution to California beaches. Runoff may contain toxic heavy metals, pesticides, petroleum hydrocarbons, animal waste, trash, and human sewage (Heal the Bay 2006, 6).

The San Francisco Estuary Institute has administered a regional monitoring program of the San Francisco Bay since 1993 (NPS 2003c, 91). The institute collects water quality data in the Central Bay at Yerba Buena Island, Richardson Bay, and the south terminus of the Golden Gate Bridge. The Central Bay is on the *Clean Water Act* 303(d) list of impaired water bodies for 11 pollutants.

Coastal water quality data have been collected by the city and county of San Francisco for 20 years at Crissy Beach, Baker Beach, Ocean Beach, and Fort Funston. The San Francisco Bay Regional Water Quality Control Board has set bacterial standards for recreational contact for marine waters. These standards are occasionally exceeded on San Francisco beaches. For example, bacteria levels were monitored at Crissy Beach, Baker Beach, and Ocean Beach from November 2008 to February 2009. A total of 45 samples were collected at each site over the 4-month period. The percentage of time that the bacteria level exceeded the California state standard was 4 percent at Crissy Beach, 1 percent at Baker Beach, and 6 percent at Ocean Beach (SFPUC 2009, 1).

Heal the Bay is a nonprofit environmental organization dedicated to making Southern California coastal waters and watersheds safe, healthy, and clean. Each year since 1990, Heal the Bay has published the Beach Report Card, which provides water quality information for 500 beaches throughout California based on a grading system (A–F) that reflects the risk of adverse health effects to beachgoers (Heal the Bay 2006, 1). The grades are based on daily and weekly fecal coliform pollution levels in the surfzone. All beaches in San Francisco County except Baker Beach exhibited excellent water quality in 2008. Baker Beach had multiple coliform and enterococcus exceedances in late July and most of August 2008 (Heal the Bay 2009, 36). Water quality has been seasonally monitored by Marin County at Rodeo Beach, Muir Beach, and Stinson Beach. Aside from the bacterial contamination problems at Muir Beach, beach locations in Marin County received "A" grades during the dry-weather sampling. A grade was not given for wet-weather sampling because insufficient data was collected (Heal the Bay 2009, 38).

## DOGS AT GOLDEN GATE NATIONAL RECREATION AREA

Dogs have been observed by park staff in the lagoon and ocean at Muir Beach and in Redwood Creek, the ocean at Ocean Beach, the San Francisco Bay, the lagoon at Rodeo Beach, Crissy Field tidal marsh, Lobos Creek at Baker Beach, and the beach at Mori Point. A substudy of the San Francisco Sewage Master Plan determined that bacterial contamination of waters off Ocean Beach was significant due to dog fecal matter deposited along the shoreline (NPS 1999, 21).

## VEGETATION AND WILDLIFE

The coastal ecosystem at GGNRA supports a rich assemblage of plant and wildlife species. The park's grasslands, coastal scrub, wetlands, and forests support 387 documented vertebrate species. GGNRA is also home to 80 vegetation alliances (or plant communities), which provide habitat for at least

53 species of mammals, 250 species of birds (including shorebirds, ground-nesting birds, and many others), 20 species of reptiles, and 11 species of amphibians (NPS 2009a, 1). This section describes the vegetation and wildlife communities at GGNRA potentially affected by dog management activities; therefore, not all communities present at GGNRA will be described in this section. Plant and wildlife species that have special status are described in the following section, “Special-status Species.”

Of the general vegetation communities that have been mapped at GGNRA, the ones of interest for analysis of potential impacts resulting from the dog management alternatives in this plan/EIS are described in detail below and are presented by site in maps 21 through 23. In this section, each vegetation community is described by general location in GGNRA, overall species composition in the community, plant species of interest or management concern, and wildlife species that occur or may occur in the community. Species of interest include plants or wildlife species that are not federally or

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state listed but that have status or ranking through either the California Department of Fish and Game (DFG) or the California Native Plant Society (CNPS). Many bird species that occur at GGNRA are not federally or state listed, but are still protected under the *Migratory Bird Treaty Act* and are also considered species of interest. All the bird species at GGNRA discussed in this section with the exception of starlings, pigeons, crows, and game birds are protected under the *Migratory Bird Treaty Act*. Additionally, some species with the “fully protected” status also exist at GGNRA; a fully protected species means that the state has either restricted issuing take permits for the species or the state will only issue take permits for research or enhancement actions (DFG 2010, 1).

The following vegetation communities in GGNRA and associated wildlife are described in this section:

- Coastal communities
- Coastal scrub and chaparral
- Grasslands
- Wetlands and open water
- Native hardwood forest
- Riparian forests and streams
- Douglas-fir and coast redwood
- Monterey cypress
- Invasive plant species.

At GGNRA, vegetation and wildlife management is primarily focused on research, monitoring, and meeting desired conditions. Management activities include reestablishing and/or establishing native plant species, controlling weeds and trampling, and removing and/or controlling invasive species. The goal of vegetation and wildlife management at GGNRA is to improve monitoring, restore or enhance populations and/or remove threats, and reduce conflicts between park visitors and sensitive species. Restoration efforts include decompacting soils, removing exotics, and planting. Park stewardship programs also support efforts to protect and improve resources at the park, such as renovating and expanding GGNRA trails and providing assistance in restoration efforts (NPS 2009a, 1).

In addition to vegetation and wildlife management activities, the park collects data regarding the frequency of disturbance to wildlife and habitats at GGNRA sites. Wildlife species and their habitats are currently being affected by dogs at this park, which has been documented by reports taken and warnings

and citations issued (all referred to as incidents) related to dogs in closed areas and disturbing wildlife at GGNRA (NPS 2008c (appendix G)). These data come from two independent law enforcement divisions in NPS (the U.S. Park Police and Law Enforcement (LE) Rangers) and include incidents recorded for 2007 and 2008 by site (table 6).

**TABLE 6. RECORDED INCIDENTS INVOLVING DOGS IN 2007 AND 2008**

Park Site	Recorded Incidents In 2007/2008		
	Dogs in Closed Areas	Dogs Disturbing Wildlife	Total
Stinson Beach	334	4	338
Alta, Orchard, Pacheco	18	0	18
Muir Beach	3	0	3
Rodeo Beach	1	4	5
Marin Headland Trails	28	0	28
Tennessee Valley	109	0	109
Fort Baker	1	0	1
Crissy Field Wildlife Protection Area (WPA)	17	3	20
Fort Point	2	0	2
Lands End	2	0	2
Ocean Beach Snowy Plover Protection Area (SPPA)	2	32	34
Fort Funston	1	2	3
Total	518	45	563

Source: NPS 2008c (appendix G).

These numbers of incidents of visitors not complying with dog walking regulations is not equal to the number of actual violations occurring at the park. The enforcement of violations is not uniform. This is partly due to the size of the park and the inability of law enforcement staff to be in many different areas at once. It is also due to the court decision in *U.S. vs. Barley* (405 F.Supp.2d 1121 (N.D. Cal. 2005)), which required the park to revert to the 1979 Pet Policy until notice and comment rulemaking could evaluate a change to this policy. The 1979 Pet Policy allows off-leash, voice-controlled dog walking in some portions of the park. In effect, the court decision caused the NPS Service-wide regulation on dogs to be enforced only in areas not covered by the 1979 Pet Policy. Special regulations for species protection, such as 36 CFR 7.97(d), also regulate dog walking at Crissy Field Wildlife Protection Area (WPA) and Ocean Beach Snowy Plover Protection Area (SPPA). Public confusion has resulted from the various different requirements throughout the park. The different rules have also resulted in different levels of enforcement and numbers of citations. Areas specifically covered by Service-wide regulations, not the 1979 Pet Policy, are subject to enforcement resulting in higher numbers of incidents.

## COASTAL COMMUNITIES

The coastal communities at GGNRA include habitats such as coastal dunes, beaches, adjacent open water, and rocky intertidal areas, of which only the coastal dune habitat supports plant communities that are likely to be affected by dogs. In the study area at GGRNA, coastal dune habitat is found at Muir Beach, Rodeo Beach, Crissy Field, Baker Beach, Ocean Beach, and Fort Funston. There is also beach and coastal

dune habitat at Stinson Beach, but this area is not affected by dog management alternatives and is not discussed further in this plan/EIS. The following areas in the dog management planning areas at GGNRA have beach habitat: Muir Beach, Rodeo Beach, Crissy Field, Baker Beach, Ocean Beach, Fort Funston, and Mori Point; dogs are currently allowed access to these beaches or portions of these beaches. As applicable, these beach areas are discussed in more detail in the following paragraphs. Many of the coastal sites in GGNRA have accessible intertidal areas and rocky cliffs, including Muir Beach, Rodeo Beach, Fort Baker, Lands End, Fort Funston, and Mori Point. There are rocky intertidal areas at Fort Mason and Pedro Point as well, but these areas are generally not accessible to visitors and are not discussed further in this plan/EIS. There is offshore habitat on piers at Fort Baker, Fort Point, and at Fort Mason; dogs are not allowed on the piers at Fort Baker and Fort Point.

Coastal dune habitat develops wherever there is accumulated sand resulting from wind and wave action above the high tide line. The active foredunes and inner, stabilized dunes support a simple, yet unique, plant community. The overall diversity of plant species that inhabit coastal dunes is low, and plants are usually prostrate or low growing. Naturally stabilized dunes at GGNRA are inhabited by low-growing perennial shrub species also found in the coastal scrub habitat. Active foredunes are usually colonized by pioneering species such as coastal buckwheat (*Eriogonum latifolium*), sand verbena (*Abronia maritima*), and beach bur (*Ambrosia chamissonis*) (Powell 1978, 41-42). The beach at Rodeo Beach supports coastal vegetation consisting mainly of native low-growing dune species. These dune perennials are easily disturbed by trampling, digging, and other human-related activities, creating opportunities for the establishment of non-native and/or invasive plant species, such as ice plant (*Carpobrotus edulis*).

The Coastal Trail at Lands End is currently being improved and the surrounding forest is being revitalized through park stewardship programs. A portion of the beach habitat at Ocean Beach is designated as the Ocean Beach SPPA and a portion of the beach habitat at Crissy Field is designated as the Crissy Field WPA. Both areas are protected to provide overwintering habitat for the federally threatened western snowy plover and are described in more detail in the “Special-status Species” section of this chapter. Ocean Beach today represents a highly constructed and manipulated beach environment influenced by a combination of natural processes and human influences on those natural processes (NPS 1999, 42). While vegetation is minimal on the portions of Ocean Beach that experience periodic wave overwash, the beach is backed by an extensive dune complex dominated by non-native European beach grass (*Ammophila arenaria*), which was historically planted to stabilize the sand and prevent it from blowing onto the highway and further inland (NPS 2010b, 11, 16).

The native dune community at Crissy Field and the dune scrub community at Baker Beach provide important and unique habitat. The Baker Beach dune scrub is one of the few remaining intact stands of this vegetation type in San Francisco. Dune scrub is found on the sand terrace slopes above Baker Beach and in the Lobos Creek Dunes, and the listed San Francisco lessingia is found in association with this community. The San Francisco lessingia, listed as federally and state endangered, is described in detail in the “Special-status Species” section of this chapter. The dunes around Crissy Field, Baker Beach, and Lobos Creek Valley have been seeded with San Francisco dune gilia (*Gilia capitata* ssp. *chamissonis*) and San Francisco Bay spineflower, both species of interest at GGNRA because of their inclusion on CNPS List 1B (CNPS 2010, 1). Both Fort Funston and Baker Beach have been designated as San Francisco lessingia recovery and enhancement sites (USFWS 2003, 52). Other plant species of interest or management concern that occur at individual sites in the coastal dune habitat at GGNRA are described below, as applicable.

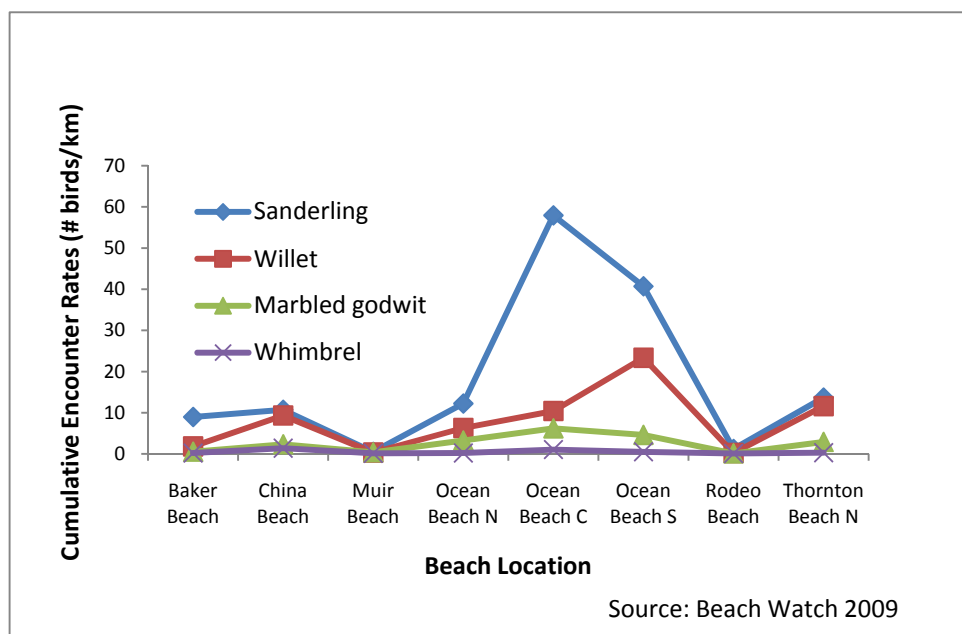
One CNPS-listed plant species, the pink sand-verbena (*Abronia umbellata* ssp. *breviflora*), is found in the coastal dune habitat and is being reintroduced at Baker Beach, below completed remediation sites. Trampling of the camphor tansy or dune tansy (*Tanacetum camphoratum*) species is being reduced and controlled through the restoration work of park stewardship programs. Several other CNPS-listed species

have been planted at GGNRA to reestablish and/or enhance populations; for instance, the dunes around Crissy Field and at Lobos Creek Valley at Baker Beach have been seeded with San Francisco dune gilia and San Francisco Bay spineflower. Patches of non-native ice plant at GGNRA have been removed by park stewardship programs as well.

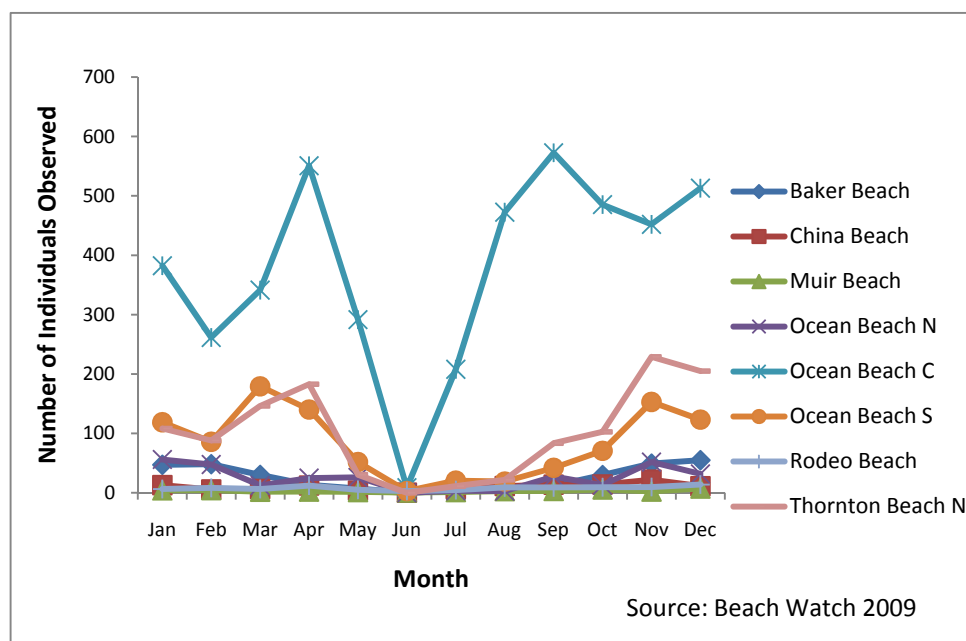
The intertidal zone in the upper sandy beach (swash zone) supports amphipods, polychaetes (marine worms), and flies that also provide food for shorebirds (Fong et al. 2000), including the western snowy plover (NPS 2009b, 113). The western snowy plover uses the active foredune and beach areas at GGNRA and forages along the intertidal areas. This species is discussed in more detail in the “Special-status Species” section of this chapter. A variety of other shorebird species migrate or overwinter in coastal areas of GGNRA and are often found in the same habitats as those used by the western snowy plover. All the bird species discussed in this habitat are protected under the *Migratory Bird Treaty Act*. Species abundance and diversity of shorebirds is monitored by the park and the Gulf of the Farallones National Marine Sanctuary Beach Watch program. The highest density of shorebirds on monitored GGNRA beaches generally occurs during shorebird northbound (April) and southbound (September) migration (Beach Watch 2006, 1). Beach Watch bird count data were analyzed for the following beaches included in this plan/EIS: Baker Beach, Muir Beach, Ocean Beach (North, South, and Central), Rodeo Beach, and Fort Funston (or Thornton Beach North). Collected data for beaches have indicated that willet (*Catoptrophorus semipalmatus*), marbled godwit (*Limosa fedoa*), sanderling (*Calidris alba*), and whimbrel (*Numenius phaeopus*) are the most common species of shorebirds using beaches in GGNRA and are often found to some extent year-round (Beach Watch 2006, 1). Numerous other species of waterbirds occur in the park in open water marine and rocky intertidal habitats, cliffs, and beach areas. These include a mix of migrant, wintering, and breeding species, such as loons, grebes, ducks, geese, gulls, terns, wading birds (herons and egrets), and the California brown pelican (recently delisted from the federal and state *Endangered Species Act* (ESA)). Muir Beach and Rodeo Beach sites had documented low shorebird abundance and diversity compared to other GGNRA coastal beaches that had high shorebird abundance and diversity such as Ocean Beach (Central and South) and Fort Funston (or Thornton Beach North) (Beach Watch 2006, 1; NPS 2009b 54, 2010b, 22, 23).

Common bird species that use the coastal dune and tidal zone (areas subject to tidal actions) include western gull (*Larus occidentalis*), Heermann’s gull (*Larus heermanni*), ring-billed gull (*Larus delawarensis*), Caspian tern (*Hydroprogne caspia*), semipalmated plover (*Charadrius semipalmatus*), western sandpiper (*Calidris mauri*), dunlin (*C. alpina*), and least sandpiper (*C. minutilla*). Figures 1 and 2 present numbers of commonly observed shorebird species by GGNRA site and month from 1993 through 2009. The Caspian tern and the elegant tern (*Sterna elegans*) both roost on the park’s beaches during the summer months (NPS 2008a). Seabirds and diving ducks also use nearshore habitat along the outer coast of GGNRA and inside San Francisco Bay for foraging and resting (NPS 2010b). Common seabirds include several species of loons, grebes, and cormorants. In addition to the bird species listed above, common mammal species also use the coastal areas in GGNRA, including skunks (*Mephitis mephitis*) and raccoons (*Procyon lotor*). Deer mice (*Peromyscus maniculatus*) and a western harvest mouse (*Reithrodontomys megalotis*) were captured in the dune area at Muir Beach during small mammal surveys (Takekawa et al. 2003, 7). Roof rat, a non-native mammal species were also captured in dune habitat during the surveys (Takekawa et al. 2003, 7) and feral house cats (*Felis silvestris catus*) have also been observed in coastal areas at GGNRA.





**FIGURE 1. COMMONLY OBSERVED SHOREBIRD SPECIES AT GGNRA BEACHES, 1993–2009**



**FIGURE 2. AVERAGE SHOREBIRD DENSITY BY MONTH AND BEACH AT GGNRA, 1993–2009**

Fort Funston is the largest of several significant remnants of the San Francisco dune complex (Shulzitski and Russell 2004, 4). The NPS implemented a restoration project in 1991 to protect habitat for the bank swallow, restore native dune vegetation, and reduce human-induced impacts to the coastal bluffs and dunes (Shulzitski and Russell 2004, 5). The 12-acre Fort Funston Habitat Protection Area is closed per the GGNRA Compendium (NPS 2008b, 9). A nesting colony of the state-threatened bank swallow occupies burrows in coastal bluff habitat at Fort Funston, which has a voluntary seasonal closure during nesting season and is discussed in more detail in the “Special-status Species” section of this chapter.

Nearshore areas offshore of the beaches in GGNRA are likely used by fish species such as English sole (*Pleuronectes vetulus*), speckled sand dab (*Citharichthys stigmaeus*), white croaker (*Genyonemus lineatus*), shiner surfperch (*Cymatogaster aggregate*), barred surfperch (*Amphistichus argenteus*), and striped bass (*Roccus saxatilis*) (McCormick 1992). Marine mammals use the waters and shorelines of GGNRA, including rocky, intertidal habitat that provides haul-out sites. Haul-out sites have been documented at Bonita Cove, Seal Rocks, Lands End, and Pedro Point. Pacific harbor seals (*Phoca vitulina*) are known to haul out primarily at Bonita Cove but may be found at any site with appropriate conditions. Point Bonita is located on the shoreline at the southernmost tip of the Marin Headlands. Up to 250 harbor seals haul out in Point Bonita Cove at Marin Headlands, and significant harbor seal pupping areas are found in Bolinas Lagoon and Tomales Bay in or directly adjacent to the park (NPS 1999, 13). California sea lions (*Zalophus californianus*) are found in association with Pacific harbor seals at Seal Rocks and Lands End but are sporadic in their use of the sites. All marine mammals are protected under the *Marine Mammal Protection Act*.



**Pedro Point**  
Credit: NPS

Marine mammals that have been found stranded, sick, or injured on beaches in GGNRA are recorded by the Marine Mammal Center. The Marine Mammal Center data indicate that the following marine mammals have been found stranded in GGNRA: whales (not identified to species level), Pacific harbor seal, the California state fully protected northern elephant seal (*Mirounga angustirostris*), the federally listed threatened Guadalupe fur seal (*Arctocephalus townsendi*), the California sea lion, the federally listed threatened southern sea otter (*Enhydra lutris nereis*), and the river otter (*Lontra canadensis*) (Marine Mammal Center 2010, 1). The following sites at GGNRA experience marine mammal strandings based on Marine Mammal Center data (Marine Mammal Center 2010, 1): the beach at Fort Baker (averages 2 to 3 strandings per kilometer per year [km/yr]), Ocean Beach (averages 5 strandings per km/yr), the Marin Headlands (averages 12.5 strandings per km/yr), Muir Beach (averages 25 strandings per km/yr), Rodeo Beach (averages 3.25 strandings per km/yr), Crissy Field (averages 8.5 strandings

per km/yr), Baker Beach (averages 8.9 strandings per km/yr), the beach at Fort Funston (averages 3.25 strandings per km/yr), and Tennessee Valley Cove (averages 12.5 strandings per km/yr). A list of recent live animal reports for stranded animals in GGNRA from 2000 through 2005 was compiled from the Marine Mammal Center Data and is presented below in table 7 (Marine Mammal Center 2010, 1). It has been noted that as the northern elephant seal population rapidly increases, individuals of this species are encountered more frequently on sandy beaches throughout the region (NPS 1999, 13), not necessarily as strandings but also hauling out. Three healthy immature elephant seals hauled out on the beach in the Crissy Field WPA for a few days each on three separate occasions in December 2009 and January 2010, necessitating temporary closure of portions of the beach (Merkle 2010f, 1). Harbor porpoises (*Phocoena phocoena*) and whale species, such as California gray whales (*Eschrichtius robustus*), use offshore waters, and young whales occasionally wander into San Francisco Bay. Southern sea otters are infrequently seen offshore, with numbers increasing as the population spreads north (NPS 1999, 13). Further discussions of listed marine mammals are included in the “Special-status Species” section of this chapter.

**TABLE 7. MARINE MAMMAL CENTER TOTAL NUMBER OF INDIVIDUAL LIVE ANIMAL REPORTS FOR STRANDING IN GGNRA, 2000 THROUGH 2005 AND 2007 THROUGH 2009**

<b>GGNRA Location</b>	<b>Whales</b>	<b>California Sea Lion</b>	<b>Northern Elephant Seal</b>	<b>Northern Fur Seal</b>	<b>Guadalupe Fur Seal</b>	<b>Pacific Harbor Seal</b>	<b>Otters (River or Sea)</b>	<b>Total*</b>
Stinson Beach	4	50	34	2	1	15	3	<b>109</b>
Muir Beach	3	24	17	1	0	0	1	<b>46</b>
Rodeo Beach	3	29	8	0	0	1	1	<b>42</b>
Marin Headlands	1	2	2	0	0	0	0	<b>5</b>
Tennessee Valley	1	16	6	0	0	0	0	<b>23</b>
Fort Baker	3	19	3	0	0	2	0	<b>26</b>
Crissy Field	11	36	9	0	0	2	0	<b>58</b>
Fort Point	1	12	1	0	0	0	0	<b>14</b>
Baker Beach	6	23	7	0	0	3	0	<b>39</b>
Lands End	0	4	1	0	0	0	0	<b>5</b>
Sutro Baths	1	6	0	0	0	0	0	<b>7</b>
Ocean Beach	13	125	14	0	0	13	2	<b>167</b>
Fort Funston	4	26	12	0	0	1	0	<b>43</b>
<b>Total</b>	<b>51</b>	<b>372</b>	<b>114</b>	<b>3</b>	<b>1</b>	<b>37</b>	<b>7</b>	<b>—</b>

Source: Marine Mammal Center 2010.

\*Does not include unidentified species, carcasses, or animal reports from outside the project area.

## COASTAL SCRUB AND CHAPARRAL

Scrub communities, such as bluff scrub, coastal scrub, and serpentine scrub, and chaparral communities are found throughout GGNRA. Bluff scrub occurs rarely in GGNRA on the steep oceanside and along the bay-exposed bluffs. Coastal scrub is similar to bluff scrub, but is found at a slightly higher elevation on slopes and inland areas and is dominated by low shrubs along the California coast. The coastal scrub community creates a mosaic with the grassland community and is found throughout the park from near mean sea level (msl) up to approximately 2,500 feet above msl. Coastal scrub plants must contend with harsh conditions such as steep rocky soils and shearing winds. Interspersed among the shrubs are areas of forbs and grasses. Bluff scrub is dominated by low shrubs and herbaceous species. Serpentine scrub habitat occurs on serpentine outcrops and shallow serpentine soils and as a result is rare and localized in GGNRA. Chaparral is a specific type of scrubland that also occurs along the California coast. In GGNRA the presence of chaparral is rare and localized. Most of the shrubs that make up chaparral are tough-leaved evergreens, and many species have thorns or prickly leaves to guard against grazing. Chaparral occurs in dry soils, which often occur on the south-facing slopes of coastal mountains adjacent to coastal scrub or woodlands. During the dry season, chaparral is extremely vulnerable to fire; thus, plant species that inhabit this environment are adapted to regular fires.

Coastal scrub and chaparral communities are found in the following park sites included in this plan/EIS: Homestead Valley, Oakwood Valley, Alta Trail, Muir Beach, Marin Headlands, Fort Baker, Baker Beach (bluff scrub), Fort Point (bluff scrub and coastal scrub), Lands End, Fort Miley, Mori Point, Milagra Ridge, Cattle Hill/Sweeney Ridge, and Pedro Point Headlands. The serpentine scrub community provides habitat for several of the park's endangered, threatened, or rare plant species. Some plant species that are

presumably unable to compete with other plants also occupy only harsh environments such as serpentine scrub, where more common species do not grow. These “serpentine endemics” include several threatened or endangered plant species, such as Presidio manzanita, Marin dwarf-flax, and Presidio clarkia, which all inhabit low-growing serpentine coastal scrub and rock outcrops (see “Special-status Species” section for more detail on threatened or endangered plant species). Serpentine outcroppings with serpentine-dependent plant species exist adjacent to coastal and bluff scrub communities, which lie along bluffs east and north of Baker Beach (USFWS 2003, 6) and are also located behind the fort at Fort Point (May & Assoc. 2005, 9). Serpentine coastal scrub is also found at the Marin Headlands and serpentine soils can be found at Baker Beach, Muir Beach, Lands End, and Crissy Field.

Bluff scrub is dominated by low shrubs and herbaceous species, such as California blackberry (*Rubus ursinus*), poison-oak (*Toxicodendron diversilobum*), and toyon (*Heteromeles arbutifolia*) (NPS 2009b). The coastal scrub community is dominated by coyote brush (*Baccharis pilularis*), California sagebrush (*Artemisia californica*), bush lupine (*Lupinus arboreus*), and poison-oak, with variations in dominant species based on moisture levels, soil types and slopes, and past land use history (NPS 2005a, 192). Other plant species that inhabit the coastal scrub include sticky monkey flower (*Mimulus aurantiacus*), ceanothus (*Ceanothus* spp.), and coffee berry (*Rhamnus californica*), as well as various forbs and grasses that grow interspersed between the shrubs described above (NPS 2009b). Vines such as hillside morning glory (*Calystegia* spp.), wild cucumber (*Marah macrocarpus*), and giant vetch (*Vicia gigantea*) trail over the shrubs (NPS 2009b). Plant species such as blackberry, osoberry (*Oemleria cerasiformis*), and twinberry (*Lonicera involucrata*) provide food sources for wildlife. The coastal scrub community also contains large numbers of non-native species, and at times is dominated by non-native shrubs such as French broom (*Genista monspessulana*) and thoroughwort (*Ageratina adenophora*) (NPS 2009b). The serpentine scrub habitat, found on serpentine outcrops and shallow serpentine soils, is dominated by ceanothus, toyon, osoberry, and blackberry.

Chaparral stands, although not abundant at GGNRA, contain a high number of locally to regionally rare species of management concern for the park, and are contiguous with coastal scrub stands. Small communities of chaparral exist on the Marin Headlands. There are several types of chaparral in GGNRA, including chamise chaparral, ceanothus chaparral, and manzanita chaparral (NPS 2005a, 192). The chaparral is dominated by many species of manzanita (*Arctostaphylos* spp.), buckbrush or California lilac (*Ceanothus* spp.), poison-oak, buckthorn (*Rhamnus* spp.), chamise (*Adenostoma* spp.), and other shrubs, including yerba santa (*Eriodictyon* sp.) and black sage (*Salvia mellifera*).

Coastal scrub and chaparral communities provide habitat for many CNPS-listed plant species, including San Francisco Bay spineflower, San Francisco dune gilia, Kellogg’s horkelia (*Horkelia cuneata* var. *sericea*), Choris’s popcornflower (*Plagiobothrys chorisianus* var. *chorisianus*), and Santa Cruz microseris (silverpuffs) (*Stebbinsoseris decipiens*). Several other listed plant species occur on serpentine soils associated with scrub and chaparral communities, including the following CNPS-listed plant species: Tamalpais manzanita (*Arctostaphylos hookeri* ssp. *montana*), Tamalpais jewel-flower (*Streptanthus glandulosus*), coast rock-cress (*Arabis blepharophylla*), Franciscan thistle (*Cirsium andrewsii*), Marin checker lily (*Fritillaria lanceolata* var. *tristulis*), fragrant fritillary (*Fritillaria liliacea*), San Francisco gumplant (*Grindelia hirsutula*), and Crystal Springs lessingia (*Lessingia arachnoidea*). The serpentine chaparral community also provides habitat for some of the park’s federally and state-listed plant species, such as the endangered Presidio manzanita and the threatened Marin dwarf-flax. See the “Special-status Species” section for more information on federally and state-listed plant species.

Invertebrates that inhabit the coastal scrub habitat include various species of butterflies: skippers, swallowtails, hairstreaks, blues, ladies, admirals, and crescents (NPS 2009b). A wide variety of small mammals use the coastal scrub and chaparral habitats, including pocket gophers (*Thomomys* spp.), deer mice, brush rabbits, raccoons, spotted and striped skunks, and black-tailed deer (*Odocoileus hemionus*).

(Semenoff-Irving and Howell 2005, 9, 10). Predators such as gray and red foxes (*Urocyon cinereoargenteus*, *Vulpes vulpes*), bobcats (*Felis rufus*), and coyotes (*Canis latrans*) hunt small mammals in the vicinity; mountain lions (*Felis concolor*) and feral cats are also possible (Semenoff-Irving and Howell 2005 9, 10). Both red foxes and feral cats are non-native mammal species. Other mammals include the Mexican free-tailed bat (*Tadarida brasiliensis*), which forages over the coastal scrub habitat. Coastal scrub provides habitat for reptiles that burrow or use underground den sites, such as western fence lizards (*Sceloporus occidentalis*), red-sided garter snakes (*Thamnophis sirtalis*), and alligator lizards (*Elgaria* spp.) (NPS 2009b).

Many bird species also use the coastal scrub and chaparral habitats. All the bird species discussed in this habitat are protected under the *Migratory Bird Treaty Act* (with the exception of starlings, pigeons, crows, and game birds). From bird point count censuses in 1999 and 2000 (Point Reyes Bird Observatory (PRBO) 2002, 1), the most abundant species in the coastal scrub habitat were the white-crowned sparrow (*Zonotrichia leucophrys*) and spotted towhee (*Pipilo maculatus*). Several other resident bird species forage, roost, nest, and/or breed in scrub habitat, including the house wren (*Troglodytes aedon*), western scrub jay (*Aphelocoma californica*), Steller's jay (*Cyanocitta stelleri*), California towhee (*Pipilo crissalis*), California thrasher (*Toxostoma redivivum*), northern flicker (*Colaptes auratus*), mourning dove (*Zenaida macroura*), Wilson's warbler (*Wilsonia pusilla*), and acorn woodpecker (*Melanerpes formicivorus*). Various sparrows and thrushes, wrentit (*Chamaea fasciata*), and other small ground- or shrub-nesting birds also use this community; California quail are low-/ground-nesting birds that also use this habitat and, locally, are extremely rare in San Francisco; Presidio Trust is exploring the possibility of reintroducing California quail to the Presidio (NPS 2010b, 24). Other low- and ground-nesting birds besides California quail that occur in this habitat at GGNRA and are considered in the PRBO Conservation Science in the Landbird Habitat Modeling project include: San Francisco common yellowthroat (*Geothlypis trichas sinuosa*), northern harrier (*Circus cyaneus*), grasshopper sparrow (*Ammodramus savannarum*), Bewick's wren (*Thryomanes bewickii*), Wilson's warbler, white-crowned sparrow, Swainson's thrush (*Catharus ustulatus*), rufous-crowned sparrow (*Aimophila ruficeps*), western meadowlark (*Sturnella neglecta*), MacGillivray's warbler (*Oporornis tolmiei*), and dark-eyed junco (*Junco hyemalis*) (NPS 2010b). Scrub habitat also attracts predators, such as Cooper's hawk (*Accipiter cooperii*), red-tailed hawk (*Buteo jamaicensis*), and other raptors.

## GRASSLANDS

The grassland community forms a mosaic with the coastal scrub community and mixed evergreen forests (NPS 2005a, 194). At GGRNA, this community extends from mean sea level to nearly 2,600 feet above msl and includes both coastal prairie grasslands and serpentine grasslands. California grasslands in general have been disturbed and changed due to cultivation, grazing, fire suppression, and the spread of non-native, invasive plant species. The original, pristine grasslands in California were composed of perennial bunchgrasses with annual forbs occupying areas between tussocks, including purple needlegrass (*Nassella pulchra*), the designated California state grass, as well as tufted hair grass (*Deschampsia caespitosa*), blue wild rye (*Elymus glaucus*), and California oatgrass (*Danthonia californica*) (NPS 2009b). Grasslands are found in GGNRA at Homestead Valley, Oakwood Valley, Alta Trail, Marin Headlands, Fort Baker, Milagra Ridge, Mori Point, Cattle Hill/Sweeney Ridge, and Pedro Point Headlands. A native grassland exists at Mori Point that is dominated by purple needlegrass, and native grasses also persist in the grasslands at Homestead Valley.

Serpentine grasslands occur on well-developed serpentine soils formed by the rock serpentinite. Serpentine occurs in fault zones and is associated with high levels of heavy metals, such as zinc and magnesium, and low levels of nutrients (see the "Soils and Geology" section for more detail on serpentine soils). Serpentine grasslands are dominated by needlegrasses (*Nassella* spp.) and support some federally and state-listed plant species, such as Marin dwarf-flax, white-rayed pentachaeta (*Pentachaeta*



*bellidiflora*), and fountain thistle (*Cirsium fontinale* var. *fontinale*), some of which are discussed in more detail in the “Special-status Species” section. Both Mission Delores (San Francisco) campion (*Silene verecunda* ssp. *verecunda*) and San Francisco owl’s-clover (*Triphysaria floribunda*), are CNPS-listed plant species that inhabit serpentine grasslands. In GGNRA, serpentine grasslands are found north and east of where Lobos Creek enters the ocean at Baker Beach. These serpentine grasslands provide habitat for a variety of raptors and other birds as well as native mammals, reptiles, and amphibians. In addition, the Oakland mariposa lily (*Calochortus umbellatus*) is a grassland plant species that occurs in a very limited distribution at Homestead Valley (Fritzke 2010a, 1).

Today, many grasslands in the park are dominated by non-native annual grasses and forbs adapted to the climate (NPS 2005a, 194). As with many park sites in GGNRA, the spread of non-native plant species is a management concern and is discussed further in the “Invasive Plant Species” portion of this section. Additionally, the exclusion of grazing, extirpation of large native mammals, and suppression of wildfires have caused a decrease in grasslands and a marked increase in acreage of coyote brush, resulting in an increase in the acreage of coastal scrub community in the San Francisco Bay Area (McBride and Heady 1968, cited in NPS 2005a, 195). The grassland community also includes coastal prairie grasslands. The coastal prairie is found on coastal terraces with well-developed soils and is dominated by native perennial bunchgrasses of purple needlegrass, foothill needlegrass (*Nassella lepida*), California oatgrass, and many non-native grasses. Management to control weeds, reduce trampling (through park stewardship programs), and establish new populations at completed remediation sites is being conducted for Mission Delores campion; management to control invasives and to reduce trampling is being conducted for San Francisco owl’s clover.

A number of species of lupine occur in GGNRA, including three species of lupine that occur in the grassland community: silver-leaf lupine (*Lupinus albifrons*), summer lupine (*L. formosus*), and many-colored lupine (*L. variicolor*). Silver-leaf lupine is the primary host plant for the federally endangered mission blue butterfly. Mission blue butterfly habitat and host plants are found at Oakwood Valley, Alta Trail, Marin Headlands, Fort Baker, Milagra Ridge, and Cattle Hill/Sweeney Ridge, which are discussed in detail in the “Special-status Species” section. In addition to the mission blue butterfly, many other species of invertebrates are primary inhabitants of the grassland community, including the red admiral (*Vanessa atalanta*), American lady (*Vanessa virginiensis*), anise swallowtail (*Papilio zelicaon*), and common sulfurs (*Colias* spp.) (NPS 2009b). Two federally listed species of butterflies, the San Bruno elfin butterfly (*Incisalia mossii bayensis*) and the Bay checkerspot (*Euphydryas editha bayensis*), also occur in grasslands at GGNRA and are discussed in more detail in the “Special-status Species” section.

Typical bird species of grasslands include western scrub jay, northern mockingbird (*Mimus polyglottos*), and a variety of species of sparrows and hawks. All the bird species discussed in this habitat are protected under the *Migratory Bird Treaty Act* (with the exception of starlings, pigeons, crows, and game birds). The California thrasher also uses grassland habitats at GGNRA, though it is not very common. Grasslands support many rodents (mice, gophers, and voles), which are hunted by raptors such as great horned owl (*Bubo virginianus*), red-tailed hawk, and American kestrel (*Falco sparverius*). Ground-nesting birds also make their home in the grassland, including several species of sparrows. Common mammalian species that occupy grassland habitats include raccoons, black-tailed deer, small rodents (voles, moles, and mice), jackrabbits (*Lepus californicus*), California ground squirrels (*Spermophilus beecheyi*), and striped skunks. Some species, such as the western harvest mouse (*Reithrodontomys megalotis*), appear to be restricted to areas where native perennial grasses persist. Carnivorous mammals that use grasslands include foxes, coyotes, bobcats, and mountain lions. Reptiles such as western fence lizards, gopher snakes (*Pituophis catenifer*), and alligator lizards (*Elgaria* spp.) have been observed in grasslands at GGNRA (Semenoff-Irving and Howell 2005, 17).

## WETLANDS AND OPEN WATER

GGNRA has abundant wetland resources, including estuarine, riverine, and palustrine wetlands. Wetlands, according to the definition developed by the USFWS and adopted by the NPS, are lands transitional between terrestrial and aquatic systems, where the water table is usually at or near the surface or the land is covered by shallow water (Cowardin et al. 1979, 11). Typical wetlands in GGNRA include wet meadows, seeps, streams, riparian forests, ponds, and lagoons. Deepwater habitats such as rivers, lakes, and estuaries are not technically wetlands, but are classified as aquatic sites using the same classification system (NPS 2006c, section 4.6.5). Wetlands and open water communities, including ponds, seeps, freshwater wetlands, lagoons, and salt marshes, are discussed in this section. Streams and riparian forests are discussed in detail in the sections that follow.

Wetlands in GGNRA are generally located in valley bottoms, with seeps and small intermittent streams reaching into the higher portions of the watersheds (NPS 2005a, 203). Estuarine wetlands and salt marshes also exist at GGNRA. The following areas have herbaceous wetlands and woody vegetation in GGNRA: Crissy Field (palustrine and estuarine wetlands), Muir Beach, Baker Beach (seeps along bluffs and Lobos Creek), Rodeo Beach (Rodeo Lagoon and Rodeo Lake), Lands End (seeps), Mori Point (four created ponds with associated wetlands), and Milagra Ridge (pond). Many of these wetland areas at GGNRA either have undergone or are currently undergoing restoration efforts, as described in the paragraphs below by project site. Other wetland areas also exist at GGNRA, including at Tennessee Valley and Pedro Point Headlands, but these particular wetland areas are not described in detail because they are not affected by dog activities at the park.



**Crissy Field Wetlands**

Credit: NPS

The majority of wetlands in the park are herbaceous wetlands, which have vegetation consisting of a mix of low-growing species of sedges (*Carex* spp. and *Cyperus* spp.), rushes (*Juncus* spp.), bulrushes (*Scirpus* spp.), cattails (*Typha* spp.), horsetails (*Equisetum* spp.), and other wetland-dependent species, as well as non-native species of wetland-tolerant grasses and forbs. Areas covered with various reeds along the shoreline of lagoons and ponds, herbaceous strips of vegetation along perennial and ephemeral stream courses, and isolated wetland patches where seeps emerge are found throughout the park (NPS 2005a, 196). Freshwater seeps, where groundwater flows onto the surface, are dominated by rushes and sedges and occur along the bluffs north of Baker Beach and are widely distributed at Lands End (May & Assoc. 2005, 13). These seeps and small wetlands provide a source of freshwater and vegetative cover for songbirds and other wildlife, as well as possible breeding habitat for amphibians (NPS 1993, 6-11, 6-12). All the bird species discussed in this habitat are protected under the *Migratory Bird Treaty Act* (with the exception of starlings, pigeons, crows, and game birds).

Both freshwater and estuarine wetlands exist at Crissy Field. Freshwater wetlands in the swale include tule reed (*Scirpus californicus*) and cattails. Crissy Field Tidal Marsh supports salt marsh habitat and is closed to public access per the GGRNA Compendium. From 1998 through 2000, the restoration of Crissy Field included the restoration of an 18-acre tidal marsh linked to the San Francisco Bay (NPS 2009k, 1). The Point Reyes (north coast) bird's-beak (*Cordylanthus maritimus* ssp. *palustris*) is the only CNPS-listed plant species that occurs in coastal salt marshes. This small annual was introduced to the salt marsh at Crissy Field in 2001 (NPS 2009k, 1). The federally listed endangered California seablite (*Suaeda californica*) (discussed in the "Special-status Species" section) was also experimentally introduced to the restored salt marsh at Crissy Field in 2001. Following restoration efforts, nearly 100 species of birds have

been documented using the tidal marsh at Crissy Field, including migrating ducks, pelagic birds diving for fish, and shorebirds (NPS 2006h, 1). The park has installed fencing to restrict access by dogs and people to Crissy Field Tidal Marsh, and signage has been installed to educate visitors on the access restrictions; however, dogs gain access to the marsh through the tidal channel under the pedestrian bridge, and have been observed by park staff in the tidal marsh (NPS 2009k, 1).

Rodeo Lagoon is located in Marin County at Rodeo Beach and consists of herbaceous wetlands and wet meadows. An estuarine emergent wetland fringe surrounds Rodeo Lagoon, which is sustained by a mix of freshwater and tidal water input. Central California steelhead trout (*Oncorhynchus mykiss*) occur in the drainages to Rodeo Lagoon (NPS 2005a, 211). Rodeo Lake provides suitable breeding habitat for California red-legged frogs (*Rana aurora draytonii*), while both the lagoon and the lake are used outside the breeding season for rearing (Fong and Campo 2006). Rodeo Lagoon provides foraging and loafing habitat for a variety of aquatic birds, such as California brown pelicans, grebes, gulls, terns, cormorants, shorebirds, ducks, egrets, and herons. The lagoon waters support several fish species, including native species such as prickly sculpin (*Cottus asper*) and threespine stickleback (*Gasterosteus aculeatus*). River otters have also been observed in the lagoon (NPS 2009b, 67, 11). Rodeo Lagoon is closed to public access for overall resource protection per the GGRNA Compendium, but NPS staff members regularly observe dogs in the lagoon. The park has estimated that they observe dogs in the lagoon at least once a week and during good weather on a daily basis (Merkle 2010b, p. 1).

A small, intermittently tidal lagoon with open water is located adjacent to Muir Beach. The lagoon was restored in 2009; surveys prior to the restoration found that the diversity of waterbirds was low, with only mallards (*Anas platyrhynchos*), killdeer (*Charadrius vociferus*), and bufflehead (*Bucephala albeola*) present, and mallards representing 88 percent of the total number of individuals observed (Dybala 2002, 4).

The NPS created four ponds at Mori Point to enhance the freshwater wetland habitat and provide foraging habitat for the San Francisco garter snake. These ponds also provide breeding and rearing habitat for the California red-legged frog (NPS 2009b, 114). The San Francisco garter snake's main prey item is the California red-legged frog, and both species are discussed in detail in the "Special-status Species" section. Native wetland plant species were planted around the ponds and invasive plant species were removed (NPS 2009b). Educational signage and fences have been placed around the ponds and wetland habitat at Mori Point to prevent direct impacts to frogs and indirect impacts to frog habitat. The fence that currently exists around the ponds excludes both visitors and dogs.

## **NATIVE HARDWOOD FOREST**

This variable community extends from approximately 200 to 2,500 feet above msl in elevation, and is dominated by a number of oak species (*Quercus* spp.), California bay laurel (*Umbellularia californica*), and tanbark oak (*Notholithocarpus densiflorus*). Along the moisture boundary of this mixed evergreen forest is the Douglas-fir/redwood community, and along the xeric boundary are coastal scrub and grassland habitats (NPS 2005a, 196). In the planning area at GGNRA, native hardwood forests exist at Oakwood Valley, Alta Trail/Orchard Fire Road/Pacheco Fire Road, and Fort Baker. The Douglas-fir and coast redwood community is found sporadically in portions of Homestead Valley and within Oakwood Valley but outside the area accessed by dogs and is not discussed further in this plan/EIS.

Coast live oak (*Quercus agrifolia*) dominates this community at elevations below 1,000 feet above mean sea level (msl). It is often the only species present on hills in the foggy, coastal climate of GGNRA. Interior live oak (*Q. wislizenii*) occasionally replaces coast live oak in canyon bottoms and on north-facing slopes. As the community approaches 1,000 feet above msl, California bay, tanbark oak, and other hardwoods become common (NPS 2005a, 196). Since 1995, large numbers of tanbark oaks, coast live

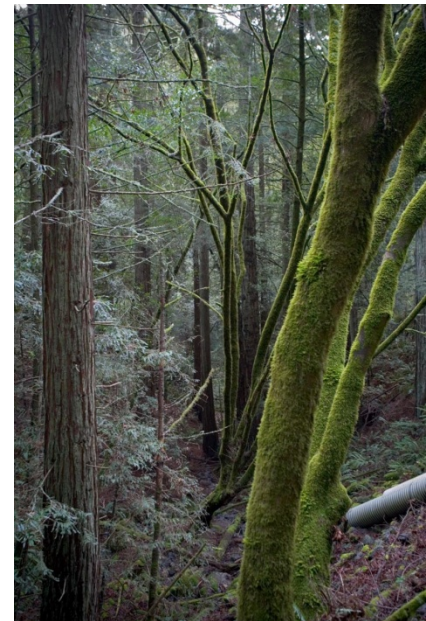
oaks, and black oaks (*Q. kelloggii*) in California's coastal counties have been dying from a disease referred to as sudden oak death (SOD). SOD is caused by a fungus-like organism, *Phytophthora ramorum*, which is a very aggressive pathogen that can infect and kill otherwise healthy trees and may be spread through infected wood, soil, and rainwater (NPS 2009b). At GGNRA, SOD has killed many of the tanbark oaks and has also affected other hardwood tree species (NPS 2009e, 1).

In forested habitats, bushtits (*Psaltirparus minimus*), chestnut-backed chickadees (*Poecile rufescens*), dark-eyed juncos, Pacific-slope flycatchers (*Empidonax difficilis*), and winter wrens (*Troglodytes troglodytes*) were commonly detected during point count censuses in 1999 and 2000 (PRBO 2002, 1). The native hardwood forest community also provides habitat for the threatened northern spotted owl (*Strix occidentalis caurina*), which is discussed in more detail in the "Special-status Species" section. Live oaks are known for attracting high insect diversity, and thus, birds that are gleaners (insectivores). Oaks also attract jays and acorn woodpeckers, both of which cache acorns. They also provide cover and shade in what is otherwise extremely exposed habitat. All the bird species discussed in this habitat are protected under the *Migratory Bird Treaty Act* (with the exception of starlings, pigeons, crows, and game birds). The hardwood forest provides habitat for the vagrant shrew (*Sorex vagrans*), Trowbridge's shrew (*Sorex trowbridgii*), Sonoma chipmunk (*Tamias sonomae*), western gray squirrel (*Sciurus griseus*), and dusky-footed woodrat (*Neotoma fuscipes*). Wide-ranging mammals such as the bobcat and coyote will travel through or use the native hardwood forest habitat as well (NPS 2009b).

## RIPARIAN FORESTS AND STREAMS

Riparian plant communities in GGNRA include streamside corridors of forests, shrubs, and herbaceous vegetation that tolerate moist conditions. The sites in GGNRA that possess riparian habitat include: Easkoot Creek at Stinson Beach, Redwood Creek at Muir Beach in Marin County, Marin Headlands Trails along the Rodeo Valley Trail Corridor from Rodeo Beach to Capehart Housing, and Lobos Creek at Baker Beach. The area at the Lobos Creek inlet that supports riparian vegetation is generally not used by visitors with dogs and is not affected by this plan/EIS (NPS 2009b, 22). At Easkoot Creek, the creek is densely vegetated with riparian plant species and generally difficult to access. These creeks are closed per the GGRNA Compendium (NPS 2008b, 9). As a result, riparian vegetation at both Lobos Creek at Baker Beach and Easkoot Creek at Stinson Beach are not discussed further in this section. Below and discussed in more detail include the following sites: Muir Beach (Redwood Creek) and Marin Headlands Trails (along the Rodeo Valley Trail Corridor from Rodeo Beach to Capehart Housing).

Other riparian areas exist in GGNRA, but these areas are outside the scope of this project. Streamside forests and shrub areas are dominated by broad-leaved deciduous trees or shrubs, most commonly arroyo and Pacific willows (*Salix lasiolepis* and *S. lucida* ssp. *lasiandra*) and occasionally red alder (*Alnus rubra*). The understory is typically dense, with a variety of shrubs, including berries, such as the native salmonberry (*Rubus spectabilis*), thimbleberry (*R. parviflorus*), and California blackberry (*R. ursinus*) as well as non-natives such as Himalayan blackberry (*R. discolor*) and Cape ivy (*Delairea odorata*). In addition to shrubs, numerous herbaceous species, including ferns, rushes, and sedges, dominate the understory. Non-native trees, including eucalyptus (*Eucalyptus* spp.) and Monterey cypress (*Cupressus macrocarpa*), have become established in some riparian forests in the park (NPS 2005a, 196; 2010b, 25). These non-native species are discussed in more detail in the "Invasive Plant Species" section. Riparian forests provide habitat for the following CNPS-



Forest at Stinson Beach Area

Credit: NPS



listed plant species: western leatherwood (*Dirca occidentalis*) and California bottlebrush grass (*Elymus californicus*).

Riparian trees support many invertebrates, such as insects, that are important to resident and migrating songbirds (NPS 2009d, 205; 2010b). Some commonly observed bird species that nest in riparian habitats at GGNRA include Swainson's thrush (*Catharus ustulatus*), Wilson's warbler, warbling vireo (*Vireo gilvus*), song sparrow (*Melospiza melodia*), Brewer's blackbird (*Euphagus cyanocephalus*), and American goldfinch (*Carduelis tristis*) (Williams 2003). Other bird species that use riparian habitats at GGNRA include the red-winged blackbird (*Agelaius phoeniceus*), American robin (*Turdus migratorius*), cedar waxwing (*Bombycilla cedrorum*), and black-headed grosbeak (*Pheucticus melanocephalus*), as determined by point counts from 1998 to 2002 (PRBO 2002, 1). The riparian forest also provides habitat for the threatened northern spotted owl, which is discussed in more detail in the "Special-status Species" section. All the bird species discussed in this habitat are protected under the *Migratory Bird Treaty Act* (with the exception of starlings, pigeons, crows, and game birds). Riparian corridors also provide important habitat for amphibians such as tree frogs, newts, salamanders, and the endangered California red-legged frog, as well as the arboreal salamander (*Aneides lugubris*), California toad (*Bufo boreas halophilus*), coast range newt (*Taricha torosa torosa*), and western fence lizard. Riparian areas provide a water supply and cover habitat for flying insects and, in turn, for bats. Several bat species have been recorded using riparian habitats such as Lobos Creek and Redwood Creek in the park, including the Mexican free-tailed bat and California myotis (*Myotis californicus*). Because roost sites for bat species are generally not accessible to dogs, it is not expected that bats would be affected by dogs. Therefore, bats are excluded from further discussion in this plan/EIS. The freshwater stream Lobos Creek supports a variety of invertebrates, including water striders, dragonflies, and water beetles. Threespine sticklebacks also occupy Lobos Creek.

The Muir Beach area is at the mouth of the Redwood Creek watershed, which features a riparian corridor that is currently dominated by red alders and some arroyo willows. The Redwood Creek watershed extends from the peaks of Marin County's tallest mountain, Mount Tamalpais, to the Pacific Ocean at Muir Beach. Pacific tree frogs (*Hyla regilla*) and California newts (*Taricha torosa*) inhabit both the creek and riparian habitat at Muir Beach. California giant salamanders (*Dicamptodon ensatus*) inhabit areas higher up Redwood Creek. Each winter coho salmon (*Oncorhynchus kisutch*) and steelhead trout return to Redwood Creek to spawn where they were born. Steelhead trout and coho salmon in Redwood Creek are federally listed as threatened and endangered, respectively. These species are discussed in more detail in the "Special-status Species" section. The park has closed the Redwood Creek area to people and dogs, including the trail along Redwood Creek and at the creek crossing near Muir Beach. Off-leash dogs have frequently been observed in Redwood Creek and Redwood Lagoon despite these closures (NPS 2008c (appendix G)). A post-and-cable fence installed by NPS between lower Redwood Creek and lagoon is intended to discourage visitors from accessing the water; however, it does not physically exclude dogs or visitors from the area (NPS 2010b, 34). The lagoon restoration at Muir Beach, discussed previously, also aims to improve the quality and quantity of coho salmon and steelhead trout habitat (NPS 2008d). Within the Marin Headlands Trails, the Rodeo Valley Trail Corridor parallels riparian habitat for its entire length (along the Rodeo Valley Trail Corridor from Rodeo Beach to Capehart Housing) and the Lagoon Trail both passes through and is adjacent to riparian habitat along both sides of Rodeo Lagoon.

## DOUGLAS-FIR AND COAST REDWOOD

Many species contribute to the Douglas-fir and coast redwood forest community. Major overstory and understory tree species include coast redwood (*Sequoia sempervirens*), Douglas-fir (*Pseudotsuga menziesii*), California bay laurel, tanbark oak, California hazel (*Corylus californica*), and madrone (*Arbutus menziesii*). The coast redwood requires moist areas in valleys or near springs and is characteristically associated with tanbark oak and California bay laurel. In the understory of the coast



redwood community, shrubs such as hazelnut (*Corylus* spp.), thimbleberry, and wood rose (*Rosa gymnocarpa*) are common, as well as wildflowers such as wild ginger (*Asarum* spp.), trillium (*Trillium* spp.), redwood sorrel (*Oxalis oregana*), sweet coltsfoot (*Petasites frigidus*), and elk clover (*Aralia californica*); sword ferns (*Polystichum* spp.) are a common ground cover (NPS 2009d). The Douglas-fir and coast redwood forest community is found sporadically in portions of Homestead Valley and Oakwood Valley. The inner gorges of the watershed near Stinson Beach and the habitat at Muir Woods are dominated by the Douglas-fir and coast redwood community, but these areas are outside the scope of this project.

The Douglas-fir and coast redwood community provides habitat for the barred owl (*Strix varia*) and also for the threatened northern spotted owl, which is discussed in more detail in the “Special-status Species” section. Originally an eastern species closely related to the northern spotted owl, the barred owl has expanded its range westward and its range now overlaps with that of the northern spotted owl in most of the coastal woodlands of the west. The barred owl competes with the northern spotted owl for prey and habitat and is currently the most important threat facing the northern spotted owl (USFWS 2008d, vii). All the bird species discussed in this habitat are protected under the *Migratory Bird Treaty Act* (with the exception of starlings, pigeons, crows, and game birds). Many small mammals, such as the gray squirrel and Sonoma chipmunk, inhabit the forest canopy, while larger mammals, like raccoons and gray foxes, seek shelter in hollows in trees and logs. Amphibians such as the California giant salamander, slender salamander (*Batrachoseps* spp.), and rough-skinned newt (*Taricha granulosa*) inhabit the leaf litter on the forest floor. There are few insects, due to repellants produced by the tannins in redwood bark, and the deep shade of the coniferous canopy limits the number of flowers and fruit produced. This lack of food sources restricts the diversity of bird species, although the old growth forest does support the threatened northern spotted owl, as discussed above (NPS 2009d).

## MONTEREY CYPRESS

Stands of the non-native tree Monterey cypress are found within GGNRA, including at the Fort Miley site. East Fort Miley is dominated by older stands of Monterey cypress, which were densely planted but also includes some wetland/riparian vegetation around the fringes of the site. A large portion of the site is developed and only a small portion of the entire site supports mature, coniferous vegetation (which includes primarily the non-native Monterey cypress) in areas that are open to dogs. The densely planted trees leave little to no opportunity for light to reach the ground, so ground cover is minimal to non-existent except in areas where old trees have died and/or fallen. The dense Monterey cypress canopy with little understory diminishes songbird use of the site, but common landbirds most likely use this habitat; the pygmy nuthatch and Swainson’s thrush (in migration) may utilize this habitat. Additionally, raccoons, red foxes, and skunks are probably present and feral cats are common in the vicinity of the Navy Memorial parking lot and Fort Miley. Other non-native species include black and Norwegian rats and European starlings. Slender salamanders are probably present at Fort Miley as well.

## INVASIVE PLANT SPECIES

The park stewardship programs at GGNRA coordinate habitat restoration activities in over 10,000 acres of the park (NPS *Government Performance Results Act* reporting). An invasive species is defined as a non-native or exotic species whose introduction causes or is likely to cause economic or environmental harm or harm to human, animal, or plant health (NISC 2006, 1). Non-native plant species thrive in the park, particularly in areas subject to intensive historical land use (grazing, military occupation) or adjacent to urbanized areas that are a constant source of invasive weeds (NPS 1999, 23). The spread of non-native plants represents the most significant threat to the biodiversity of GGNRA and affects approximately 85 percent of the park’s estimated 80 vegetation alliances (NPS 1999, 23). Non-native species directly threaten habitat for listed species, including the federally endangered mission blue and

San Bruno elfin butterflies, Presidio manzanita, Presidio clarkia, and San Francisco lessingia, as well as other special-status plants (state and CNPS listed) (NPS 1999, 23). GGNRA currently is targeting over 80 invasive plant species parkwide, which require constant stewardship (NPS 2010b). The following paragraphs describe invasive and/or non-native species by site in GGNRA, where information is available.

Sites in GGNRA in San Mateo County have documented problematic invasive plant species. At Milagra Ridge, invasive, non-native plants continue to be the primary threat to native plant communities. The species of most concern include Cape ivy, pampas grass (*Cortaderia selloana*), French broom, Scotch broom (*Cytisus scoparius*), ice plant, cotoneaster (*Cotoneaster* sp.), Monterey pine (*Pinus radiata*), Monterey cypress, and eucalyptus.

Habitat at the Pedro Point Headlands includes coastal scrub, coastal bluff scrub, and coastal prairie. The north slope of the Pedro Point Headlands includes a large, non-native woodland of eucalyptus and Monterey pine. Because Pedro Point is a site that is pending acquisition by GGNRA, limited site-specific information is available at this time.

As with other park sites in GGNRA, the spread of non-native species is a management concern at Mori Point. Plant species that have been targeted for removal include pampas grass, Cape ivy, ice plant, French and Scotch broom, and cotoneaster. The *Mori Point Restoration and Trail Plan* includes measures for preserving and restoring the ecological integrity of Mori Point habitats by reducing threats to native plant communities and natural processes through restoration of native plant communities (NPS 2006d, 1).

At Fort Funston, the topography, stability, and soils of San Francisco dune remnants have been highly modified by the residual effects of past introductions of dune-stabilizing vegetation starting in the 1870s. Non-native European beachgrass was first planted in the 1870s to stabilize otherwise mobile dunes and has created steep, hummocky topography; the non-native ice plant was planted to stabilize both mobile and relatively stable dunes. Even though these plant species were historically planted for dune stabilization, they are now being targeted for removal. Non-native trees and shrubs, such as Monterey cypress, eucalyptus, and wattle (*Acacia* spp.), were also planted to act as strong baffles to dune-forming winds (Shulztiski and Russell 2004, 2).

## SPECIAL-STATUS SPECIES

Special-status species are plants and animals that are legally protected under the state and federal ESA of 1973 or other regulations, as well as species that are considered sufficiently rare by the scientific community to qualify for such status. The federal ESA was enacted to protect plant and animal species considered to be in danger of extinction and affords legal protection to species listed as endangered and threatened, including protection of their habitats. Critical habitat is defined in the federal ESA as a specific geographic area that contains habitat features essential for the conservation of a threatened or endangered species (USFWS 2005a, 1). The USFWS of the Department of the Interior and the National Oceanic and Atmospheric Administration–Fisheries (NOAA–Fisheries) of the Department of Commerce share responsibility for administration of the federal ESA. The terms *threatened* and *endangered* generally describe the official federal status of vulnerable species, as defined by the federal ESA. Additional federal regulations protect both listed and non-listed wildlife species in the park, including the *Fish and Wildlife Coordination Act of 1934* (as amended), the *Bald and Golden Eagle Protection Act*, the *Marine Mammal Protection Act*, and the *Migratory Bird Treaty Act*.

Designated critical habitat areas are necessary for the recovery of endangered or threatened species, even though the species of concern may not be documented in these areas. An evolutionarily significant unit (ESU) is considered to be a distinct population segment and thus a species under the federal ESA. When

applicable, critical habitat is discussed in the paragraphs below for listed species. The constituent elements of critical habitat defined by the USFWS and NOAA–Fisheries (1998, 4-36) as follows:

Physical and biological features of designated or proposed critical habitat essential to the conservation of the species, including, but not limited to: (1) space for individual and population growth, and for normal behavior; (2) food, water, air, light, minerals, or other nutritional or physiological requirements; (3) cover or shelter; (4) sites for breeding, reproduction, rearing of offspring, germination, or seed dispersal; (5) habitats that are protected from disturbance or are representative of the historic geographic and ecological distributions of a species.

The California ESA is similar to the federal ESA both in process and substance; it is intended to provide additional protection to threatened and endangered species in California. The California ESA does not supersede the federal ESA, but operates in conjunction with it. The California DFG maintains an informal list of plant and wildlife species of special concern because of population declines and restricted distributions, and/or because they are associated with habitats that are declining in California. The CNPS has developed lists of plants of special concern in California. Although federal agencies are not required to comply with California’s Fish and Game Code, the NPS makes every reasonable effort to conduct its actions in a manner consistent with relevant state laws and regulations. Due to the extensive numbers of plant and wildlife species included on the lists produced by the CNPS and the California DFG, these species are discussed in the “Vegetation and Wildlife” section. However, these species are still given equal consideration in this plan/EIS compared to the federally and state-listed threatened and endangered species that are included in this section. In addition to special concern species, some animal species with the “fully protected” status also exist at GGNRA; most fully protected species have also been listed as threatened or endangered species under the state or federal ESA (DFG 2010, 1). Fully protected species are noted in this section as applicable.

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*The federal Endangered Species Act was enacted to protect plant and animal species considered to be in danger of extinction and affords legal protection to species listed as endangered and threatened, including protection of their habitats.*

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GGNRA has one of the highest numbers of threatened and endangered species occurring within its boundaries of any unit of the NPS in the continental United States (NPS 2009d, 2010b). Nearly all of the park’s threatened and endangered species for GGNRA were listed after the 1979 Pet Policy; changing conditions in the park can therefore affect listed species (NPS 2010b). If an observation of a species has been entered in GGNRA records, it is assumed that this species could occur at the park wherever suitable habitat exists. If habitat is not currently found at Marin County, San Francisco County, or San Mateo County park sites for a particular species of special status, the species is discounted from further analysis and discussion. “Appendix H: Special-status Species” includes an annotated table of all listed or candidate wildlife or plant species potentially present in the study area of GGNRA and affected by this plan/EIS, as well as a brief summary of presence/absence of suitable habitat and any distribution notes. This list in appendix H includes species that could be affected by dog management activities based upon the presence of suitable habitat in the previously defined sites of the planning area for this project. Although habitats at GGNRA support many species with special status, only those species potentially affected by this plan/EIS are discussed in this section. Special-status species that are considered vagrants (e.g., species where individuals have been documented in the park on occasion) are not discussed further because these species are not likely to be affected by the plan/EIS due to the short-term nature of their presence at GGNRA. Also, marine mammal species such as whales and sea otters are not expected to be affected by dogs. However, the stranding of sick and injured pinnipeds (and sometimes healthy pinnipeds as well) is common on park beaches of GGNRA, as described in table 7. Because stranded marine

mammals may provide an opportunity for contact or disturbance by dogs on beaches, the species in this category are included in this section for discussion.

## FEDERALLY AND STATE-LISTED THREATENED AND ENDANGERED SPECIES AND CANDIDATE SPECIES

The following wildlife and plant species are discussed in this section: species listed or proposed for listing as threatened or endangered under the California or federal ESA (no candidate species are found in GGNRA).

**Endangered species.** If the USFWS determines that a species is on the brink of extinction, it is listed as endangered. Listing as endangered gives the species protection under section 9 of the federal ESA, which prohibits the unauthorized take of a federally listed endangered wildlife species and malicious damage or destruction of federally listed plant species.

**Threatened species.** If the USFWS determines that a species is experiencing serious threats that may eventually lead to its extinction but the situation is not yet critical, the species is classified as threatened. Species listed as threatened do not automatically have protection under the federal ESA, but the USFWS has applied most of the same protection described above to threatened species (authorized by section 4(d) of the federal ESA).

Because of the diversity of habitats and sensitive areas available at GGNRA and the protected nature of NPS lands, a total of 17 threatened and endangered species and associated critical habitat (when applicable) are being considered in this plan/EIS. Table 8 presents the wildlife and plant species being considered in this plan/EIS that have federal and/or state status. A detailed life history of each species follows the table.

**TABLE 8. FEDERALLY AND STATE-LISTED SPECIES CONSIDERED IN THIS PLAN/EIS**

Group	Scientific Name	Common Name	Federal Status <sup>a</sup>	State Status <sup>a</sup>	GGNRA Location
Invertebrate	<i>Callophrys mossii bayensis</i>	San Bruno elfin butterfly	FE	—	Milagra Ridge
Invertebrate	<i>Icaricia icarioides ssp. missionensis</i>	Mission blue butterfly	FE	—	Marin Headlands Trails, Oakwood Valley, Milagra Ridge, Sweeney Ridge, Fort Baker
Fish	<i>Eucyclogobius newberryi</i>	Tidewater goby	FE, CH	—	Marin Headlands (Rodeo Lagoon)
Fish	<i>Oncorhynchus kisutch</i>	Coho salmon—central California coast	FE, CH	SE	Muir Beach (Redwood Creek)
Fish	<i>Oncorhynchus mykiss</i>	Steelhead—central California coast	FT, CH	—	Muir Beach (Redwood Creek)
Amphibian	<i>Rana aurora draytonii</i>	California red-legged frog	FT, CH	—	Marin Headlands (Tennessee Valley Pond), Muir Beach (lagoon), Rodeo Beach (lagoon and lake), Mori Point, Milagra Ridge, Sweeney Ridge
Reptile	<i>Thamnophis sirtalis tetrataenia</i>	San Francisco garter snake	FE	SE	Mori Point, Milagra Ridge, Sweeney Ridge, Pedro Point
Bird	<i>Charadrius alexandrinus nivosus</i>	Western snowy plover	FT, CH <sup>b</sup>	—	Crissy Field, Ocean Beach

Group	Scientific Name	Common Name	Federal Status <sup>a</sup>	State Status <sup>a</sup>	GGNRA Location
Bird	<i>Riparia riparia</i>	Bank swallow	—	ST	Fort Funston
Bird	<i>Strix occidentalis caurina</i>	Northern spotted owl	FT	—	Homestead Valley, Oakwood Valley
Mammal	<i>Arctocephalus townsendi</i>	Guadalupe fur seal	FT	ST	All beach areas
Mammal	<i>Eumetopias jubatus</i>	Steller sea lion	FT, CH <sup>b</sup>	—	All beach areas
Plant	<i>Arctostaphylos hookeri</i> ssp. <i>ravenii</i>	Presidio (Raven's) Manzanita	FE	SE	Baker Beach
Plant	<i>Hesperolinon congestum</i>	Marin dwarf-flax (Marin western flax)	FT	ST	Baker Beach
Plant	<i>Lessingia germanorum</i>	San Francisco lessingia	FE	SE	Fort Funston, Baker Beach
Plant	<i>Suaeda californica</i>	California seablite	FE	—	Crissy Field
Plant	<i>Potentilla hickmanii</i>	Hickman's potentilla (Hickman's cinquefoil)	FE	SE	Mori Point, Pedro Point

<sup>a</sup> FE = federally endangered, FT = federally threatened, CH = critical habitat, SE = state endangered, ST = state threatened, SR = state rare.

<sup>b</sup> =Critical habitat has been designated for this species, but it does not occur in GGNRA.

## ENDANGERED, THREATENED, AND CANDIDATE SPECIES: WILDLIFE

### San Bruno Elfin Butterfly (*Callophrys mossii* ssp. *bayensis*)

The San Bruno elfin butterfly is federally listed as endangered. The USFWS has prepared a recovery plan for this species with the objective of protecting, maintaining, and enhancing existing populations of the two endangered butterfly species, the San Bruno elfin and mission blue butterflies (USFWS 1984, 2). The larval host plant for the San Bruno elfin butterfly is sedum (*Sedum spathulifolium*), a succulent that grows on rocky, north-facing slopes along the coast (coastal scrub) and occurs in colonies at one site (Milagra Ridge) in GGNRA (Newby 2000, 4). Existing San Bruno elfin butterfly populations are closely tied to their sedum host and nectar plants where the butterfly lays its' eggs and the larvae develop; adults emerge for only a short time (NPS 2010b, 29). At Milagra Ridge, San Bruno elfin populations and sedum occur on rocky outcrops that are relatively inaccessible to people and dogs (NPS 2005a, 206). At Milagra Ridge, GGNRA natural resource managers follow the recommendations found in the *Recovery Plan for San Bruno Elfin and Mission Blue Butterflies* (USFWS 1984, 48) by periodically monitoring the population. Only on-leash dog walking is allowed on trails in Milagra Ridge, and trails are routed away from known habitat to minimize possible impacts to this species.

### Mission Blue Butterfly (*Icaricia icarioides* ssp. *missionensis*)

The mission blue butterfly is federally listed as endangered (DFG 2009, 3). The mission blue butterfly is very closely tied to just three species of lupine, called host plants, which are the sole food source for mission blue caterpillars (NPS 2009 h, 1): *Lupinus albifrons*, *L. formosus*, and *L. variicolor*. Larvae feed on lupine host plants and undergo diapauses (similar to hibernation) at the base of the lupine plants and emerge in the spring. The larvae then undergo a series of molts and metamorphose into butterflies that live 7-10 days (less than 3 percent of the entire life cycle) during a single, brief period each spring (NPS 2010b, 30). Lupine tends to grow in thin, rocky soils, particularly in patches of grasslands found in areas of coastal scrub, favoring sites that have been recently disturbed (NPS 2009h, 1; 2010b). Lupine will typically not grow in areas dominated by dense areas of coastal scrub or chaparral. The lupine host plant



species that support mission blue butterflies are disturbance-associated species, which means the plants require disturbance prior to growth. In the past, periodic fires and Tule elk grazing kept shrubs and trees from taking over the grasslands that supported lupine and provided the disturbance needed to stimulate lupine seeds to germinate. Fire suppression and the loss of elk have potentially contributed to declines in both the quality and quantity of lupine habitat (NPS 2009h, 1). In addition to more natural areas, the lupine host plants are also found along road cuts, former quarry sites, and along and adjacent to trails and in trail treads in some locations at GGNRA (NPS 2009b, 63, 2009g). Within the study area, the mission blue butterfly has been documented at the Marin Headlands, Oakwood Valley, Alta Trail, Milagra Ridge, Sweeney Ridge, and Fort Baker; Tennessee Valley, within the Marin Headlands also has mission blue butterfly habitat and documented occurrence of mission blue butterfly (Bennett 2008, 8; NPS 2009b, 116; USFWS 1984, 1). No lupine host plants have been documented in inventories conducted at Sweeney Ridge and Cattle Hill (NPS 2010b, 32). In San Mateo County 2,000 acres of habitat (on San Bruno Mountain, located outside the planning area) are being managed by the San Mateo County Department of Parks and Recreation. San Francisco's Twin Peaks population of mission blue butterfly was rediscovered in 2001. The City of San Francisco did a small mission blue butterfly reintroduction/population enhancement at Twin Peaks in 2009 by moving several gravid (pregnant) female mission blue butterflies to the site (NPS 2010b).

In response to the butterfly's endangered status, GGNRA initiated a broad-scale habitat restoration program to remove French broom, pampas grass, and other targeted invasive plant species throughout mission blue butterfly habitat in the park during the late 1980s and early 1990s. Habitat restoration efforts for the butterfly have continued annually, consistent with recovery objectives for the species (NPS 2007c). Park stewardship programs in Marin County are also working to protect butterfly habitat adjacent to trails. Habitat restoration is ongoing at Milagra Ridge, where vegetation management involves removal of exotic species, including broom, pampas grass, and ice plant. At Fort Baker, where restoration has been ongoing since 1990, approximately 55 acres of mission blue butterfly habitat has been enhanced and restored to date.

The recovery plan for the San Bruno elfin and the mission blue butterflies calls for the protection of essential habitat for the mission blue butterfly, prevention of further degradation of habitat and recommends the enhancement of habitat when possible (USFWS 1984, 4). The plan also recommends that land managers minimize use of herbicides, insecticides, and other toxic substances; control off-road vehicle activity; remove exotic weeds; transplant selected native flora; and improve seedling establishment of native flora. It also directs managers to restore or rehabilitate habitat in the butterfly's historical range (USFWS 1984, 48). Actions have been identified in the recovery plan that NPS can implement to help in the recovery of this species (NPS 2010b, 51).

The population of mission blue butterfly in GGNRA has been monitored since 1994 at Marin Headlands and Fort Baker, since 1995 at Milagra Ridge, and since 2004 at Oakwood Valley/Alta Trail by a variety of methods (NPS 2010b). At Fort Baker, Battery Yates has mission blue butterfly habitat that is partially fenced (post-and-cable) but does not physically exclude dogs and Drown Fire Road is adjacent to mission blue butterfly habitat (Merkle 2010b). The mission blue butterfly is known to occur along the Notch Trail at Sweeney Ridge and the host plants are known to occur in other areas at Sweeney Ridge (USFWS 1995, 3). Recent habitat surveys indicate that mission blue butterfly host plants are not present at Cattle Hill (NRM Environmental Consulting 2007, 2). At Milagra Ridge, the mission blue butterfly is known to at the site in an area referred to as the "Mission Blue Butterfly Corridor," located in portions of this site (NPS 2005c), including the Loop Trail. There is no mapped mission blue butterfly habitat directly along the Alta Trail or Oakwood Valley Fire Road. However, there is mapped mission blue butterfly habitat very nearby in the grassy hillsides between the two areas, where social trails have connected the trail and fire road. These social trails are closed, but are still used by both visitors and dogs (Merkle 2010b, 1). These grassy, west-facing hillsides adjacent to the Alta Trail (mapped mission blue butterfly habitat) are a

favorite use area for commercial dog walkers (Merkle 2010b, 1). Mission blue butterfly presence and habitat exist along the North Miwok trail corridor, where dogs are allowed on leash, and along a section of the Coastal Trail (Julian Road) where voice-control dog walking is allowed (Smith 2010, 1). NPS installed fencing in an attempt to discourage dogs and people from accessing mission blue butterfly habitat at the Alta Trail and along sections of the Coastal Trail in the Marin Headlands; however, the installed fencing is post and cable and does not exclude dogs from the habitat, especially if they are off leash. The park practice is to close trails through mission blue butterfly habitat to bikes, dogs, and horses, but allow dogs on-leash on fire roads through mission blue butterfly habitat (Merkle 2010d, 1).

### **Tidewater Goby (*Eucyclogobius newberryi*)**

The tidewater goby is listed as federally endangered. This species is a small benthic fish that occurs in California coastal lagoons with salinity less than 10 parts per thousand (USFWS 2005b, iii). While generally found in coastal embayments, gobies are also known to occur in streams. The tidewater goby is present in high densities in GGNRA's Rodeo Lagoon. The tidewater goby burrows in Rodeo Lagoon's soft shoreline sediment and completes its entire life cycle in the lagoon habitat. Males dig breeding burrows and then females aggressively spar with each other for access to males with burrows (Swenson 1995). The males care for the embryos for 9 to 11 days until they hatch, rarely if ever emerging from the burrows to feed (USFWS 2005b, 13). Because the fish do not enter the ocean, each population of the tidewater goby is isolated from the others (USFWS 2005b, 6). Various genetic markers demonstrate that pronounced differences in the genetic structure of tidewater gobies exist, and that tidewater gobies in some locations are genetically distinct (USFWS 2005b, 31); the population of tidewater gobies in Rodeo Lagoon is isolated from other populations and is genetically distinct (Dawson et al. 2001, 4). The lagoon is closed to people and dogs for overall resource protection (NPS 2010b, 33). However, there is no physical barrier to prevent dogs from accessing the lagoon, specifically at the beach-lagoon shoreline. A concurrent NPS project includes the installation of a post-and-cable fence along the beach side of Rodeo Lagoon to discourage visitors from accessing the lagoon, though it would not physically exclude dogs or visitors from this area (NPS 2010b, 33). Additionally, the voice-control areas are located immediately adjacent to the shoreline of the lagoon. Pet citations have been issued as a result of dogs accessing closed areas (Rodeo Lagoon) at Rodeo Beach (NPS 2008c (appendix G)).

A recovery plan for the tidewater goby, dated December 2005, is in effect. The recovery plan calls for protection and enhancement of currently occupied habitat, including managing freshwater inflow, exotic species, channelization, water quality, and human impacts; development of strategies to prevent further loss of habitat; and research and monitoring (USFWS 2005b, 43–45). The plan also names increasing public awareness and possible translocation of gobies as strategies to help populations recover (USFWS 2005b, 44–45). In January 2008, the USFWS published a Final Rule re-designating critical habitat for the tidewater goby to include additional sites throughout the range of the goby. Rodeo Lagoon was included in the revised designation of critical habitat for the tidewater goby and is described as critical habitat unit MAR-4 in the Final Rule. The Final Rule states that “tidewater gobies are abundant within Rodeo Lagoon, and the lagoon was occupied by tidewater gobies at the time of the listing and is currently occupied” (50 CFR Part 17).

### **Coho Salmon (*Oncorhynchus kisutch*)**

The central California coast coho salmon ESU is listed as federally endangered as well as state endangered (DFG 2004, ES.1). The ESU includes all naturally spawned populations of coho salmon from Punta Gorda in northern California south to and including the San Lorenzo River in central California, as well as populations in Redwood Creek at Muir Beach in GGNRA. This species occurs in several creeks in the planning area, as well as the nearshore waters of the Pacific Ocean and estuarine sites such as Bolinas Lagoon and the San Francisco Bay. A single cohort of coho salmon was found in Easkoot Creek (Marin

County) (DFG 2004, 6.45). Designated critical habitat for coho in GGNRA includes some estuarine and stream areas in the coastal watersheds of Marin County, including Redwood Creek, that are accessible to coho salmon (64 FR 24053). The park has closed the Redwood Creek area to dogs, including the trail along Redwood Creek and at the creek crossing near Muir Beach. However, these closures are not always followed; a citation was issued for a dog in the creek in 2006 (NPS 2008c (appendix G)).



**Muir Beach**

Credit: NPS

Coho salmon use Redwood Creek during many of their life stages (DFG 2004, 6.44). Coho salmon return to their home streams (Redwood Creek in the plan/EIS area) to spawn and lay eggs in nests called redds. Salmonids require gravel areas of substrate for laying eggs, and these areas are located upstream of the area where dogs can access Redwood Creek. When the eggs hatch, the young salmon are called alevins. Each alevin remains in the gravel and lives off its yolk sac until it is depleted. At this point, they are called fry and leave the gravel to feed on small prey in the stream; after 16 months, the young salmon are called smolts. Smolts

migrate to the sea, remaining at sea until they return as adults to spawn in their home streams. A genetically distinct run of coho salmon are found in Redwood Creek (Marin County). The park monitors coho salmon annually and has begun a research and habitat restoration effort that is restoring streamside habitat at Redwood Creek and adding woody debris to enhance the in-stream habitat. In addition, the park has initiated the restoration of the Redwood Creek lagoon to help in restoring coho habitat near Muir Beach. Redwood Creek empties into the lagoon just upstream from the entrance channel of the creek at Muir Beach and ultimately enters the Pacific Ocean. Coho salmon have been declining in Redwood Creek in recent years (NPS 2008d, 2). Specifically, there were no spawning coho salmon observed in Redwood Creek during the 2007–2008 winter monitoring period, although a small number of coho fry were observed the next spring. While a portion of this recent decline can be attributed to a regional oceanic phenomenon, local conditions that have not yet been determined may also have been a factor (NPS 2008d, 2).

### **Steelhead Trout (*Oncorhynchus mykiss*)**

The central California coast steelhead trout distinct population segment is listed as federally threatened. This species occurs in several creeks in the planning area. Steelhead trout are found in Redwood Creek and Easkoot Creek in Marin County, as well as in the drainages to Bolinas Lagoon and Rodeo Lagoon. Designated critical habitat for central California coast steelhead includes most of the coastal streams of Marin County, including Redwood Creek (NOAA 2005, 76). As stated above for coho salmon, the park has closed the Redwood Creek area to dogs, including the trail along Redwood Creek and at the creek crossing near Muir Beach. In addition, NPS has installed a post-and-cable fence along the beach side of lower Redwood Creek and lagoon to discourage visitors from accessing the water; however, the fence would not physically exclude dogs or visitors from the area, and voice-control areas are located immediately adjacent to the shoreline of the lagoon. These closures have been violated, and pet violations have been recorded in the past (NPS 2008c (appendix G)). Adult steelhead enter streams (including streams in GGNRA) in the late winter through spring to reach spawning sites. The amount of time

steelhead rear in freshwater and marine/estuarine habitats is variable, ranging between 1 and 3 years. The park monitors steelhead and is conducting research and restoration efforts, particularly in Redwood Creek, as described above for coho salmon (NPS 2008d, 2).

### **California Red-legged Frog (*Rana aurora draytonii*)**

The California red-legged frog is listed as federally threatened. This species uses diverse habitat elements, including aquatic, riparian, and upland habitats (USFWS 2002, iv). Breeding sites of the California red-legged frog are located in a variety of aquatic habitats: larvae, tadpoles, and metamorphs have been collected from streams, deep pools, backwaters in streams and creeks, ponds, marshes, sag ponds, dune ponds, and lagoons (USFWS 2002, iv). Numbers of California red-legged frogs have decreased dramatically in the urbanized San Francisco Bay Area, but populations persist at Marin County at Tennessee Valley (Tennessee Valley pond provides breeding habitat), Muir Beach (water bodies at site provide habitat but no known breeding occurs), Rodeo Beach (Rodeo Lake provides breeding habitat), as well as at Mori Point (ponds provide breeding habitat), Milagra Ridge (ponds provide breeding habitat), Sweeney Ridge/Cattle Hill (Fong 2010). Cattle Hill has mapped occurrences of the California red-legged frog at the site, but neither Sweeney Ridge nor Cattle Hill has known breeding that has been documented to date (URS Corporation 2010, figure 3). However, both Sweeney Ridge and Cattle Hill provide potential breeding and nonbreeding habitat for the California red-legged frog based upon modeling efforts (URS Corporation 2010, figure 3). Although the California red-legged frog is normally associated with wetland areas and water bodies, this species can also use upland and riparian habitat as well. The USFWS designated critical habitat units for the California red-legged frog in 2001 and revised the units in 2006 and 2008 (USFWS 2008b). For the California red-legged frog, a small portion of critical habitat Unit SNM-1A is located in the southern corner of Sweeney Ridge (USFWS 2006). Proposed critical habitat also occurs at Pedro Point (USFWS 2008b). Although the California red-legged frog is normally associated with wetland areas and water bodies, this species can also use upland habitat. In consultation with USFWS, the Milagra Ridge and Wolf Ridge site management plans include habitat enhancement for California red-legged frogs and the designation of several sites (Wolf Ridge, Rodeo Lagoon, and Redwood Creek) as special habitats with the objective of protecting habitat for the California red-legged frog and other species. The California red-legged frog is the primary prey of the federally and state-endangered San Francisco garter snake (as discussed below).



**Cattle Hill**

Credit: NPS

Current management of the California red-legged frog at GGNRA includes closure of Tennessee Valley to dog walkers, with the exception of the sections of the Coastal Trail that cross Tennessee Valley, and the placement of educational signs at Rodeo Lagoon, Rodeo Lake, and Mori Point. The NPS created four ponds at Mori Point to enhance the freshwater wetland habitat and to provide foraging habitat for the San Francisco garter snake, and these ponds also provide breeding and rearing habitat for the California red-legged frog (NPS 2009b, 114). The pond habitat at Mori Point is currently fenced to reduce dog impacts. Current GGNRA regulations require on-leash dog walking at Mori Point, but some off-leash dogs have been observed at this site by park staff (see the “Visitor Use and Experience” section under “Visitor Use

by Dog Owners”). The USFWS designated critical habitat units for the California red-legged frog in 2001 and revised the units in 2009 (50 CFR Part 17).

### **San Francisco Garter Snake (*Thamnophis sirtalis tetrataenia*)**

The San Francisco garter snake is listed as both federally and state endangered. The San Francisco garter snake is also a fully protected animal in California. Habitat requisites of the San Francisco garter snake include densely vegetated ponds near open hillsides where there are basking areas, cover, and food. Cattails, bulrushes, and spike rushes (*Juncus* spp. and *Eleocharis* spp.) are plant species preferred as cover by the snake (NPS n.d.b, 1–2). The San Francisco garter snake is normally associated with wetland areas and water bodies, but also uses upland habitat for basking and/or burrowing (USFWS 1985a, 9). On the California coast, snakes hibernate during the winter, and adults may aestivate in rodent burrows during months when ponds dry. The primary food of the San Francisco garter snake is the California red-legged frog, but the snakes will also capture small bullfrogs (NPS n.d.b, 1). Young snakes depend primarily on Pacific tree frogs for food (USFWS 2007c, 2). The decline of the California red-legged frog (the adult snakes' primary prey) and the introduction of exotic predators such as bullfrogs into aquatic habitats are both threats to the San Francisco garter snake (USFWS 2002, 24). In GGNRA, habitat for the San Francisco garter snake is found in San Mateo County. Specifically, the San Francisco garter snake has been documented as occurring at Mori Point and most of Mori Point contains habitat for the San Francisco garter snake (NPS 2010b, 37). The NPS created four ponds at Mori Point to enhance the freshwater wetland habitat and provide breeding and rearing habitat for the California red-legged frog as well as providing foraging habitat for the San Francisco garter snake (NPS 2009b, 114). Milagra Ridge has suitable aquatic, adjacent upland, and dispersal habitats for the San Francisco garter snake; other sites such as Sweeney Ridge and Pedro Point may serve as dispersal habitat for the San Francisco garter snake (NPS 2010b, 37).

### **Western Snowy Plover (*Charadrius alexandrinus nivosus*)**

The western snowy plover is a subspecies found along the Pacific coast from Washington to Baja California, portions of the interior western and southwestern United States, the Gulf coast of Texas, and interior portions of Mexico (Page et al. 1995, 1). The population of western snowy plovers nesting within 50 miles of the Pacific Coast of North America from southern Washington to Baja California was declared as federally threatened by the USFWS in March 1993 (USFWS 2007, 1). Therefore, the subspecies of western snowy plover that occurs along the shorelines of GGRNA is federally threatened. In September of 2005, the USFWS published a Final Rule to re-designate critical habitat for the western snowy plover along the coasts of California, Oregon, and Washington (50 CFR Part 17). The *Recovery Plan for the Pacific Coast Population of the Western Snowy Plover*, developed by the USFWS in 2007, indicates that monitoring and management of western snowy plover breeding, wintering, and migrating habitat (including reducing disturbance to this species) continue to be important steps for this species' recovery (USFWS 2007, vi). In GGNRA, the western snowy plover uses areas with wide, sandy, dune-backed beaches for roosting and foraging during the nonbreeding season. This species forages above and below the mean high waterline, typically gathering food from the surface of the sand, wrack line, or low foredune vegetation. There is no documentation of western snowy plovers nesting in GGNRA, but they overwinter at the Ocean Beach SPPA and at the Crissy Field WPA from July through May (NPS 2010b).

### **Western Snowy Plover Monitoring**

The NPS monitors the populations of western snowy plovers at both the Crissy Field and Ocean Beach sites at GGNRA. The monitoring season runs from July through May and is referred to by the year of the July start; the winter season, from November through February, is the time period that best defines the western snowy plovers that consistently inhabit beaches during the nonbreeding season by removing the fall and spring migration periods when some of the plovers are moving through these areas (NPS 2010b). The NPS has been monitoring shorebirds at Crissy Field WPA since 2000, and records of western snowy plover pre-date the focused monitoring program there, which began in 2004 (NPS 2008e, 1). Two to six



western snowy plovers have overwintered in Crissy Field WPA annually since individuals were first observed there in January 2005. Additionally, wintering site fidelity was demonstrated by two color-banded individuals that were observed overwintering in the WPA in the 3 consecutive years from 2004 through 2006 (NPS 2008e, 2).

The NPS began western snowy plover surveys at Ocean Beach in 1988, and a standardized protocol was completed in 1995 (NPS 2010b). Monitoring using this standardized protocol has continued from December 1994 through the present. The average number of plovers observed per survey during the winter was highest in the 1994-1995 survey period, at more than 54 plovers, and was lowest in 1999, at less than 13 plovers (NPS 2010b). The winter population of western snowy plovers was on average above 30 plovers per winter survey in 2002–2006 (NPS 2010b). Therefore, the numbers of western snowy plovers vary year to year based on a variety of factors, including conditions at other wintering sites, the width of the beach, the severity of storms, and other influences. Even though the western snowy plover distribution at Ocean Beach has fluctuated over time, the plovers have consistently concentrated in two primary areas of the beach at this site (NPS 2010b, 22).

### Presence and Impacts of Dogs on Western Snowy Plover

Monitoring data indicate the presence of the western snowy plover in the Crissy Field WPA, although this population is small in size (NPS 2009b). Both on- and off-leash dogs are routinely brought into the WPA by park visitors, and are the greatest source of disturbance to western snowy plovers (Zlatunich 2009, 10). There have been multiple instances of dogs flushing or chasing shorebirds, including western snowy plovers (Hatch 1996, ii; Hatch et al. 2006, 4; 2007, 4; Zlatunich 2009, 12). Hatch (1996) specifically observed dogs chasing western snowy plovers at the Ocean Beach SPPA. Plovers tend to take flight more readily, and expend more energy, when approached by dogs than by people on foot, and plovers react to dogs at twice the distance as to humans (Hatch 1996, 13; Lafferty 2001b, 318). The Crissy Field WPA is a high visitor use area, and warnings and citations have been issued and reports taken for closed area restrictions and disturbance to wildlife (NPS 2008c (appendix G)). During a 2008/2009 survey at the WPA, it was determined that impacts to western snowy plovers are predominantly from walkers who traverse the dune area and from on- and off-leash dogs (Zlatunich 2009, 10). However, on- and off-leash dogs surpassed the walkers in both level of disturbance and total disturbances per hour (Zlatunich 2009, 10).



Ocean Beach

Credit: NPS

During focused behavioral observations of groups of snowy plovers led by Hatch on Ocean Beach (1996, 11) from December 1994 to May 1996, 362 dogs were observed chasing birds, including 19 dogs that were observed chasing at least 62 western snowy plovers, and roaming dogs inadvertently disturbed at least 100 additional western snowy plovers. From long-term monitoring surveys conducted from 1994 to 2006, 48 off-leash dogs were observed chasing western snowy plovers (NPS 2006e, 1; NPS 2010b).

During the period of leash law enforcement (1997–2003), surveyors observed 1,825 dogs on leash (31.9 percent) and 3,894 dogs off leash (68.1 percent). From 2000 to 2005, the average number of dogs observed per hour increased from just below 7 to over 13, and the percentage of unleashed dogs increased from about 60 percent to nearly 80 percent.



### **Regulatory Actions and Current Status of Western Snowy Plover**

In 2004, the decision in *U.S. vs. Barley* (405 F.Supp.2d 1121 (N.D. Cal. 2005)) allowed off-leash dogs in certain areas of the park. Harassment and disturbance of western snowy plovers and other shorebirds increased as a result of off-leash dogs accessing the protection areas following the decision (NPS 2008e, 2). After the seasonal leash requirement was put in place at Ocean Beach in November 2006, the median number of dogs per hour decreased, as did the percentage of off-leash dogs; for the entire 2006 season, the median percentage of off-leash dogs at Ocean Beach was 64 percent (NPS 2008e, 2). Results of monitoring from the Crissy Field WPA also indicated an upward trend in dog use after the *U.S. vs. Barley* decision, and increases in the number of off-leash dogs and incidence of dogs chasing snowy plovers and other shorebirds (NPS 2008e, 2).

In November 2006 and July 2007, GGNRA adopted emergency regulatory provisions under 36 CFR 1.5, requiring on-leash dog walking when plovers are present (July 1 to May 15) in the Crissy Field WPA and Ocean Beach SPPA, and signs stating the seasonal restrictions were posted. A final seasonal protection rule, as detailed in the GGRNA Compendium (NPS 2009f, 31), was published on September 19, 2008. However, despite education and enforcement efforts, current compliance with the 2008 seasonal protection rule remains low, as described in the “Vegetation and Wildlife” section and the “Visitor Use and Experience” section under “Visitor Use by Dog Owners” (NPS 2008c (appendix G)). The NPS recently (January 2010) installed new fencing, gates, and signage at the eastern boundary of the WPA at Crissy Field to better demarcate where dog walking restrictions start; gates and signage were also installed at trail entry points to the WPA.

### **Bank Swallow (*Riparia riparia*)**

The bank swallow is listed as state threatened. A recovery plan for the bank swallow has been developed by the State of California (DFG 1992, 1) and a conservation plan has been developed by Partners in Flight (Garrison 2004, 1). The bank swallow is the only swallow that does not build a nest, instead occupying burrows and holes in bluffs and cliffs. Channelization and stabilization of banks of nesting rivers, as well as other destruction and disturbance of nesting areas, have caused a decline of the species (DFG 1992, ii). A nesting colony of bank swallows occupies burrows in the coastal bluff habitat at Fort Funston, which is currently one of only two remaining colonies for the species along the outer coast in California (NPS 2010b). Bank swallows are present at Fort Funston during their nesting season (April 1 to August 15) and spend the nonbreeding season in South America (Garrison 2004, 1; NPS 2009b, 74). Breeding bank swallows have been documented at Fort Funston by California DFG since 1956 (DFG 1992, 20). A voluntary seasonal closure is in effect that restricts access to the bluffs from above and 50 feet out from the bluff face during the bank swallow nesting season (NPS 2001b, 6). Other closures at Fort Funston include the north end of the Coastal Trail due to erosion and a 12-acre Habitat Protection Area. The bank swallow population numbers have historically fluctuated in size and location over time at Fort Funston, but the colony generally occupies the bluffs between the second overlook and just north of the beach access point (NPS 2010b). The nesting colony is monitored approximately once per week by park personnel. In addition to tracking bank swallow numbers, monitoring is also conducted to document disturbance to the colony (approaching or climbing on bluffs) (NPS 2010b). Visitors can access areas surrounding the bluffs from above the beach at the beach access trail. Signage and fencing (currently partially buried) have been installed along the trails adjacent to the closure area, and signs along the beach below the colony voluntarily restrict access to the northern section of the bluffs by visitors when the swallows are nesting. Fort Funston has moderate to high visitor use, and in 2007–2008 there were two pet citations, warnings, and reports taken related to wildlife disturbance at the site (NPS 2008c (appendix G)).

### **Northern Spotted Owl (*Strix occidentalis caurina*)**

The northern spotted owl, a subspecies of the spotted owl, is listed as federally threatened and was originally listed by USFWS due to the widespread loss of suitable habitat across the owl's range and the inadequacy of existing regulatory mechanisms to conserve the owl (USFWS 2008d, VII). Northern spotted owls occur in coniferous and evergreen hardwood forests on GGNRA lands north of the Golden Gate, most notably at Muir Woods National Monument (which is closed to dogs) and Homestead Valley. Although suitable habitat exists at Oakwood Valley, northern spotted owls have not been detected at this site. A potential predator of northern spotted owls, the great horned owl have been detected in and around the area in recent years; their presence may preclude northern spotted owls from using the area (NPS 2010b, 41). Marin County, at the southern limit of the subspecies' range, supports relatively high densities of this owl in appropriate habitat (NPS 2009e). The local population is considered healthy and is protected by the large expanse of public lands in Marin County. Additionally, NPS works with other land managers and the county to monitor and actively protect northern spotted owls and habitat, including providing information to Marin County planners. The dusky-footed woodrat is the primary prey for northern spotted owls (Hamm, et, al 2007, 1). Therefore, any changes in the abundance and/or distribution of the dusky-footed woodrat could indirectly affect the northern spotted owl. The final recovery plan for the northern spotted owl developed in 2008 by the USFWS stated that competition from the barred owl poses a complex threat to the northern spotted owl as the barred owl expands its territory to the western states (USFWS 2008d, VII). The recovery plan recommends barred owl removal experiments to assess the best path to recovery for the northern spotted owl (USFWS 2008d, Recovery Action 29). Barred owls currently occur in Marin County and pose a new threat to the northern spotted owl population in Marin County (NPS 2010b). NPS management focuses on protecting northern spotted owl habitat and reducing disturbance (including from dogs) to the greatest extent possible to ensure their long-term survival (NPS 2010b). The calls of territorial northern spotted owls have been described as sounding like dog barks, and these territorial northern spotted owls may respond to barking dogs. Young northern spotted owls that have recently fledged are sometimes found on the ground, where they are susceptible to dogs, especially those dogs that are off leash (NPS 2010b). There have been a few cases reported of dogs discovering young northern spotted owls on the ground or alerting owners to the presence of owls on the ground (NPS 2009b, 76).

### **Guadalupe Fur Seal (*Arctocephalus townsendi*)**

The Guadalupe fur seal is listed as both federally and state threatened. This seal breeds along the eastern coast of Guadalupe Island, approximately 200 kilometers west of Baja California. However, individuals have been sighted in the Southern California Channel Islands, including two males who established territories on San Nicolas Island. This species is an occasional vagrant from offshore marine habitat. In the park sites, the Guadalupe fur seal is primarily at risk from dogs if found stranded on beaches that allow dogs. From nine years of collected data by the Marine Mammal Center (2000 through 2005 and 2007 through 2009), there was only one stranding of a Guadalupe Fur Seal at GGNRA (Stinson Beach) (MMC 2010). Therefore, a detailed impact analysis of this species is not necessary for this project, but a general discussion of impacts to hauled-out or stranded pinnipeds is included in the "Wildlife" section of chapter 4 for each applicable site at GGNRA.

### **Steller Sea Lion (*Eumetopias jubatus*)**

The Steller sea lion is listed as federally threatened. This sea lion breeds from the northern Channel Islands north to the Aleutians and Pribilofs, and a breeding colony exists on Año Nuevo Island, Santa Cruz County, approximately 50 miles south of San Francisco and GGNRA. A historical haul-out was also located at Seal Rock, near the Lands End site. This species is an occasional vagrant from offshore marine habitat. Critical habitat for the sea lion in the vicinity of San Francisco is designated for both Año Nuevo

Island (a state reserve) and Southeast Farallon Island in the Farallon National Wildlife Refuge, both located in the Pacific Ocean approximately 55 miles to the south and 30 miles to the northwest of San Francisco; no critical habitat is mapped at GGNRA. From nine years of collected data by the Marine Mammal Center (2000 through 2005 and 2007 through 2009), there were no strandings of Steller sea lions at GGNRA (MMC 2010). Therefore, a detailed impact analysis of this species is not necessary for this project, but a general discussion of impacts to hauled-out or stranded pinnipeds is included in the “Wildlife” section of chapter 4 for each applicable site at GGNRA.

## THREATENED, ENDANGERED, AND CANDIDATE SPECIES: PLANTS

### Presidio (Raven’s) Manzanita (*Arctostaphylos hookeri* ssp. *ravenii*)

Presidio manzanita is listed as federally and state endangered and is a perennial, prostrate to low-growing, shrub. It exists as a single individual east of Lincoln Boulevard (in Area B) of the Presidio on a serpentine outcrop (GGNRA 2004). As part of restoration efforts to reintroduce this species at GGNRA, clones of this individual have been planted west of Lincoln Boulevard, near Baker Beach, in suitable serpentine coastal prairie habitat. The Presidio manzanita is a self-fertile plant, which means the plants can pollinate themselves and produce viable offspring. The management of this species is guided by the *Recovery Plan for Coastal Plants of the Northern San Francisco Peninsula* (USFWS 2003, 63-64), which suggests that the species is stress tolerant with sparse competing vegetation, but is relatively intolerant of direct vegetative competition such as shading from shrub or tree canopies. There have been no reports of natural seedling or clone establishment around the remnant wild Presidio manzanita, which may indicate a lack of viable seed, seed predation, or lack of sufficient seedling microsites. The Trust has removed non-native vegetation around the single clone and has installed fencing and interpretive signs.

### Marin dwarf-flax (*Hesperolinon congestum*)

Marin dwarf-flax (or Marin western flax) is listed as federally and state threatened and is a small herbaceous annual of the flax family with slender threadlike stems. This species is included in the September 1998 *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area* (USFWS 1998, iv) and the management of this species is also guided by the *Recovery Plan for the Coastal Plants of the Northern San Francisco Peninsula* (USFWS 2003, iii). It is found in GGNRA as a small population west of Lincoln Boulevard of the Presidio. It grows in the serpentine chaparral (coastal prairie-grassland) habitat and is exclusive to serpentine or other bedrock outcrops (USFWS 2003, 20). At GGNRA, Marin dwarf-flax occurs



**Baker Beach**  
Credit: NPS

in serpentine grassland soil outcrops above Baker Beach, near the one remaining natural Presidio manzanita location (USFWS 2003, 65). Of the 11 locations in Marin County where Marin dwarf-flax currently resides, 2 are in GGNRA: the Presidio and Baker Beach (USFWS 2003, 89; 1998, II-98). However, Baker Beach is the only GGNRA site where the Marin dwarf-flax occurs that is considered in this plan/EIS. The species is threatened by residential and recreational development as well as by competition with non-native, invasive species. Population trend monitoring of GGNRA populations and adjacent populations indicates stable to increasing numbers in the area, although trends are difficult to interpret due to fluctuating annual population sizes typical for annual species. Results from other areas, not under direct management of the NPS, suggest that overall impacts on the species are from non-native

and native plant species encroachment, particularly by shrubs. These species encroach on suitable habitat and limit the annual display of this species (USFWS 2003, 89). It has also been suggested that the occurrence of this species may also be threatened by trampling when people and dogs walk off of established trails (E. Buxton, pers. comm., 1998 in USFWS 1998, II-98). Current efforts to restore Marin dwarf-flax are underway in the Presidio, where NPS biologists will be attempting to experimentally establish new populations this year (Fritzke, 2010b, 1).

### **San Francisco Lessingia (*Lessingia germanorum*)**

San Francisco lessingia is listed as federally endangered and state endangered and is a low-growing, slender-stemmed annual herb of the sunflower family (Asteraceae). Populations of this species occur primarily in small, local remnants of dune scrub in the Presidio. Dune scrub is found on the sand terrace slopes above Baker Beach and in the Lobos Creek Dunes, and San Francisco lessingia is found in association with this community at Baker Beach. Both Fort Funston and Baker Beach have been designated as San Francisco lessingia recovery and enhancement sites (USFWS 2003, 128, 141). Although dune scrub habitat occurs at Fort Funston, the San Francisco lessingia does not currently occur there (NPS 2010b). Reintroduction of the species is precluded by the current unmanaged (or unrestricted) dog use at Fort Funston (NPS 2010b). In the Baker Beach site, there are areas designated for further study and potential recovery of the San Francisco lessingia (NPS and Presidio Trust 2001, Chap. 3, 3). Additionally, at Baker Beach, a dunes site at Lobos Creek is an area of early-succession stable dune scrub that was recently (1995 to 1997) restored as a mitigation effort (USFWS 2003, 29). The San Francisco lessingia prefers sparse, relatively open native dune scrub, coastal scrub, and grassland vegetation and specific substrates described as old coastal sand deposits (USFWS 2003, iii). Historical populations were probably associated with early stages of succession following natural dune blowouts (hollows derived from wind erosion of dunes) or other local disturbances in coastal dune scrub (USFWS 2003, 38). The San Francisco lessingia is now narrowly associated with either sparse vegetative cover or substantial vegetation gaps, usually related to past disturbance of the substrate or the vegetation. The management of this species is guided by the *Recovery Plan for the Coastal Plants of the Northern San Francisco Peninsula* (USFWS 2003, iii), which indicates that primary impacts on this species are related to the edge effects of adjacent vegetation, including shading, non-native plants, and wind blockage. This plan suggests that primary protection and recovery actions should focus on removing non-native plant species, minimizing edge effects, and increasing or enhancing suitable habitat around the population and can be implemented by NPS to help in the recovery of this species.

### **Hickman's Potentilla (*Potentilla hickmanii*)**

Hickman's potentilla (Hickman's cinquefoil) is listed as federally and state endangered. This species is a perennial herb that is endemic to California (CNPS 2009, 1). Hickman's potentilla is found in coastal scrub habitats such as coastal bluff scrub, closed-cone coniferous forest, meadows and seeps, and marshes and swamps, and it can also inhabit freshwater marshes, seeps, and small streams in open or forested areas along the coast with an elevation of 10 to 150 meters above msl. This species is seriously threatened by urbanization, recreational activities, non-native grasses, grazing, and the proposed Devil's Slide Bypass highway project, which includes the construction of two tunnels beneath San Pedro Mountain (CNPS 2009, 2). Suitable habitat to support Hickman's potentilla occurs at both Mori Point and the Pedro Point Headlands (URS 2010, figure 19), but there are no mapped occurrences of this plant at either the Mori Point or Pedro Point Headlands sites (Fritzke 2010c).

### **California Seablite (*Suaeda californica*)**

California seablite is listed as federally endangered. It formerly occupied salt marsh habitat in the San Francisco Bay and southward, but is now restricted to sandy high salt marsh edges of Morro Bay. The

recovery of this species, and its reintroduction to the Bay Area salt marshes are covered by the *Recovery Plan for Tidal Marsh Ecosystems of Central and Northern California*, which is currently in preparation by the USFWS. This species has been extirpated from the San Francisco Bay Area, although it was reintroduced to the restored salt marsh at Crissy Field in 2001. However, two efforts to reintroduce the species to the Crissy Field Tidal Marsh have failed, possibly due to excessive flooding of the marsh.

## CULTURAL RESOURCES

Cultural resources are material manifestations of past human activities. They include prehistoric and historic structures, objects, landscapes, etc. Of the many cultural resources in the park, the only ones that have been analyzed for this plan/EIS are those believed eligible for or listed on the NRHP and that are resources composed of or including features that are earthen and vegetative, which are considered vulnerable to impacts from visitors with dogs.

Erosion and ground disturbance are primary factors in the loss of integrity of cultural resources. The loss of integrity can be caused by natural forces (wind, rain, seismic activity, soil instability, burrowing animals) as well as human factors (park visitors, dogs—trampling, digging). The presence of humans and their dogs, both on and off trail, is believed to increase natural erosion processes, furthering the potential to negatively affect cultural resources in GGNRA (e.g., seacoast fortifications and their integral earthworks, field fortifications, archeological resources). In addition, some cultural resources are affected by dog urination (e.g., detrimental effects to character-defining features, such as vegetation, associated with historic districts and structures) (Haller, pers. comm., 2009c).

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## AREA OF POTENTIAL EFFECTS

The Area of Potential Effects (APE) is defined by the *National Historic Preservation Act* (NHPA) Section 106 regulations as the “geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties” (36 CFR 800.16(d)). Historic properties are those cultural resources listed in or considered eligible for inclusion on the National Register of Historic Places (NRHP). In this case, the area of potential affects (APE) is defined primarily by national historic district and landmark boundaries, as well as a few individual resource areas where smaller, general boundaries are used. These cultural resource boundaries do not readily conform to defined geographic areas as are used in the analysis of other resource topics and, consequently, this section is structured differently than others.

The APE was determined prior to resource analysis and includes multiple areas in both Marin and San Francisco counties (map 24, Marin County sites, and map 25, San Francisco County sites). Boundaries of these areas were established based on the occurrence of cultural resources within areas for which dog management actions have been proposed.

Many of the individual resources that may be affected by the plan are encompassed within larger district or landmark designations: Forts Baker, Barry, and Cronkhite Historic District; the Presidio of San Francisco National Historic Landmark (Presidio National Historic Landmark (NHL)); Fort Mason Historic District; and the Fort Miley Military Reservation. While the APE encompasses these larger historic district boundaries, the potential effects of the dog management plan are more limited to discrete elements of these districts (historic structures, etc.), as identified below.

The general boundaries of the Forts Baker, Barry, and Cronkhite Historic District include uplands and tidelands in southern Marin County, extending west from the north side of the Golden Gate along the Pacific Ocean coastline and east to the San Francisco Bay. The general boundaries of the Presidio NHL include a large area from Crissy Airfield (San Francisco Bay) west to the Pacific Ocean. The Fort Mason Historic District is located just east of the Presidio NHL, along San Francisco Bay. Fort Miley Military Reservation is located on Point Lobos bordered by Clement Street and Lincoln between 40th Avenue and 48th Avenue.

In addition, smaller areas containing cultural resources that have the potential to be affected by the plan are included in the defined APE. These include general locations of archeological resources at Muir Beach and Point Lobos, as well as Battery Davis at Fort Funston and the U.S. Coast Guard Station Historic District, which is a 5-acre district containing historic structures that contribute to Presidio NHL.

## **CULTURAL RESOURCE CONTEXT**

### **Pre-Contact Context**

Native American population densities in California were among the highest in all of North America. Evidence of Native American use of the general area dates back approximately 10,000 years. At the time of Native Americans' first contact with European and Mexican visitors, the lands around San Francisco Bay were occupied by numerous small tribes that, as a result of linguistic similarities, are described as belonging to two major linguistic areas: the Coast Miwok (approximately 15 tribes north of the Golden Gate) and the Ohlone (approximately 50 tribes south of the Golden Gate). These tribes were organized into small, politically independent groups, living in small villages associated with coastal and marshland areas. Groups were often organized by watershed areas, which could result in a single group defining its territory by one or more watersheds. Subsistence activities were based on annual group movements—seasonal rounds of hunting, fishing, and gathering—between temporary and permanent village sites (NPS 2008g, 1).

Early European and Mexican visitors to the area noted a variety of resources included in the native inhabitants' diet—crabs, birds, deer, nuts, herbs, and fruits. Villages contained a variety of structures of vegetation, earth, and supporting pole construction used for a variety of functions, including dwelling, assembly, ceremony, sweathouses, food processing and storage, etc. With a subsistence strategy tied to the ocean and bay, villages were typically located along the coastlines and, indeed, numerous prehistoric shellmounds and other artifacts have been identified in these areas (Toogood 1980). Coast Miwoks and Ohlones are believed to have engaged in periodic burning of the landscape to promote the growth of desirable native vegetation species for seed gathering, to drive game animals for harvest, and to create forage for hunting prey (deer, elk) (NPS 2008g, 1). The park's oldest indigenous archeological site consists of shell material found at Lands End, dating to AD 150 (NPS 2008g, 1).

The Spanish settlement of the area in the late 18th century resulted in dramatic cultural and organizational changes for the indigenous people of the San Francisco Bay Area. Ultimately, these changes resulted in the devastation of the native cultures through introduced diseases, forced labor, and disruption of family and social structures (NPS 2008g, 2). Despite the devastation, the Coast Miwoks and Ohlones survived.

### **Historical Context**

In the late 18th century, Spanish military and civilian settlers began establishing their military, religious, and civilian presence in the area. As a part of this settlement of the San Francisco Bay Area, activities such as cattle grazing, dairy farming, timber harvesting, and other agricultural pursuits were introduced throughout the 19th century, particularly north of the Golden Gate (NPS 2007c, 123–126). The San



Francisco Bay developed into one of the most important harbors on the Pacific Coast during the 19th century, serving as an outlet for products from approximately 70 percent of California by 1927 (Toogood 1980).

The beginnings of military defenses in the area began in 1776 with the establishment of the Spanish Presidio, which was intended to protect the claim of the Spanish crown to the northernmost permanent outpost of its empire on the Pacific. During the approximately 230 years since the Presidio was established, numerous fortifications have been built along the San Francisco coastline by the governments of Spain (1776–1822), Mexico (1822–1846), and the United States (1846–1974). Fortifications constructed by the United States include those designed to ensure coastal and harbor defense during the Civil War, the Spanish-American War, World War I, World War II, and the Cold War, making this coastline one of the best defended on the West Coast (NPS 1999b).

## **CULTURAL RESOURCE TYPES**

The NPS recognizes five categories of cultural resources for management purposes: archeological resources, historic structures, cultural landscapes, ethnographic resources, and museum objects (NPS 1998). It is not expected that ethnographic resources or museum collections will be affected by this plan and they are not included in this analysis. Appendix I is a list of cultural resources included in this analysis.

### **Archeological Resources**

Archeological resources are the remains of past human activity and the records documenting the scientific analysis of these remains. They are often buried but may extend aboveground. They are commonly associated with native peoples but can also be products of more contemporary society (NPS 1998). Archeological sites are considered fragile, nonrenewable resources. While field fortifications (military earthwork features, such as foxholes and trenches) feature some characteristics of archeological sites, they are addressed as features of cultural landscapes for this analysis.

The three archeological resources addressed in this plan are indigenous in nature and are either listed on or considered eligible for the NRHP. The Marin County site (CA-MRN-333) is located in the general Muir Beach/lagoon area. The site is a relatively intact pre-contact shell midden, which was listed on the NRHP in 1979 (NPS 2008j).

The San Francisco County sites (CA-SFR-5 and CA-SFR-21) are located in the general area of Point Lobos and were listed in the NRHP in 1976. They are described as containing, among other items, “mammalian and fish bones, chert and obsidian flakes, a bead and stone fishing weight, and a prehistoric hearth of fire-cracked rocks” (NPS 2005b, 30). Both have been stabilized with native vegetation; site CA-SFR-5 is fenced, but not in a way that precludes entry into the area by visitors or dogs (Scolari, pers. comm., 2009).

### **Historic Structures**

Historic structures include buildings, bridges, roads, temples, and other manufactured objects that extend the limits of human capability. Structures allow humans to live in harsh climates and in areas far removed from where they work and live (NPS 1998). The structures analyzed in this plan include permanent seacoast fortifications and their integral earthworks and Crissy Airfield. The majority of structures analyzed within this plan/EIS are located within the boundaries of the Forts Baker, Barry, and Cronkhite Historic District; the Presidio NHL; the Fort Mason Historic District; and the Fort Miley Military Reservation (appendix I).

### Permanent Seacoast Fortifications and Their Integral Earthworks

Permanent seacoast fortifications (sometimes referred to as batteries) within GGNRA consist of numerous gun batteries of brick, stone, and concrete, partially covered with carefully designed earthworks for additional protection. These seacoast fortifications were a part of an integrated defensive network and contained features and equipment needed to support the big guns mounted therein. This network of defense included permanent fortifications constructed along the San Francisco area coastline and was “designed and emplaced to protect naval bases, seaports, and other important coastal waters from the intrusion of hostile warships” (NPS 1999b, xxi). The history of these defensive structures ranges from the Spanish Colonial and Mexican eras (1794) through the Cold War Era (1974) (for additional information, please see NPS 1999b).

The earthwork portions of these permanent seacoast fortifications are defined as “military construction formed chiefly of earth, used in both defensive and offensive operations” (NPS 1999b, xiv) and are inherently fragile in nature. They consist of earth placed over and around fortifications of brick, stone, and concrete (batteries) that were used as defensive structures, with features and equipment necessary to support a variety of artillery (figure 3). There are several reasons for the use of earth as a construction material, including its blunting properties against the brunt of powerful offensive ordnance, the relative ease with which structures could be built and repaired, and the rapidly changing military technology that made it difficult to know what to prepare for defensively (NPS 1999b, 47).



**FIGURE 3. BATTERY EAST, WITH EROSION OF EARTHWORKS EVIDENT**

The earthwork portions of these seacoast fortifications were designed not only to absorb artillery impact but also to camouflage fortifications from the air and sea. While the earthworks are the most apparent visual element of these structures, they mask the internal hardened (concrete, stone, masonry) features within such as magazines, artillery emplacements, armatures, entryways, etc. To avoid penetration by offensive artillery, the resistance of a battery was calculated in “so many feet of earth placed in front of so many feet of concrete” (NPS 1999b, 47). As of 1910, the Office of the Chief of Coast Artillery required

that all exterior slopes of new coastal defenses conform to their surrounding topography, with geometrical contours avoided, and be further concealed by the appropriate planting of the slopes (NPS 1999b, 80).

The earthwork portions of seacoast fortifications evaluated in this plan are associated primarily with Fort Baker within the Forts Baker, Barry, and Cronkhite Historic District; Fort Scott and Fort Point within the Presidio NHL; Fort Mason Historic District; and Fort Miley Military Reservation (appendix I). All are considered “well-preserved examples of nearly every important development in military fortification engineering from before the Civil War to the guided-missile era” (NPS 1999b, 1) and are considered contributing features to NRHP or National Historic Landmark resources. Fort Funston, which includes Battery Davis, was removed from the NRHP in 2006 due to resource degradation related to erosion and human use to the point where the site lacked integrity. However, Battery Davis was singled out for eventual inclusion in a National Historic Landmark District for seacoast fortifications of San Francisco Bay. This nomination is being prepared as of this writing (Haller, pers. comm., 2009b). For this reason, Battery Davis is included in the analysis of historic structures. In general, permanent seacoast fortifications are described as being in good condition (NPS 1999b, 116). However, they are considered fragile and are subject to natural erosion processes that are accelerated by loss of vegetative cover, digging, social trail uses, etc.

### **Crissy Airfield**

Crissy Airfield is located along the northern shoreline of the Presidio NHL on the site of a previous landfill completed for the 1915 exposition (map 25). Crissy Airfield was established in 1919, functioning as the center of West Coast military aviation operations from 1921 to 1936. It is the only Air Coast Defense Station airfield in the country that retains the majority of its original buildings—hangars, barracks, guardhouse, etc. A related signal cable hut constructed in 1921 (building 946—partially buried structure) could also be affected by the plan. Both the airfield and the signal hut are considered to be in good condition (Scolari, pers. comm., 2009).

### **Cultural Landscapes**

Cultural landscapes are environmental settings that humans have created that reveal the fundamental ties between people and the land and reflect the human need to grow food, give form to settlements, meet a need for recreation or work, or bury the dead (NPS 1998). They are the result of decades—or in some cases, centuries—of cumulative human land uses, politics, economies, and cultures. Alterations to cultural landscape features can adversely affect the resource and its NRHP status.

Most of the historic structures that are analyzed in this plan are located within larger cultural landscapes or historic districts. As effects on elements (e.g., historic structures) of a cultural landscape can affect its overall integrity, both cultural resource types are analyzed. Cultural landscapes within the project APE include the Forts Baker, Barry, and Cronkhite Historic District; the Presidio NHL (including the U.S. Coast Guard Station Historic District); Fort Mason Historic District; and Fort Miley Military Reservation (maps 24 and 25).

### **Forts Baker, Barry, and Cronkhite Historic District**

The Forts Baker, Barry, and Cronkhite Historic District encompass approximately 2,300 acres in Marin County (map 24). Its period of significance ranges from 1866 to 1974 and it is associated with the history of coastal defense in the San Francisco Bay Area. Fortifications constructed in this area were designed to enhance those at the Presidio, south of the Golden Gate, in guarding against the entry of enemy ships into San Francisco Bay (NPS 2005b, 3; 2008j). Resources that could be affected by the plan include earthwork

portions of seacoast fortifications at Fort Baker (see discussion above) as well as numerous field fortifications primarily associated with Fort Cronkhite.

*Field Fortifications.* Though no less significant than previously described earthwork portions of seacoast fortifications (above), field fortifications are less conspicuous World War (WW) II features that include hand-dug foxholes, trenches, machine gun pits, etc. that provided supplemental support to nearby fortified batteries (Haller, pers. comm., 2009b) (appendix I) (figure 4). Those associated with Fort Cronkhite are primarily located north of the cantonment area, in the general vicinity of Wolf Ridge. Similar resources also appear on the high ground at Fort Barry and Fort Baker (map 24) (Haller, pers. comm., 2009b). All are considered contributing resources to the Forts Baker, Barry, and Cronkhite Historic District.



Source: Martini n.d.a:43

**FIGURE 4. EXAMPLE OF TEMPORARY FIELD FORTIFICATION WHICH SUPPORTED NEARBY FORTIFIED BATTERIES**

All of these features represent simple “fighting positions,” measuring about 6 to 8 feet long and 2 feet deep, where one or two men could provide defensive fire with rifles. These positions could be quickly dug with the simplest hand tools and only provided minimal protection. When time allowed, deeper and longer zigzag trenches were constructed that were reinforced with wooden sides and thwarts to keep them from collapsing. The purpose of the zigzags was to limit shrapnel damage and prevent attacking aircraft from strafing the entire length of the trench (Martini n.d. a, 40).

There is little formal military documentation of these temporary defensive works, with period photographs providing the best record of the extent and design of these features. Many of them have been lost to the elements. Photos taken after World War II indicate that grading activities in these areas may have filled in many of these features. Today, their locations are generally indicated only by suspicious landforms or gun mounts sticking up from the sand (Martini n.d. a.). What is left of these temporary fighting positions is inherently fragile in nature; they are extremely vulnerable to erosion and ground

disturbance (e.g., digging). In some cases, dense vegetation offers some protective cover for these resources (Barker, pers. comm., 2009).

### **The Presidio of San Francisco National Historic Landmark**

The Presidio was designated a National Historic Landmark in 1962 and is described as

the oldest Army installation operating in the American West and one of the longest-garrisoned posts in the country. The size and duration of this installation has resulted in a complex landscape in which many layers of history overlap in a relatively small geographical area. (NPS 2006f, 19)

The Presidio's NRHP eligibility is related to its numerous historical, architectural, and archeological resources associated with important events in American history. Its period of significance is from 1776 to 1945 and also includes the year 1951. This period encompasses the Spanish colonial, Mexican, and American periods of governance. It is described as a "vast district entity ... [that] possesses exceptional value in illustrating the history of the United States through its association with important historical events and its outstanding representation of patterns of national development through multiple periods" (NPS 2006f, 20).

The boundaries of the Presidio NHL encompass numerous cultural resources that could be affected by this plan, including Crissy Airfield, the U.S. Coast Guard Station Historic District, numerous seacoast fortifications and their integral earthworks, and field fortifications associated with Fort Winfield Scott and Fort Point. These resources are associated with the Presidio's Political and Military Affairs period (1865–1939) and the World War II period (1941–1945) (NPS 2006f, 20) and are considered as contributing to the significance of the Presidio NHL (map 25). Descriptions of the earthwork portions of seacoast fortifications and Crissy Airfield are found under "Historic Structures" above.

### **U.S. Coast Guard Station**

The U.S. Coast Guard Station Historic District is a 5-acre district containing historic structures determined to be contributing to the larger Presidio NHL. Its period of significance dates from 1915 to 1964 and is related to several important structures associated with maritime transportation and early social and humanitarian efforts, such as providing aid to stranded or wrecked ships (NPS 2006f, 21). Affected elements of the district include a cypress hedge planted in 1915, which defined the buildings and site perimeter of the U.S. Coast Guard Station. Much of this hedge was replaced with junipers in 1996 and, along with other landscaping, continues to convey the original formal design intent and define the edges of the property, setting it apart from the rest of the area (i.e., Crissy Airfield and the Presidio) (NPS 2006f) (map 25).

### **Fort Winfield Scott**

Fort Scott was established in the western part of the Presidio of San Francisco as a separate coastal artillery post in 1912, serving as an artillery garrison and headquarters of the Artillery District of San Francisco. The fort housed 17 Endicott-era gun batteries that were constructed, armed, and manned at varying levels between 1891 and 1946 (NPS 2010a). Seacoast fortifications and their integral earthworks and field fortifications within Fort Scott (along Baker Beach) are included in this analysis.

### **East Battery—Fort Point**

Construction activities at Fort Point, located at the south shore of the Golden Gate, ranged from 1853 to 1861 (Martini n.d. b). At completion, the fort and its outworks had emplacements for 141 guns of various types, but only a fraction of those were mounted at that time. The lowest tier of artillery was constructed as close as possible to water level so cannonballs could ricochet across the water's surface to hit enemy ships at the waterline. The structure was protected by 7-foot-thick walls, had multi-tiered casemated construction typical of Third System forts, and was unique to the West Coast (NPS 2010x). Earthwork portions of seacoast fortifications within the fort are included in this analysis.

*Field Fortifications.* Many of these features are located within the Presidio NHL and are more specifically associated with Fort Winfield Scott along the coastal bluffs north of Baker Beach. These resources are represented as “hastily built field fortifications constructed ... in the aftermath of the Japanese attack on Pearl Harbor, when the possibility of raiding parties landing on Baker Beach was a very real threat” (Martini n.d.a, 4). During World War II, mobile anti-aircraft guns were situated in sandbagged positions, and numerous trenches and foxhole fighting positions were dug along the Baker Beach bluff area (Martini n.d.a). All are considered contributing resources to the Presidio NHL. Please refer to the discussion above (Forts Baker, Barry, and Cronkhite Historic District) for more general information on field fortifications.

### **Fort Mason Historic District**

The roughly rectangular 68.5-acre historic district is located east of the Presidio NHL, along San Francisco Bay. It is represented by a collection of military structures and its period of significance is from 1855 to 1953. The fort illustrates “the evolution of military landscape planning and architecture over a one-hundred-year period” (NPS 2004a, 4). Earthwork portions of seacoast fortifications located within this historic district have the potential to be affected by the plan/EIS (map 25).

### **Fort Miley Military Reservation**

The Fort Miley Military Reservation is a roughly rectangular area (approximately 54 acres) located south of the Golden Gate Bridge on Point Lobos, just east of the existing El Camino del Mar Trail and Road. The U.S. Army acquired the land in 1893 with the intent of constructing gun and mortar batteries for the defense of San Francisco Bay. The military reservation is composed of three distinct complexes of structures (east, west, and central). Elements that contribute to the historic district include several batteries on the east and west sides of the reservation, a searchlight power plant, a few miscellaneous earthworks, fire control stations, and an ordnance storehouse. Descriptions of the earthwork portions of seacoast fortifications at Fort Miley are included under “Historic Structures” (above). Between the east and west portions of the reservation, a large Veterans Administration hospital replaced a variety of historic barracks, storehouses, etc. in 1934. Earthwork portions of masonry gun batteries located within this historic district have the potential to be affected by the plan/EIS (map 25).

## **CLIMATE CHANGE**

The NEPA process cannot be used to regulate greenhouse gases, but it can be used to analyze the impacts of actions that would intensify climate change. Recent mandates have been issued that will provide support and guidelines for addressing climate change. Secretarial Order 3289 established the Climate Change Response Council, which will work to increase the understanding of climate change and to coordinate an effective response to its impacts (SOI 2009, 1–2). Executive Order 13514, Federal Leadership in Environmental, Energy, and Economic Performance, requires agencies to measure, manage, and reduce greenhouse gas emissions toward agency-defined targets in an effort to support sustainable practices. The order also requires agencies to meet energy, water, and waste-reduction targets (NPS



2009j, 1). On February 18, 2010, the Council on Environmental Quality released a draft Guidance Memorandum on the consideration of greenhouse gas emissions and climate change impacts as part of compliance with NEPA (Nelson et al., 2010, 1). GGNRA is one of 52 NPS units involved in the Climate Friendly Parks Program, which is a collaboration of the NPS and the U.S. EPA aimed at addressing climate change. The purpose of the program is to measure greenhouse gas emissions, develop sustainable strategies to mitigate these emissions and adapt to climate change impacts, and educate the public about these efforts (NPS 2009i, 1).

All beaches in GGNRA are highly to very highly vulnerable to climate change effects because of their coastal slope, wave heights, and the range of local tides. A sea-level rise of 3 feet or more would likely inundate most, if not all, of the sandy beaches at GGNRA (Saunders et al. 2006, 17–18). If global warming progresses at predicted rates, sea level could rise 3 feet or more along coastal California by the end of this century.

The sea level at Crissy Field has risen by 0.2 meter (0.7 feet) over the past 100 years, and predictions indicate that it would rise 0.5 to 1.6 meters (1.6 to 5.2 feet) more by 2100 (NPS n.d.c, 1). By 2100, the volume and effects of each annual flood could be the equivalent of today's 100-year flood (NPS n.d.c, 1). Since the term of this plan/EIS is only 20 years and changes to sea level along the coast of California are predicted by 2100, climate change is not discussed further in this document because shoreline changes would not be expected during the life of this plan/EIS.

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*All beaches in GGNRA are highly to very highly vulnerable to climate change effects because of their coastal slope, wave heights, and the range of local tides.*

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## VISITOR USE AND EXPERIENCE

### PARK VISITATION INFORMATION

Since measurement of park visitation began in 1973, it is estimated that over 500 million people have visited Golden Gate, making it one of the NPS's most highly visited units (NPS 2008h, 2). Since GGNRA is made up of many park areas and does not have a central entrance where visitors can be counted, it is difficult to accurately count the number of people who visit GGNRA sites each year. The park employs a variety of counting methods to capture the number of visitors who drive to the sites as well as visitors who walk, bike, or ride public transportation to the sites. Most of the traffic counters multiply the number of vehicles by a multiplier to account for the number of people in each car. Some sites have additional seasonal multipliers to capture walk-in visitors (NPS 1997, 1).

The park exposes visitors to many of the resource values that exemplify America's national park system. The area includes miles of hiking trails, five campgrounds, hundreds of historic sites and structures, and 59 miles of bay and ocean shoreline and beaches. There are five visitor centers in the park and nine retail facilities run by park concessionaires, nonprofit partners of the park. Overnight stays are available at four walk-in campsites in the Marin Headlands, one drive-in campsite at Kirby Cove, two hostels (one at Fort Mason and another in the Marin Headlands), the newest national park lodge at Fort Baker, and local hotels and inns in areas outside the park boundaries (NPS 2009d, 131). Overnight facilities at Rodeo Beach are used extensively by youth groups, such as the Headlands Institute and Point Bonita Young Men's Christian Association (YMCA). Activities include hiking, jogging, water sports, hang gliding, horseback riding, fishing, bike riding, camping, wildlife viewing, dog walking, sunbathing, stewardship opportunities, and interpretive

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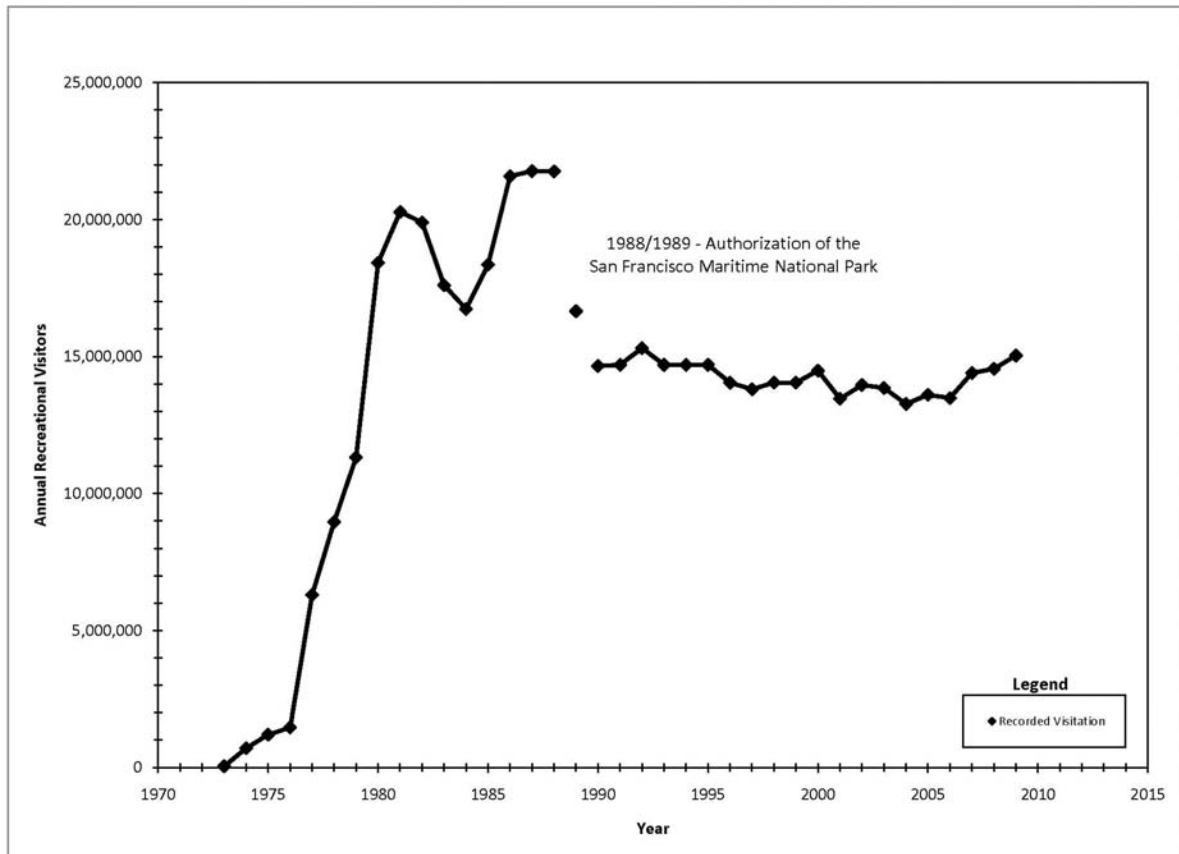
*Since measurement of park visitation began in 1973, it is estimated that over 500 million people have visited Golden Gate, making it one of the NPS's most highly visited units.*

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and educational opportunities. Visitors to the park come as individuals, as families, and as part of private and commercial tour groups and educational groups (schools, summer programs, youth groups, after-school programs, etc.). They come to recreate, learn, and attend special events. Additionally, participants in special use permits and events also are exposed to the park settings and resources.

### Summary of Visitation Trends

The annual visitation trends for GGNRA show a dramatic increase from its creation in 1972 (first annual visitation recorded in 1973) to its peak of over 21 million visitors from 1986-88, with a slight decrease from 1983 to 1985 (figure 5) (NPS Stats). The initial growth and variability in visitation from 1973 to 1988 is expected since the park was expanding during these years—more than 28,000 acres were added to the park since 1974 (Rothman 2002). In addition, prior to 1989, visitor counts at the GGNRA included visitors to the San Francisco Maritime National Historic Park (SAFR). Since 1989, visitor counts for the GGNRA and SAFR have been tabulated separately, resulting in a drop in annual visitation from the GGNRA of approximately 5 million. When factoring for the change in visitation counts related to the authorization of SAFR, annual visitation to the GGNRA is shown to have reached a capacity of 13 to 15 million visitors since 1980.



**FIGURE 5. RECORDED ANNUAL VISITATION TO GOLDEN GATE NATIONAL RECREATION AREA, 1973 TO 2009**

Monthly visitor use data from 2005 through 2009 were analyzed to evaluate the variance of visitation rates by month (NPS Stats). The data indicated only slightly higher use from April through September, accounting for approximately 54% of visitors year round. This shows that visitation to the park is fairly constant regardless of the time of year.

## Forecasts of Future Park Visitation (Based on Visitation Trends)

The 2010/2011 NPS Forecast of Recreation Visits for GGNRA predicts a 2.4% increase in annual visitation in 2010, and a 2.6% increase in 2011 based on trend line extension of visitation data from the past five years (NPS Stats). Trend line extensions usually work well for projections two to three years into the future for park facilities. However, the confidence level is fairly low when extending this kind of forecast out to 20 years (Gramann 2003).

Our long-term forecast method utilizes data recorded since 1990, since this is after SAFR was removed and there have been minor changes to the “Public Use Counting and Recording” methodologies<sup>1</sup>. Within this longer time frame of 20-years, visitation does not exhibit any significant increasing or decreasing trend, but rather is observed to oscillate about a mean annual visitation of approximately 14 million. This pattern of visitation is assumed to continue unless a large expansion or change of the park boundaries occurs. A 99% prediction interval (PI) was developed representing the lower and upper limits of annual visitation with 99% confidence using the following formula:



**Visitors Arriving at Rodeo Beach**

Credit: NPS

$$PI = \bar{x} \pm t_{1-\alpha/2, n-1} \times \sqrt{s_x^2 \left( 1 + \frac{2}{n} \sum_{l=1}^5 (n-1) \rho_l \right) \left( \frac{1}{n} + 1 \right)}$$

$\bar{x}$  = average annual visitation from 1990 to 2009,

$s_x$  = standard deviation in annual visitation from 1990 to 2009,

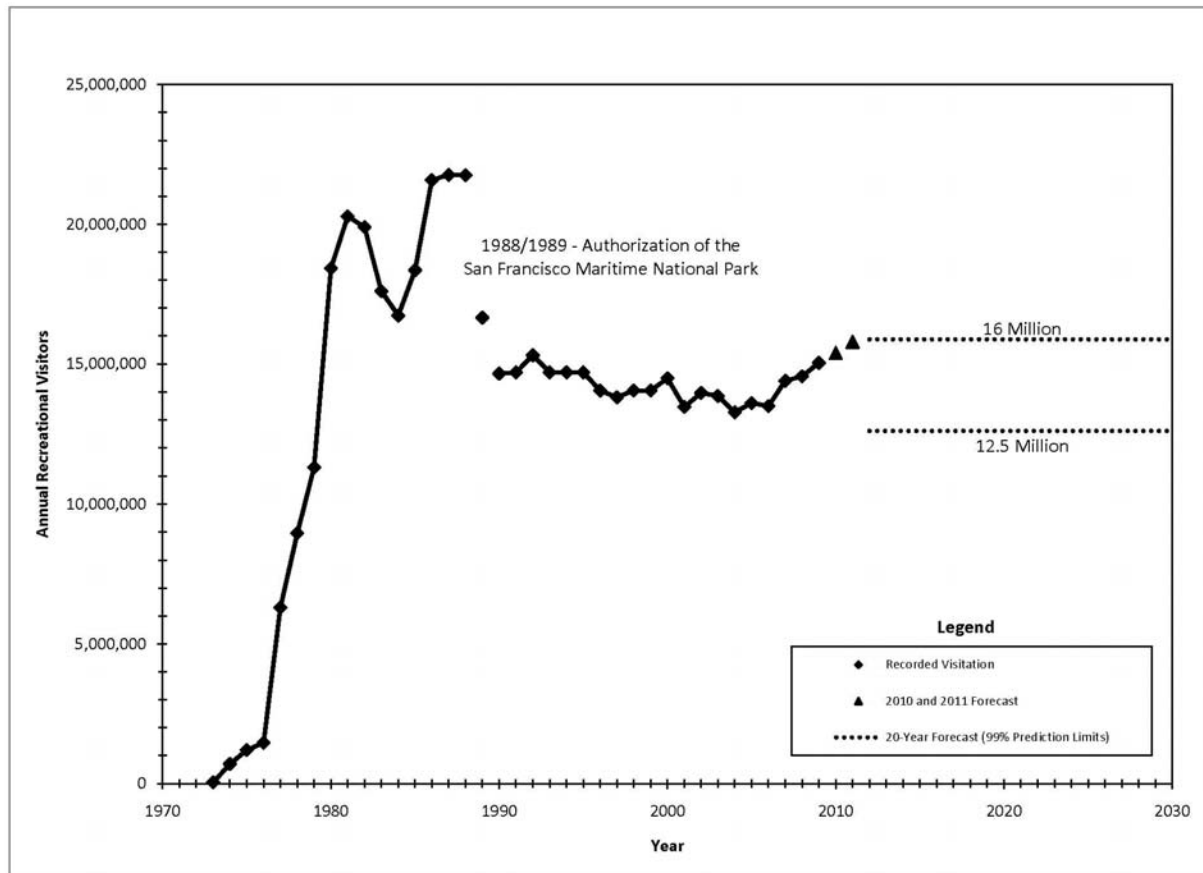
$n$  = number of years in data set ( $n = 20$  years),

$\rho_l$  = the autocorrelation between visitation  $l$  years apart, and

$t_{1-\alpha/2, n-1}$  = critical value of the two-sided  $t$ -statistic with  $\alpha = 0.01$  for a 99% prediction interval.

This formula accounts for correlation between annual visitations up to 5 years apart consistent with the NPS practice of conducting 2-year forecasts by linear regression of the past 5-years of visitation data. The results of the prediction interval calculation are presented in figure 6 that shows that annual visitation is expected to remain in the range of 12.5 to 16 million.

<sup>1</sup> From 1981 to 1994, “Public Use Counting and Recording Instructions” were mildly different than the methodologies used from 1997 to the present day. The older standard included less traffic counters (11 compared to 18), and used slightly different “Persons per Vehicle (PPV)” multipliers. The methodologies for the years 1995-1996 are unavailable online, but are assumed to resemble the current procedures that have been in place since 1997.



**FIGURE 6. FORECASTED ANNUAL VISITATION TO GOLDEN GATE NATIONAL RECREATION AREA**

### Forecasts of Future Park Visitation (Considering Population Trends)

Predicting future park visitation based on population forecasts is often problematic when looking at smaller-scales (i.e., state and county levels) (Gramann 2003). This is due to several reasons. For example, the state-level Census Bureau projections do not incorporate the influence of economic swings on population change, and the Census Bureau does not project population change at the county level—which is left to the individual states, and thus is not standardized. In addition, park facilities that are designed for repeat visitors would be affected differently by changes in the local population than those designed for one-time visitors or travelers. In result, it is suggested that describing visitor population characteristics and tracking how they are changing is critical to accurate long-term forecasting (Gramann 2003). Annual visitation data for GGNRA (NPS Stats) was compared to population growth trends of the San Francisco Bay Area<sup>2</sup> (Bay Area Census), and it was found that there is no apparent association (coincident, leading, or lagging) between Bay Area population and annual visitation to the park, most likely because park visitation is influenced by other factors than just resident population, such as amount of non-resident visitors, recreation use, etc. This suggests that the predicted 15.8%<sup>3</sup> increase in population estimated for

<sup>2</sup> The Bay Area consists of nine counties: Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano and Sonoma

<sup>3</sup> The 15.8% increase is the average increase of all the Bay Area counties; San Francisco County in particular is only expected to increase by 1% by 2030. Found here: <http://www.abag.ca.gov/planning/currentfcst/regional.html>

the San Francisco Bay area in 2030 would not result in an equal increase in park-use. However, although not directly correlated, the projected population increase may still result in some increased park usage.

### **Overall Forecasts of Future Park Visitation**

Given the overall visitation trends to GGNRA, it can be interpreted that the park has been operating at capacity since 1990, and would not experience a significant increase in visitation over the next 20 years. Assuming there are no major changes in park boundaries or facilities, park visitation would range between 12.5 million to 16 million people annually, similar to how it has been operating over the previous 20 years.

### **Visitor Use by Dog Owners**

Because the San Francisco Bay Area is highly urbanized, dog owners may have access to few outdoor areas for exercising their pets. In many parts of the Bay Area, GGNRA lands are the backyards of the citizens, and residents have come to expect public lands to be made available for dog walking and other recreational activities. Many of these visitors report that they enjoy visiting GGNRA sites with their dogs off leash. They cite the importance of adequate exercise opportunities for their dogs as well as the importance of social connections with other dog walkers as reasons for the necessity of off-leash recreation (NAU 2002a, 42). Many dog walkers are specifically looking for an off-leash beach experience for their dogs; because GGNRA manages a large portion of the San Francisco Bay and ocean shorelines, they come to this park (NPS 2010b).

Many visitors may use GGNRA for dog walking because of the leash laws in the surrounding counties. Leashes are required within San Francisco city limits, although many city parks allow off-leash dogs in designated areas. Maps 26 and 27 show the city, county, and state parks that currently have developed dog use areas. Additional information such as leash requirements on these dog use areas can be found in appendix J. As of March 2009 there were 25 recognized dog use areas that allowed off-leash dogs in San Francisco (SFRPD 2005, 1). These dog use areas make up 120 acres in 22 different parks. The largest dog use area is in McLaren Park, which has two separate play sites for a total of 60 acres (SFRPD 2005, 1). In Marin County parks and open space lands, dogs must be kept on leash in all areas except McInnis Park, Remington Dog Park in Sausalito, Bayfront Dog Park and Beach in Mill Valley, and on maintained and designated fire roads in Marin County Open Space (Marin County Open Space District Code 2.05.010). Off-leash areas in San Mateo county include Pulgas Ridge in Midpeninsula Regional Open Space District, Esplanade Beach in Pacifica, San Bruno Dog Park, Cipriani Dog Park in Belmont, Shoreview Park in San Mateo, and the Coast Side Dog Park in Half Moon Bay. The East Bay Regional Park District allows dogs in many areas except for swimming beaches and wetlands. See the “Indirect Impacts on Adjacent Parks” sections in chapter 4 for adjacent dog parks.

The history of the dog management policies at GGNRA is presented in chapter 1. On-the-ground conditions at park sites with dog walking visitors are important elements in describing current conditions, as they represent the actual uses that may affect park resources rather than the policies and regulations regarding dog walking if compliance occurs. It is also important to know whether posted restrictions or closures are being observed by the dog walking public, as these closures are usually made to protect resources or visitors. Table 9 displays the number of reports taken and warnings and citations issued related to dogs and visitors. These data are based on GGNRA LE and U.S. Park Police noncompliance data for 2007–2008 (NPS 2008c (appendix G)). As stated previously, the numbers of reports taken and warnings and citations issued to visitors not complying with dog walking regulations are not equal to the number of actual violations occurring at the park. The enforcement of violations is not uniform. This is partly due to the size of the park and the inability of LE staff to be in many different areas at once. It is also due to the court decision in *U.S. vs. Barley* (405 F. Supp.2d 1121 (N.D. Cal. 2005)), which required

the park to revert to the 1979 Pet Policy until notice and comment rulemaking could evaluate a change to this policy.

Detailed information on current use of the individual park sites is presented below and also shown in table 9 and on alternative A maps in the “Maps” section of this document. Visitor use and dog use at each site is characterized as low, moderate, or high (table 9). An area with high visitor use is defined as a park beach, trail, or other feature that is nearly always occupied and is often crowded; an area with moderate visitor use is defined as one that is usually occupied, but the area is only occasionally crowded; and an area with low visitor use is defined as one where visitors sometimes see other visitors, but the area is never crowded. Use by visitors walking dogs is considered high when it reaches >30 percent, moderate is 10–30 percent, and low is <10 percent. These qualitative thresholds were developed by the NPS with input by the Negotiated Rulemaking Advisory Committee. They were used by the Committee to provide feedback to the NPS on levels of use in park areas (NPS 2006g, 1–10).

**TABLE 9. SUMMARY OF VISITOR USE AND PET-RELATED CITATIONS, WARNINGS, AND REPORTS TAKEN AT GGNRA**

Site	Visitor Use	Percentage of Visitors Walking Dogs	Pet-related Violations <sup>a,b</sup>			
			Leash Law (2007/2008)	Dog Bite/ Attack (2007/2008)	Hazardous Conditions/ Pet Rescues (2007/2008) <sup>c</sup>	Pet Excrement (2007 only) <sup>d</sup>
Marin County Sites						
Stinson Beach	High on weekends, low to moderate on weekdays (swimmers on beach) <sup>e</sup>	Moderate to high (picnic area) <sup>c</sup>	5/0	17/0 <sup>f</sup>	1/0	8
Homestead Valley	Low—local use <sup>c</sup>	Low <sup>c</sup>	0/0	0/0	0/0	0/0
Alta, Orchard, Pacheco	Low to moderate (runners, bikers, hikers) <sup>c</sup>	High (commercial dog walkers) <sup>c</sup>	7/1	0/0	2/1	0
Oakwood Valley	High (hikers, runners, bikers; equestrian riders)—local use <sup>c</sup>	Moderate <sup>c</sup>	0/0	0/0	0/0	0
Muir Beach	High on weekends, moderate to high on weekdays (beachgoers, hikers)—local use <sup>e</sup>	Low to high <sup>e</sup>	1/2	0/0	1/1	0
Rodeo Beach	Moderate to high (beachgoers) <sup>e</sup>	Low to moderate <sup>e</sup>	0/0	1/0	0/0	1
Marin Headlands Trails (includes Tennessee Valley)	Low to high (hikers, runners, cyclists, beachgoers, equestrian riders, school group trips) <sup>e</sup>	Low to moderate <sup>e</sup>	40/7	0/2	3/0	0
Fort Baker	Moderate <sup>c</sup>	Low <sup>c</sup>	33/24	0/0	0/0	2



Site	Visitor Use	Percentage of Visitors Walking Dogs	Pet-related Violations <sup>a,b</sup>			
			Leash Law (2007/2008)	Dog Bite/ Attack (2007/2008)	Hazardous Conditions/ Pet Rescues (2007/2008) <sup>c</sup>	Pet Excrement (2007 only) <sup>d</sup>
San Francisco County Sites						
Upper and Lower Fort Mason	Low to moderate (walkers, bikers, runners)—local use <sup>e</sup>	Low to moderate (private and commercial dog walkers)—local use <sup>e</sup>	10/5	2/0	4/1	0
Crissy Field	Moderate to high (walkers, bikers, runners, school group trips) <sup>e</sup>	Moderate to high (private and commercial dog walkers) <sup>e</sup>	269/218	4/1	9/1	0
Crissy Field WPA	High (walkers, runners) <sup>c</sup>	Low to moderate <sup>c</sup>				
Fort Point	Moderate to high (runners, bikers, walkers, sightseers) <sup>e</sup>	Low to high <sup>e</sup>	23/15	0/0	1/0	0
Baker Beach	Low to high (beachgoers, picnickers) <sup>e</sup>	Low to moderate <sup>e</sup>	0/3	1/0	0/0	0
Fort Miley	Moderate to high (picnickers)—local use <sup>c</sup>	Low <sup>c</sup>	0/0	0/0	0/0	0
Lands End	Low to moderate (hikers, bikers) <sup>e</sup>	Low to moderate <sup>e</sup>	2/0	2/0	4/0	0
Sutro Heights Park	Moderate (walkers, garden- and wedding-goers) <sup>e</sup>	Low <sup>e</sup>	17/14	0/0	1/0	0
Ocean Beach	High (beachgoers, runners, birdwatchers, whale watchers, picnickers, equestrian riders, surfers, picnickers) <sup>e</sup>	Moderate to high <sup>e</sup>	572/273	5/6	2/4	4
Ocean Beach SPPA	Moderate (beachgoers, runners) <sup>e</sup>	Moderate <sup>c</sup>				
Fort Funston	High (equestrian riders, birdwatchers, whale watchers, environmental center participants, surfers, hang gliders) <sup>e</sup>	High (private and commercial dog walkers) <sup>e</sup>	3/5	5/7	20/15	0

Site	Visitor Use	Percentage of Visitors Walking Dogs	Pet-related Violations <sup>a,b</sup>			
			Leash Law (2007/2008)	Dog Bite/ Attack (2007/2008)	Hazardous Conditions/ Pet Rescues (2007/2008) <sup>c</sup>	Pet Excrement (2007 only) <sup>d</sup>
San Mateo County Sites						
Mori Point	High (walkers, runners, bikers)—local use <sup>e</sup>	Moderate <sup>e</sup>	14/40	0/0	1/0	0
Milagra Ridge	Moderate (bikers, walkers, hikers)—local use <sup>e</sup>	Low to moderate <sup>e</sup>	13/12	0/0	0/0	0
Sweeney Ridge/ Cattle Hill	Low (hikers, bikers) <sup>e</sup>	Low to moderate <sup>e</sup>	21/34	0/0	0/0	0
Pedro Point Headlands	Low to moderate (hiking, horseback riding) <sup>c</sup>	Low to moderate <sup>c</sup>	NA <sup>g</sup>	NA <sup>g</sup>	NA <sup>g</sup>	NA <sup>g</sup>

NOTE: NA = not applicable.

<sup>a</sup>Based on 2007 and 2008 GGNRA LE and U.S. Park Police data (NPS 2008c (appendix G)). Note: Data come from two independent law enforcement divisions in NPS, the U.S. Park Police and LE Rangers. Each division has their own tracking system for data and thus there are some differences in reporting and data coding. Violations include warnings and citations issued and reports taken.

<sup>b</sup>Enforcement of violations is not uniform due to confusion surrounding the decision in *U.S. vs. Barley* (405 F.Supp.2d 1121 (N.D. Cal. 2005)).

<sup>c</sup>Based on best professional judgement of park staff.

<sup>d</sup>Park officers do not often cite for not cleaning up pet excrement because violators are rarely caught in the act.

<sup>e</sup>Based on the GGNRA Dog Management Plan/EIS Current Conditions table developed by the Negotiated Rulemaking Advisory Committee dated September 15, 2006 (NPS 2006g).

<sup>f</sup>Lifeguards on duty at Stinson beach call in dog bites to Park Police.

<sup>g</sup>This site is not currently part of GGNRA; therefore, Park Rangers do not patrol this area.

## Marin County Sites

### Stinson Beach

On-leash dog walking is allowed in parking lots and picnic areas, but not on Stinson Beach, because it is a designated swimming beach (which is closed per the CFR and the GGRNA Compendium (NPS 2008b, 20)). The adjacent beach, owned by Marin County, allows off-leash dog walking. Visitor use at Stinson Beach is high on nice weekends especially during the summer and fall, and dog use in the picnic and parking lot areas is moderate to high (table 9). Compliance is poor on the beach, with over 300 warnings given to dog owners for having a dog in an area closed to dogs in 2007/2008 (appendix G). This site had the highest recorded number (17) of dog bites/attacks at GGNRA in 2007/2008 (table 9). However, these numbers are high compared to other sites because lifeguards are on fixed duty posts at this site and call in warnings and reports to park police, thereby supplementing LE staff warnings. Compliance is considered good in the parking lots and picnic areas, with only 5 leash violations recorded in 2007/2008 (table 9). The area closest to Stinson Beach where dogs are allowed off-leash is Mount Tamalpais state park, located east of Stinson Beach.

### **Homestead Valley**

On-leash dog walking or dog walking under voice control is currently allowed throughout the site. This site is primarily used by local Mill Valley residents; use by visitors other than those walking dogs is relatively low (table 9). A few commercial dog walkers have been seen using this site (NPS 2009b, 12). Other than Homestead Valley, the closest areas for nearby residents that allows dog walking under voice and sight control are Bayfront Park in Mill Valley and Camino Alto Open Space Preserve (fire roads in the latter location permit off-leash access).

### **Alta Trail, Orchard Fire Road, and Pacheco Fire Road**

The 1979 Pet Policy allowed on-leash dog walking or dog walking under voice control between Marin City and Oakwood Valley and did not specify which trails or fire roads were the intended routes. Dogs are allowed under voice control or on leash from Marin City to Oakwood Valley. The Alta Trail, on the ridge above Marin City, connects to the Oakwood Valley Trail and can be accessed either from the end of Donahue Street or from the Orchard or Pacheco fire roads. Local visitor use of the Alta Trail by hikers, runners, and bikers is low to moderate, as access and parking are readily available off Highway 101 at the end of Donahue Street (table 9). The Alta Trail sees very high use by commercial dog walkers, and park staff estimates that there are usually 5 to 12 dogs per commercial walker, resulting in 30 to 50 dogs at a time in the area during periods of heaviest use. Dogs walked by both commercial dog walkers and private individuals are generally not on a leash. There were 3 hazardous conditions violations and 8 leash law violations recorded in 2007 and 2008 (table 9). Park personnel have indicated dog/coyote conflicts occur in this area (NPS 2009b, 12). The high concentration of dog walkers may discourage some other users in this area. The closest park that allows off-leash dog use is Remington Dog Park in Sausalito.

### **Oakwood Valley**

The 1979 Pet Policy allowed on-leash dog walking or dog walking under voice control on Oakwood Valley Fire Road and on the Oakwood Valley Trail from the junction with Oakwood Valley Fire Road to the junction with the Alta Avenue. On-leash dog walking is permitted on the Oakwood Valley Trail from the trailhead to the junction with Oakwood Valley Fire Road. Visitor use in this area by hikers, runners, and bikers is considered high (table 9). Park staff has observed that some local dog walkers allow their dogs to be under voice control as soon as they exit their vehicles along Tennessee Valley Road, in the large, open, grassy meadow at the start of the Oakwood Valley Trail, and along the trail itself, as well as on an open, grassy hillside east of the Oakwood Valley Trail. Oakwood Valley receives use by local residents, with the majority of use in the morning. The majority of users are private individuals, rather than commercial dog walkers. Park personnel have indicated dog/coyote conflicts occur in this area (NPS 2009b, 12). The closest area outside the Oakwood Valley site for local residents to walk dogs off leash is Remington Dog Park in Sausalito.

### **Muir Beach**

On-leash dog walking or dog walking under voice control is currently allowed on Muir Beach per the 1979 Pet Policy, including the path to the beach. Park staff have observed that some dogs owned by residents at Muir Beach are not kept in yards or homes, but instead roam off leash along the beach or in the lagoon, creek, or upland areas. Muir Beach has a post-and-cable fence along the beach side of lower Redwood Creek and lagoon that is intended to discourage visitors from accessing the water; however, the fencing does not physically exclude dogs or visitors from the area (NPS 2010b, 34-35). Warnings and citations have been issued to dog owners for dogs in areas closed to pets (appendix G). Few commercial dog walkers use Muir Beach. The area is heavily used by visitors (beachgoers and hikers) on nice days or weekends (table 9). Violations involving dogs in 2007/2008 included 3 violations for leash laws and 2

violations for hazardous conditions/pet rescues (table 9). The closest area outside park boundaries for visitors to walk their dogs off leash is Mt. Tamalpais State Park.

### **Rodeo Beach/ South Rodeo Beach**

Currently, dog walking on leash or under voice control is allowed on Rodeo Beach but prohibited in Rodeo Lagoon for overall natural resource protection including the federally endangered tidewater goby, California brown pelican, sensitive waterbird and shorebird habitat, and water quality. On-leash dog walking is permitted on the bridge connecting to the beach. Dogs are frequently seen in Rodeo Lagoon (NPS 2009b, 12). One citation was issued for a dog in a closed area and four for dogs disturbing wildlife in 2007/2008 (appendix G). Because people and dogs regularly walk along the western edge of the lagoon, the NPS is planning to construct a post-and-cable fence along the beach side of Rodeo Lagoon to discourage visitors from accessing the lagoon, though it would not physically exclude dogs or visitors from this area (NPS 2010b, 33). Hundreds of schoolchildren use the beach on weekdays as part of the education programs associated with the Headlands Institute and YMCA. Even though there is a low to moderate level of use by visitors with dogs at this site, the length of Rodeo Beach disperses the concentration of dog walkers, helping them avoid other users; therefore, incidents among visitors and dogs are relatively rare: only one dog bite/attack in 2007/2008 (table 9). The closest off-site area for visitors to walk their dogs off leash is Remington Dog Park in Sausalito.

### **Marin Headlands Trails**

The 1979 Pet Policy designated several sections of Marin Headlands trails (a loop consisting of sections of the Coastal Trail, the Wolf Ridge and Miwok Loop, the Old Bunker Fire Road Loop, and the Coastal Trail from the Golden Gate Bridge to Hill 88, including the Lagoon Trail) as available for on-leash dog walking or dog walking under voice control. Dog walking under voice control is permitted on the Coastal Trail from Hill 88 to Muir Beach, the Battery Smith–Guthrie Fire Road Loop, the South Rodeo Beach Trail, the North Miwok Trail, and Country View Road. Dog walking use is low to moderate on these trails (table 9). Park staff estimate that the Coastal Trail is used by about 10 dog walking visitors per week, and use of the Miwok section varies from 1 dog walking visitor per day on weekdays to 25 per day on the weekend. In 2007 and 2008, 47 leash law, 2 dog bite/attacks, and 3 hazardous conditions/pet rescue violations were recorded at the Marin Headlands. Additionally, 137 incidents were recorded for dogs in a closed area (Tennessee Valley) (appendix G). The closest area for dog walking off leash outside park boundaries is Remington Dog Park in Sausalito.

### **Fort Baker**

Currently, on-leash dog walking is allowed in the Fort Baker area except for the pier and the Chapel Trail. Visitor use at Fort Baker is considered moderate (table 9). Monitoring by LE is extensive at Fort Baker, yet park staff estimate that about half the visitors with dogs are in violation of regulations. In 2007 and 2008, 57 leash law warnings or citations were issued to dog walkers (table 9). Dogs have been observed off leash by park staff on the parade ground, Drown Fire Road, the Battery Yates area, and behind the Bay Area Discovery Museum. Few commercial dog walkers currently use Fort Baker. The closest area to Fort Baker outside park boundaries for off-leash dog walking is Sausalito's Remington Dog Park.

### **San Francisco County Sites**

#### **Upper and Lower Fort Mason**

Currently, on-leash dog walking is required at Fort Mason, but park staff members have observed that many dog walkers allow their pets off leash. Fort Mason is the park's headquarters. This park site

receives low to moderate visitor use by walkers, bikers, runners, and dog walkers (table 9). In addition, many commercial dog walkers walk to the area from the local neighborhoods. In 2007 and 2008, violations included 15 for the leash law and 2 for dog bites/attacks (table 9). The paved, multi-use trail along the waterfront that connects San Francisco Maritime National Historical Park to Marina Green through Fort Mason attracts visitors and cyclists recreating along the waterfront, as well as bicycle commuters. The Great Lawn at Fort Mason is also used for large special events, such as the San Francisco Blues Festival, during which dog walking is restricted to the perimeter of the area. Dog/human rescues have occasionally been required on the cliffs on the northern edge of Fort Mason—5 hazardous conditions/pet rescue violations were recorded in 2007/2008 (table 9). There are two off-leash dog walking areas, Alta Plaza Park and Lafayette Park, located off park property south of Fort Mason.

### **Crissy Field**

On-leash dog walking or dog walking under voice control is allowed on the Promenade from East Beach to the Warming Hut, on Crissy Airfield, on the East and Central Beaches, on the multi-use trail along Mason Street, and on the trails and grassy areas near East Beach. Dog walking under voice control is permitted in the Crissy Field WPA from May 15 to July 1; for the remainder of the year a seasonal leash restriction is in effect in the WPA to protect the federally threatened western snowy plover. The NPS recently installed new fencing, gates, and signage at the eastern boundary of the WPA to better demarcate where dog walking restrictions start. Gates and signage were also installed at trail entry points to the WPA. Crissy Field is busy as early as 4 a.m. and receives moderate to high visitor use throughout the day. Visitors include individual and commercial dog walkers, cyclists, pedestrians, rollerbladers, runners, wind surfers, and kite boarders (table 9). Within the WPA, visitor use is high; however use is low to moderate for visitors who walk dogs. Park staff estimates that there are generally 5 to 10 commercial dog walkers per day (fewer on weekends than weekdays), and typically 3 present with between 4 and 6 dogs each at any given time of the day. These dogs are often off-leash, as are many of the dogs walked by dog owners. Compliance with seasonal leash restriction in the WPA is limited; varied iterations of regulatory signs have only been partially effective. In 2007 and 2008, 487 leash law violations (table 9) and 17 incidents related to dogs in closed areas and 3 incidents of dogs disturbing wildlife were recorded (appendix G).

Particularly on nice days, the moderate to high visitor use and variety of visitor uses have resulted in visitor incidents related to dogs, including intimidation, dogs knocking over people, dog-on-dog fights, and dogs biting people. In 2007 and 2008, violations for 5 dog bites/attacks and 10 hazardous conditions/pet rescues were recorded (table 9). Maintenance is also demanding, with dog waste, urination on trash cans, vandalism of signs, etc. occurring regularly at this park site. The closest off-leash dog walking area outside park boundaries is Mountain Lake Park.

### **Fort Point**

Currently, on-leash dog walking is allowed on the Fort Point Promenade, the Bay Trail, Andrews Road, and the Battery East Trail. The Fort Point area, particularly the promenade, can receive moderate to high visitor use by runners, bikers, and walkers. In 2007 and 2008, 38 leash law violations and one hazardous conditions/pet rescue were recorded at this site (table 9). Visitor incidents with dogs occur on the promenade along the entrance road because joggers, cyclists, and walkers share this space with dog walking visitors. The closest off-leash dog walking area outside park boundaries is Mountain Lake Park.

### **Baker Beach**

On-leash dog walking or dog walking under voice control is allowed on Baker Beach north of Lobos Creek. On-leash dog walking is allowed on all trails except the Batteries to Bluffs Trail. Baker Beach receives low to moderate visitor use by dog walkers and low to high visitor use by beachgoers and

picnickers on weekends and holidays (table 9). Incidents between visitors and dogs sometimes occur; in 2007/2008 1 violation was recorded for a dog bite/attack and 3 leash law violations were recorded (table 9). The closest off-leash dog walking area outside park boundaries is Mountain Lake Park.

### **Fort Miley**

On-leash dog walking or dog walking under voice control is permitted at both East and West Fort Miley. This area has low use by dog walkers, but moderate to high use by picnickers (table 9). This site is mostly used by local residents, and no pet-related violations were documented in 2007/2008 (table 9). The closest off-leash dog walking areas outside park boundaries are Golden Gate Park—North Central Area and Golden Gate Park—South Central Area

### **Lands End**

Currently, both on-leash dog walking and dog walking under voice control are allowed at the Lands End site. Since the recent area restorations and upgrades to the Lands End section of the Coastal Trail, visitor use has increased significantly. This site is considered to have low to moderate visitor use by hikers, pedestrians, bikers, and dog walkers (table 9). Because of safety concerns (steep cliffs, poison-oak, ticks, etc.), dog walkers tend to keep their pets on leash, although off-leash dogs have been observed by park staff as well. In 2007 and 2008, a total of 2 leash law, 2 dog bite/attack, and 4 hazardous conditions/pet rescue violations were recorded (table 9). The closest off-leash dog walking areas outside park boundaries are Golden Gate Park—North Central Area and Golden Gate Park—South Central Area.



**Lands End**  
Credit: NPS

### **Sutro Heights Park**

On-leash dog walking is required throughout Sutro Heights Park. Sutro Heights Park has moderate visitor use, mainly by visitors walking through the garden and attending special events such as weddings. In 2007 and 2008, park staff recorded 31 leash law violations and 1 hazardous conditions/pet rescue violation (table 9). The closest off-leash dog walking areas outside park boundaries are Golden Gate Park—North Central Area and Golden Gate Park—South Central Area.

### **Ocean Beach**

Currently, on-leash dog walking is allowed year-round between Stairwell 21 and Sloat Boulevard; dog walking under voice control is permitted year-round north of Stairwell 21 and south of Sloat Boulevard. In the Ocean Beach SPPA, from Stairwell 21 south to Sloat Boulevard, dog walking under voice control is allowed from May 15 to July 1; the rest of the year, on-leash dog walking is required for the seasonal protection of western snowy plovers. Ocean Beach is a high use area for joggers, picnickers, surfers, and other beachgoers (including windsurfers and kite boarders) and a moderate use area for dog walking



(table 9). The SPPA is a moderately used area for dog walkers, beachgoers, and runners. In 2007 and 2008, 845 leash law warnings or citations were issued to dog walkers, as well as citations for 11 dog bites/attacks, 6 hazardous conditions/pet rescues, and 4 pet excrement violations (table 9). In addition, 2 incidents of dogs in a closed area and 32 incidents of dogs disturbing wildlife occurred (appendix G) at the Ocean Beach SPPA. The closest off-leash dog walking areas outside park boundaries are Golden Gate Park—North Central Area and Golden Gate Park—South Central Area.

### **Fort Funston**

On-leash dog walking or dog walking under voice control is allowed throughout Fort Funston and on the Fort Funston beach, except for three areas: the 12-acre habitat protection area to protect native plant communities, a voluntary seasonal closure to protect bank swallow habitat, and the north end of the Coastal Trail due to erosion. Fort Funston is heavily used by multiple user groups including equestrians, birdwatchers, whale watchers, education groups, surfers and hang gliders as well as dog walkers, including commercial dog walkers (table 9). Park staff has observed commercial dog walkers regularly walking 10 to 12 dogs per visit and generally allowing them to be off leash; park staff has also observed private dog walkers allowing their dogs off leash. The high concentration of dog walkers may discourage other users, although some users state that they come to Fort Funston to interact with dogs. Due to the high volume of dogs that visit this site, urination and the associated smell is obvious in areas adjacent to the parking lots. In 2007 and 2008, 12 dog bite/attack violations were recorded (table 9). Horse and dog incidents have also been reported by park users along the beach and on trails at Fort Funston. The area has had a high rate of dog/human rescues—35 hazardous conditions/pet rescue violations were recorded in 2007/2008 (table 9). The closest park where off-leash dog walking is available is Lake Merced.

### **San Mateo County Sites**

#### **Mori Point**

On-leash dog walking is permitted in designated areas as indicated by signage. The site has high use by visitors and is used primarily by locals for walking, running, and biking. It is also a moderate use area for dog walking (table 9). In 2007 and 2008, park staff recorded 54 leash law violations and 1 hazardous conditions/pet rescue violation (table 9). The closest off-leash dog walking areas outside park property are Esplanade Beach in Pacifica and the San Bruno Dog Park.

#### **Milagra Ridge**

On-leash dog walking is currently allowed along the trails at Milagra Ridge. The site has moderate visitor use, with mostly local visitation by walkers and hikers and low to moderate use by dog walkers (table 9). In 2007 and 2008, 25 leash law violations were recorded (table 9). The closest off-leash dog walking areas outside park property are Esplanade Beach in Pacifica and the San Bruno Dog Park.

#### **Sweeney Ridge/Cattle Hill**

On-leash dog walking is allowed on all trails at Sweeney Ridge except the Notch Trail, which is closed to dog walking to protect mission blue butterfly habitat. Sweeney Ridge has low visitor use, consisting mostly of bikers and hikers, and low to moderate use by dog walkers (table 9). In 2007 and 2008, 55 leash law violations were recorded at this site (table 9). Cattle Hill is not currently part of GGNRA. However, Cattle Hill is within the boundary and it is anticipated that the land will transfer to NPS management in the near future. Cattle Hill is currently used for unrestricted dog walking. The closest off-leash dog walking areas outside park property are Esplanade Beach in Pacifica and the San Bruno Dog Park.

## **Pedro Point Headlands**

This area is not currently part of GGNRA. However, this land is within the boundary and it is anticipated that the land will pass to NPS management in the near future. Currently, dog walking both on and off leash occurs at this site in low to moderate numbers (table 9). Hiking and horseback riding is also considered a low to moderate use at this site. The closest off-leash dog walking areas outside park property are Montara State Beach and Esplanade Beach in Pacifica.

## **VISITOR EXPERIENCE**

In a random telephone survey conducted by Northern Arizona University in the four-county area surrounding GGNRA (Marin, San Francisco, San Mateo, and Alameda counties) respondents were asked a series of questions regarding their use of GGNRA. Of the 29 percent of respondents who either owned or cared for a dog about half (14 percent) had walked their dog(s) at GGNRA. Of the 14 percent of respondents who walked dogs at GGNRA, approximately 75 percent lived in San Francisco County and 69 percent lived in Marin County. The percentage in San Mateo and Alameda counties was lower: 44 percent and 29 percent, respectively (NAU 2002b, 43). Among those visitors, one in five visited a GGNRA site daily or weekly. Residents in the four-county area who had visited a GGNRA site more than five times within the past year were the most likely to make use of GGNRA sites for dog walking. Nearly 18 percent of the dog-owning population had also asked that someone else take their dog for a walk in a GGNRA site (NAU 2002b, 17).

Approximately 22 percent of all respondents who had visited a GGNRA site and had seen an off-leash dog reported that off-leash dogs detracted from their visitation experience. Twenty-seven percent said that seeing an off-leash dog added to their visitation experience and 49 percent stated that off-leash dogs did not affect their experience (NAU 2002b, 17). About 74 percent of those surveyed who were supportive of off-leash dog walking said they would prefer dogs off leash only in limited park areas (NAU 2002b, 27). When asked if they supported or opposed allowing off-leash dog walking on trails used by hikers, cyclists, or horses, about 56 percent of respondents who were not strongly opposed to off-leash dog walking either “somewhat opposed” or “strongly opposed” the notion, while about 40 percent either “somewhat supported” or “strongly supported” the idea (NAU 2002b, 49).

GGNRA has conducted or sponsored several visitor surveys to determine what activities people participate in on park lands and how satisfied they are with their experience. A small survey (31 respondents) at Mori Point and Sweeney Ridge determined that dog walking was the second most popular reason for visiting the area; 21 percent of respondents walk their dogs in the area. Additionally, 35 percent of respondents ranked dog walking as a “very important” or “extremely important” activity at the site (NPS 1980).

A 2003 visitor experience and resource protection study at Muir Beach and Muir Woods found that 21 percent of visitors walked their dogs at Muir Beach. When asked what they enjoyed least about the site, 22 percent cited the wind and foggy weather. About 9 percent cited dog conflicts as the least enjoyable aspect of the site (NPS 2003e, 14).

In response to the GGNRA Advance Notice of Proposed Rulemaking (ANPR) published in the Federal Register, many park users and nonusers submitted comments regarding their preferences for either the NPS leash regulation or allowing some off-leash dog walking in GGNRA. Thirteen percent of all respondents to the ANPR (49 percent of those who preferred the NPS leash regulation) cited feelings of discomfort around and/or fear of off-leash dogs and/or believed that dogs could endanger their children. Certain user groups may be intimidated by dogs based on past experience or lack of experience with dogs. A similar percentage of comments stated that dogs make the park unsafe for park users. The following is

an illustrative quote related to the issue: “Unleashed dogs present safety hazards to the GGNRA’s wide variety of recreational users. Dogs can bite other dogs and people; trip pedestrians, skaters, and cyclists; and jump on and knock down people” (NAU 2002a, 10).

The majority of comments to the ANPR (71 percent) supported some form of off-leash dog walking in GGNRA. This percentage rose to 98 percent among dog owners. Respondents supporting off-leash dog recreation in the park cited the exercise and sociability benefits for off-leash dogs and their owners, the responsibility of dog owners, and the unique park status of GGNRA as a recreational area as reasons for their position (NAU 2002a, 16–17).

In many cases, it appears that how a visitor reacts to off-leash dogs is influenced by whether the visitor owns a dog. For instance, when telephone survey respondents were asked how off-leash dogs affected their visitor experience at GGNRA, 37 percent of dog owners responded that it “added to” it, while 23 percent of visitors that did not own dogs responded similarly. Conversely, only 9 percent of dog owners responded that the presence of off-leash dogs “detracted from” their experience, while 28 percent of visitors that did not own dogs answered similarly. Approximately half of all respondents (54 percent of those who owned dogs and 47 percent of those who did not) stated that the presence of off-leash dogs did not affect their experience (NAU 2002b, 18).

It is not uncommon for users to take more than one dog to the park. Some of these visitors may be dog owners with more than one dog, but many of these users are commercial dog walkers. Commercial dog walkers visit the park with multiple dogs per trip. Fort Funston, Fort Mason, Crissy Field, and the Alta Trail in the Marin Headlands are very popular destinations for commercial dog walkers. Some respondents to the ANPR (less than 1 percent of total comments) expressed concern related to the use of public lands for commercial purposes such as dog walking. The following is an illustrative quote related to the issue: “Make commercial dog walkers park concessionaires. Require them to pay for the privilege of doing business on park lands” (NAU 2002a). In contrast, an equal percentage of respondents believed that commercial dog walkers provide a public service.

Fifty-eight percent of the 2002 telephone survey respondents believed that the numbers of dogs walked by any one person should be limited. Of those that stated that there should be limits, 13 percent stated that one dog should be the limit, 40 percent stated that two dogs should be the maximum, and 28 percent stated that no more than three dogs should be allowed. About 15 percent believed that limits should be four or more dogs per person (NAU 2002b, 29–30).

Many people responding to the ANPR reported that they enjoyed visiting GGNRA sites with their dogs off leash. They cited the importance of adequate exercise opportunities for their dogs as well as the importance of social connections with other dog walkers as reasons for the necessity of off-leash recreation (NAU 2002a, 16–18). For example, “Just like healthy human beings, dogs need exercise that they cannot adequately get walking on a leash” (NAU 2002a, 16). Most of the organized groups that support off-leash dog recreation at GGNRA sites advocate responsible dog ownership, which includes picking up dog waste, discouraging dogs from digging holes or chasing/harassing wildlife, and leashing aggressive dogs.

### **Incidents between Visitors and Dogs**

Walkers, hikers, joggers, bikers, horseback riders, wildlife watchers, and those seeking a quiet and natural experience could all potentially be disturbed by running, barking dogs—particularly by those that chase or harass people or wildlife. Twenty-two percent of respondents to the 2002 telephone survey who had visited GGNRA sites and had seen an off-leash dog reported that off-leash dogs detracted from their visitation experience (NAU 2002b, 17). In addition, other user groups continue to experience incidents

with dogs and dog walkers (see table 9). Incidents between off-leash dogs and other visitors can be particularly intense along the beach areas of the park, as these areas attract large numbers of visitors both with and without dogs, particularly on weekends, holidays, and during the summer or on warm days.

## **AESTHETICS**

Dogs can also indirectly affect visitors because of dog waste, plastic bags containing waste, or large amounts of dog hair from grooming left on beaches, on trails, or near the park's aquatic resources. Although posted signs indicate that owners are responsible for removing their pet's waste, this rule is not always followed. Two percent of the ANPR comments noted that off-leash dogs spoil park sites by defecating and urinating and that dog owners sometimes fail to clean up after their dogs (NAU 2002a, 12). Park sites, such as the head of the Alta Trail, Fort Funston, and the areas around the trash receptacles at Crissy Field, that have a high concentration of dog use are prone to a distinct smell of dog urine and solid waste.

## **SOUNDSCAPES**

The natural sounds heard in GGNRA are a positive and valued park resource, as well as an important component of the visitor experience, which dog presence or barking may interrupt. Natural soundscapes are protected under Director's Order #47 (NPS 2000a) because they are vital to the natural function of ecosystems, cultural/historic values, and visitor experience. Soundscapes in the park provide a variety of seasonally changing visitor experiences that are important to some park users as a refuge from the noise of the urban environment. An example is the spring birdsong, which is most prevalent in more remote areas and along riparian and forested habitats. Subtler experiences—lapping waves and frog choruses—may also enrich the visitor experience. Potential disturbances from barking dogs may change the natural character of the area and the overall visitor experience. The raucous sounds of a disturbed wildlife community—birds and small mammals giving alarm calls—also add to the disruption of the visitor's experience of the soundscape. The natural soundscape is also important aside from visitor experience, as wildlife may depend on it for successful communication with others of its species, escape from predators or other dangers, protection of young, or other functions.

## **ENVIRONMENTAL JUSTICE**

Some ethnic or low-income populations may be more negatively affected by off-leash dog walking. The phone survey conducted in 2002 by Northern Arizona University (2002b, 26) separated data by race and income, as well as other variables, and found slightly lower support from low-income families for allowing off-leash dog walking in GGNRA. The survey indicated that 13.3 percent of respondents with annual incomes lower than \$50,000 strongly supported off-leash dog walking, whereas 21.7 percent of those with incomes from \$50,000 to \$100,000 and 20.4 percent of those with incomes over \$100,000 strongly supported it. Regarding park use by minorities, the elderly, children, and people with special needs, 11 percent of ANPR respondents noted that off-leash dogs discourage park use by these groups. As one respondent said, "They [off-leash dogs] take over the beach from people by intimidating small children" (NAU 2002b, 11). In contrast, 3 percent believed that the presence of off-leash dogs enhanced the experience of these populations. For example, one respondent said, "I have seen many people in wheelchairs walking their dogs. All kinds of people have dogs—with this common bond—we all come together" (NAU 2002a, 20).

In a study conducted by San Francisco State University in 2007 on ethnic minority visitor use experience at GGNRA, research found that dogs were a problem mentioned by all Latino and Asian-American groups (Roberts 2007, iii). San Francisco County is a racially diverse area, with minority populations accounting for approximately 53 percent of the population. The largest minority group in the San

Francisco area is people of Asian descent (31.3 percent), followed by Hispanic/Latino people (14.1 percent) (U.S. Census Bureau 2000, 1). Off-leash dogs frighten many people; overall, Latinos expressed the most concern with dog owners' lack of concern or control over their dogs. For example, dog owners assume that other people will like the owners' dogs as much as they do; dog owners let their dogs approach other people without first asking their permission; and owners do not react to their dogs begging for other people's food. "Every time we go to picnic the dogs come and eat our food, they wander around, and the owners don't do anything. The same with their bowel movements! The owners don't clean after them" (Roberts 2007, 34). Research found that Latinos and Asian-Americans mentioned dogs, especially dog waste, as a barrier to park visitation and a constraint to enjoyment of the park (Roberts 2007, 28).

## **PARK OPERATIONS**

Park operations include the time and money resources that the GGNRA staff uses in managing dog walking activities in the park. It includes law enforcement, administration and planning, natural resource management, and maintenance. In addition, community relations and public education are integral components of dog management at GGNRA.

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*Park operations include the time and money resources that the GGNRA staff uses in managing dog walking activities in the park.*

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## **BUDGET AND EMPLOYEES**

In fiscal year (FY) 2008, the park had an operating budget of approximately \$24.6 million, consisting of \$23.8 million in base ONPS (operation of national park system) funding. Currently, GGNRA staffing consists of 346 employees (250 permanent, 52 term, and 44 temporary employees). Similarly, in FY 2007 the park had an operating budget of approximately \$24 million, consisting of \$23.2 million in base ONPS funding. In that same year, the park also received approximately \$24 million in nonoperational funding from a variety of sources, including recreational fees, leasing and concession revenues, line item construction, and NPS Service-wide special project funding.

## **COMMUNITY RELATIONS AND PUBLIC EDUCATION**

GGNRA is an acknowledged leader in enlisting organizations for partnerships that leverage the park's ability to preserve resources, educate the public, and provide recreational opportunities for visitors. Many of these partners occupy and maintain park buildings through leases, cooperative agreements, and other legal authorities. Over recent years, the park has worked to improve community relations with regard to dog walking through response to public calls and inquiries, updates of dog walking information on the park web site and information line, outreach efforts by volunteer groups and park stewardship programs, and meetings with dog walking and other user groups. Representatives of dog walking groups were also members of the Negotiated Rulemaking Advisory Committee. The majority of funding for visitor education about dog regulations in recent years has come from the Public Affairs Budget (\$441,000 in FY2007).

## **LAW ENFORCEMENT**

The mission of GGNRA's LE personnel is to protect people, property, and park resources and to ensure that park visitors can enjoy the park without unlawful interference. This mission is achieved through interpretative and educational efforts, community outreach, and enforcement actions appropriate to establishing an effective level of compliance with applicable laws and regulations.

Law enforcement and search and rescue requirements are extensive due to the park's proximity to a large urban area, high visitation, essentially open access, wide range of resources, and wide variety of recreational opportunities. Law enforcement programs at GGNRA operate from three primary locations: Ranger Stations at Building 223 in the Presidio and Building 507 at Fort Baker, and U.S. Park Police San Francisco Field Office Headquarters at Building 1217 at the Presidio. Patrol operations cover all GGNRA lands, with U.S. Park Police operations including San Francisco, southern Marin, and San Mateo counties.

Law enforcement activities pertaining to dog management include resolving conflicts between dog walkers and other user groups, giving written or verbal warnings or issuing citations to dog walkers not complying with the current regulations, educating the public on dog management regulations, preparing and filing reports related to dog and visitor incidents, performing supervisory review of reports, and appearing in court on dog management-related cases. During the start of seasonal leash regulations in Ocean Beach SPPA and Crissy Field WPA, park LE is present at these sites to educate dog walkers on current leash policies.

Violations are handled using a reasonable enforcement response. Responses can range from a verbal or written warning, relying on education and deterrence to gain compliance, to written citations, up to custodial arrests, as appropriate. Visitor incidents dogs and dog walkers are involved are handled by park LE in the same manner as all other violation contacts. Due to the extensive history and changing pet enforcement strategies at GGNRA, LE officers are sensitive to the potential for confusion on the part of the general public and therefore make an effort to achieve compliance through educational contacts. Where conflicts are more pronounced, officers have the discretion to use the range of enforcement actions necessary to achieve visitor safety and compliance.

Rangers and U.S. Park Police will contact dog walkers for the following violations: violations of pet regulations, including the NPS leash law where currently applicable; habitat protection closure violations; harassment of wildlife; and incidents involving visitors and dogs or dog owners. Leash violation citations are assigned a collateral fine of \$50 plus a \$25 processing fee in accordance with the U.S. Magistrate's uniform bail schedule. Other violations range up to \$500 or mandatory court appearances. Search and rescue teams also perform technical cliff rescues for visitors and dogs when needed; almost all these rescues have been conducted at Fort Funston. Park staff members routinely observe dog owners leashing their pets when LE personnel are noticed in areas of the park where the NPS leash regulation is applicable, which could imply the public has been educated regarding the regulations, but some choose to disregard it unless LE is present.

Approximately 1 percent of LE time is devoted to dog management-related issues (Wasserman, personal communication). Crissy Field and Ocean Beach have historically required the most attention from LE. Dog management activities for LE staff include court time for the approximately 10 percent of violators who challenge their tickets. LE spends approximately 5 minutes for each verbal warning and 10 minutes for each written warning given to visitors (Wasserman, personal communication). Table 9 displays the number of recent case reports and incidents related to dogs and visitors. The pet-related case reports (leash law violations, dog bites, and other pet-related reports) and case reports related to areas closed to pets presented in table 9 are based on 2007–2008 LE data (NPS 2008c (appendix G)) and the best judgment of park staff. The case reports result from park visitor complaints and do not reflect visitor contacts with dogs that do not result in a written report. Pet citations related to wildlife disturbance and citations given in wildlife protection areas are also based on 2007–2008 data (NPS 2008c (appendix G)).



## **ADMINISTRATION AND PLANNING**

The administrative staff is responsible for management activities that educate visitors on the current dog walking policies. The park posts or updates signs and maps with current dog walking regulations and maintains a list of all restricted areas (NPS 2008b, 19–20), as well as a complete list of areas available for dog walking both on and off leash and those closed to dogs, on its web site. The park also maintains a Dog Management Information Line with the current status of the dog management process, where the public can leave messages for park staff. The line is monitored and calls are responded to daily. The park produced business-style information cards to educate the public on the ANPR and the negotiated rulemaking processes. These cards are available at park visitor centers and are handed out by park staff; LE and U.S. Park Police personnel hand them out with each pet violation contact and citation issued.

In the wake of the 2005 court decision that again altered dog management policies at certain park sites, LE staff members are educating and warning dog walkers who are in violation of regulations, rather than ticketing them, if they believe the violation is a result of confusion over current policies. The park has encouraged dog walking groups that participated in the Negotiated Rulemaking Advisory Committee to distribute the most current GGNRA dog walking information and regulations through their web sites and information outlets and reminded them that this would be their responsibility once a new regulation was in place. Also, the Snowy Plover Docent Program was established in 2007/2008 to help educate the public about the western snowy plover and the protection areas for the plover established by the park at Ocean Beach and Crissy Field.

## **NATURAL RESOURCE MANAGEMENT**

GGNRA supports numerous programs that enhance and/or restore natural resources in different areas of the park and under different contexts. These park stewardship programs encompass such park-sponsored and volunteer programs as the Site Stewardship Program, the Presidio Park Stewards, the Habitat Restoration Team, the Invasive Plant Patrol, the Trails Forever Program, Golden Gate National Parks Conservancy, the Headlands Institute, and the Presidio Trust.

Natural resource specialists manage and monitor ecosystems and the physical environment in order to preserve and restore healthy systems and populations. Management includes invasive species control, habitat restoration, and threatened, endangered, and candidate species protection. Planning efforts by natural resource staff related to dog management include protecting habitat from dogs, handling complaints concerning dogs, and assisting in preparation of signage and outreach material related to dog use impacts and restrictions. Hydrologists are involved with review of erosion issues associated with dogs. Ecologists at the park, specifically the Crissy Field ecologists, are responsible for restoration areas and fencing in high dog use areas, water quality monitoring, and tracking complaints about dogs. GIS specialists fulfill mapping needs associated with dog management planning for brochures, the park web site, etc. In 2006, total personnel cost for the natural resources staff was \$1,344,392 and total natural resources volunteer time was 142,890 hours. Approximately 5 percent of the natural resources budget was spent on dog management–related activities in 2006 (NPS 2007d, 1).

## **CULTURAL RESOURCE MANAGEMENT**

Cultural resource specialists monitor projects and perform research to ensure the stabilization, preservation, and restoration of historic structures and landscapes and archeological resources.

## MAINTENANCE

Maintenance of the extensive park lands and widespread facilities in Marin, San Francisco, and San Mateo counties is a major, ongoing task and cost for park operations, and is one of the largest budgets in the park. Structures, historic and nonhistoric, need basic maintenance and repair or rehabilitation; utilities and infrastructure must be maintained; and trails, roadways, and parking lots need rehabilitation and repair. Landscaping and irrigating, pruning trees, repairing and installing fences and gates, cleaning restrooms, and collecting trash are some of the basic activities in the scope of work needed to maintain park facilities and resources at an acceptable level. Maintenance Division facilities are located at Stinson Beach, Fort Cronkhite, and Fort Baker in Marin County, and at Crissy Field, Fort Mason, and Fort Miley in San Francisco County.

Maintenance operations related to dog management include garbage collection, repair of vandalized signs and property, and replacement of garbage receptacles that have been damaged by dog urine. Signs that list dog-related regulations and educational information are frequently vandalized and must be replaced by the maintenance staff. Cleanup of dog waste not properly disposed of is not a regularly scheduled GGNRA maintenance task. Dog walking associations at Fort Funston and Crissy Field hold cleanup days on a regular basis to assist in park cleanup. Maintenance staff is responsible for emptying trash cans throughout the park, which often are filled with dog waste. In areas of heavy dog walking use, trash receptacles are emptied twice as often due to weight of the dog feces, not the volume of the trash cans. Three areas with high maintenance costs due to trash removal include Ocean Beach, Fort Funston, and Lands End/Fort Miley. Maintenance staff is on duty in these areas 7 days per week. Table 10 shows the total number of maintenance hours and labor and costs associated with trash removal in these areas. Total hours for Crissy Field were added for comparison purposes.

**TABLE 10. TOTAL MAINTENANCE AND LABOR HOURS AND COSTS ASSOCIATED WITH TRASH REMOVAL FROM OCTOBER 2006 TO APRIL 2008**

Site	Maintenance Labor Hours	Total Labor and Materials Cost
Ocean Beach	814	\$26,102
Fort Funston	1,665	\$44,510
Lands End/Fort Miley	539	\$13,592
Crissy Field	226	NA

Source: Voge, pers. comm., 2008.

NOTE: NA = not available.

## HUMAN HEALTH AND SAFETY

The health and safety of visitors and park staff, volunteers, and partners are of paramount concern to the NPS. NPS *Management Policies 2006* summarize the commitment of the NPS to providing appropriate, high-quality opportunities for visitors while striving to protect human life and providing for injury-free visits (NPS 2006b, 105).

Existing conditions related to dogs and their management in GGNRA can involve inherent risks to the health and safety of both visitors and staff. These risks vary between park staff and visitors and are addressed separately below. In general, risks include injuries related to aggressive dogs, dog bites (to humans, other dogs, and horses), belligerent dog owners, dog and/or owner rescues, and health issues related to dog waste (water and soil contamination, etc.). Ongoing conditions related to dogs in the park continue to pose health and safety risks to both staff and visitors.

## **EXPOSURE TO PATHOGENS FROM DOGS**

Wherever dogs swim and run, their feces introduce pathogens into the water, soils, and sand, and also onto vegetation and paved surfaces, possibly elevating the risk of human disease. Infections with these pathogens can take place through ingestion of or contact with contaminated sand, vegetation, or water. Leaving pet waste on the ground can expose children, adults, or other pets to diseases (CRCCD 2009, 1). Park sites that may pose a higher risk of infection from pathogens found in dog waste include heavily used dog walking areas, beach areas where many visitors are barefoot, and sites where children often play.

## **VISITORS**

Most of the issues related to the health and safety of park visitors are related to the nature of their encounters with unruly/aggressive dogs. The potential for visitors to encounter unruly dogs are higher at sites where visitor use is high and dogs are often off leash, including but not limited to Crissy Field, Ocean Beach, and Fort Funston. Table 9 presents a qualitative estimation (low, moderate, or high) of visitor use at each of the park sites. This visitor use data is based on input from the Negotiated Rulemaking Advisory Committee (NPS 2006g, 1–7) and the best professional judgement of the park staff. The number of visitor incidents related to dog activities is typically low at sites with low visitor use or at sites where dogs are usually walked on leash. Many of these park sites are located in Marin and San Mateo counties (table 9). Table 9 also contains the number of pet-related violations documented at GGNRA sites included in the plan/EIS, which is based on LE's 2007–2008 pet-related case reports database. The case reports are based on park visitor complaints and these data do not reflect contacts that did not result in a written report. Park sites where the number of visitor incidents related to dog activities is highest include the Marin Headlands Trails, Fort Baker, Fort Point, Ocean Beach, Crissy Field, and Fort Funston. High numbers of incidents occur because of the large number of people that use the site at one time and the high number of dogs off leash at the site, or the noncompliance by some members of the public with the NPS leash regulation that remains applicable in many GGNRA sites.

A total of 1,819 dog-related incidents were recorded at the park during this period for leash-law violations, dog bites or attacks, hazardous conditions or pet rescues, and failure to pick up pet excrement (table 9). Pet-related incidents may include dogs acting aggressively towards visitors, dog and horseback rider incidents, off-leash dogs disrupting picnicking families, visitors being knocked down by dogs, dogs intimidating small children, dog owners refusing to leash their dogs, etc. Injuries to visitors may occur while fleeing from a threatening dog. It is also assumed that a large percentage of visitors that experience incidents with dogs do not report them to park staff (Coast, pers. comm., 2006).

Small children are typically the most common victims of dog-related injuries because of their natural behaviors, such as running, yelling, grabbing, or hitting, which sometimes may threaten a dog. Elderly people are also considered at a higher risk of complications from dog-related injuries due to their increased susceptibility to bruising and lacerations. Additionally, elderly people may have decreased sensory perception, which could result in them not seeing or hearing a dog or could make them unable to escape from an aggressive dog (AVMA Task Force 2001, 1742).

## **STAFF**

Park staff (particularly LE staff), volunteers, and partners have been targets of physical and verbal abuse by dog owners who have been contacted regarding pet violations in the park. Conflicts typically occur when a dog owner is contacted regarding violation of a pet regulation. Conflicts are more likely in park areas of high use and elevated conflict levels, such as Crissy Field and Ocean Beach. Due to the increase in LE and visitor conflict regarding compliance with pet regulations following the park's efforts to initiate

enforcement of the NPS leash regulation parkwide in 2001 and for safety reasons, rangers now approach visitors in pairs when contacting them about enforcement issues. It is assumed by staff that any contact with a dog owner regarding dog walking regulation compliance will be confrontational, and it is the park's goal to reduce the number of these conflicts (Coast, pers. comm., 2006). There has been one reported physical assault of a federal LE officer by a dog owner (no injuries resulted). Conflicts also occur in the form of verbal abuse at public meetings, and through written correspondence. Park administrators, including the superintendent, have been subjected to such abuses.

Park staff members have been involved in rescues of both dogs and visitors from certain areas of the park, particularly from the coastal bluffs at Fort Funston. Rescues have also been performed at Sutro Heights Park and Baker Beach. Rescues sometimes result in injuries to park rangers and other park employees, including lifeguards. A minimum of three people and at least 1.5 hours are necessary for most rescues. In some cases, both dogs and owners require rescue. Such efforts tax staff capabilities when more than one of these occurs in a short time period, placing staff at elevated safety risk. In addition, staff members are redirected from their existing duties to perform rescues, leaving other regularly patrolled park areas unattended.

