Vegetation, Soils, and Wildlife **(**from SEIS, Chapter 3)

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).

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 draft plan/SEIS are described in detail below and are presented by site in maps 22 through 24. 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 state-listed but that have status or ranking through either the California Department of Fish and Game 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 or watch list species. 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 soils and 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.

## LE Data Overview Related to Natural Resource Disturbances

The park collects data regarding disturbance to wildlife and habitats at GGNRA sites, for example, data collected through western snowy plover and bank swallow monitoring programs. Wildlife and habitat disturbance data are also collected as incident reports when visitors violate park regulations. For example, 36 CFR 2.1 covers the preservation of natural resources. Vegetation damage is described in 36 CFR 2.1 (a) (1) (ii)); the following is prohibited: possessing, destroying, injuring, defacing, removing, digging, or disturbing from its natural state. In addition, 36 CFR 2.2 covers the protection of wildlife. Wildlife disturbance is described in 36 CFR 2.2 (a) (2) and the following is prohibited: feeding, touching, teasing, frightening, or intentional disturbing of wildlife nesting, breeding, or other activities. 36 CFR 7.97(d) describes the seasonal dog walking leash restrictions for the western snowy plover in the Snowy Plover Protection Area (SPPA) at Ocean Beach and in the Wildlife Protection Area (WPA) at Crissy Field, discussed in more detail in the Special-Status section.

**Table 6. Dog-related Incidents for Vegetation, Soils, and Wildlife, 2008–2011**

| **Park Site** | **Recorded Incidents, 2008–2011** | | | |
| --- | --- | --- | --- | --- |
| **Dogs Damaging Vegetation** | **Dogs in Closed Areas / Leash Violations of the WPA or SPPA\*** | **Dogs Disturbing Wildlife** | **Total** |
| Oakwood Valley | 0 | 1 | 0 | **1** |
| Muir Beach | 0 | 6 | 1 | **7** |
| Marin Headland Trails | 0 | 222 | 1 | **223** |
| Fort Baker | 0 | 4 | 0 | **4** |
| Crissy Field | 0 | 73 / 283\* | 2 | **358** |
| Fort Point | 0 | 3 | 0 | **3** |
| Ocean Beach | 0 | 77 / 729\* | 9 | **815** |
| Fort Funston | 1 | 1 | 0 | **2** |
| Mori Point | 0 | 1 | 0 | **1** |
| Sweeney Ridge / Cattle Hill | 0 | 1 | 0 | **1** |
| Total | **3** | **1,519** | **15** | **1,537** |
| \*Includes incidents reported for having an unleashed dog within the Ocean Beach SPPA or the Crissy Field WPA during the period (July 1–May 15) when dogs must be leashed. | | | | |

Excerpts of quotes from the law enforcement incident reports included below demonstrate the natural resources issues associated with dogs at GGNRA sites.

Closed Areas:

“We observed the canine swim in Rodeo Lagoon (which is prohibited). We observed the same canine bark at and repeatedly chase numerous water-foul [sic] that were in the lagoon.” (Rodeo Beach, May 19, 2010, Incident Report # 10-005086)

“While patrolling with a NPS Ranger in a marked patrol vehicle along Mason, I observed an off-leash dog running in the posted and fenced closed wildlife area adjacent to Crissy Field. The area is posted closed with no entry allowed.” (Crissy Field, May 23, 2009, Incident Report # 09-005249)

“I observed the two dogs run into the Muir Beach Lagoon, an area that is closed to pets.” (Muir Beach, November 9, 2010, Incident Report # 10-012822)

Damaging Vegetation:

A NPS “Ranger and I observed two dogs running off leash on the protected plant area of Battery Chamberlin.” (Baker Beach, January 12, 2009, Incident Report # 09-432)

“I observed two off-leash dogs running around the Fort Funston Ranger Office. I observed them running around and digging up native plants near the native plant nursery.” (Fort Funston, September 29, 2010, Incident Report # 10-011098)

“They were accompanied by an unrestrained Australian Shepherd-like dog which was walking over the just-revegetated slope west of the stairs, cordoned off to allow growth.” (Mori Point, March 17, 2009, Incident Report # 09-002701)

“We noticed a male in the area with a dog conducting resource damage by digging.” (Sutro Heights, March 26, 2009, Incident Report # 09-003043)

Chasing Wildlife:

“I saw a man… wearing a backpack and accompanied by an unrestrained dog, walk toward a small herd of about five deer. His direction of travel was purposeful and directly toward the deer. The dog appeared excited, but sat repeatedly on command, until about one hundred feet from the deer. I exited my vehicle and approached the man, wanting to discuss wildlife harassment. Shortly before I began my contact, the dog rushed toward the deer, chasing them over a small rise and up the hillside. The man called his dog and the dog finally returned from a distance of about two hundred feet.” (Marin Headlands, November 25, 2009, Incident Report # 09-013103)

“While on foot patrol of the Wildlife Protection Area at Ocean Beach near Judah, I observed a male-adult walking with his two unleashed pets though the signed and designated Wildlife Protection area. The dogs ran up to approximately forty yards away from the owner chasing nearby shorebirds.” (Ocean Beach Wildlife Protection Area, January 10, 2010, Incident Report # 10-368)

“I observed two female-adults, one of which was hitting a tennis ball with a racquet for a black medium large dog to fetch as they walked along the beach. I observed her hit the ball thirty to forty yards away as the dog would chase shore birds, fetch the ball, and return it.” (Ocean Beach Wildlife Protection Area, January 10, 2010, Incident Report # 10-374)

“I observed a male-adult throwing a soft Frisbee for a small speckled cattle dog mix to fetch as he walked along the beach. I observed him throw the Frisbee thirty plus yards away as the dog would chase shore birds, fetch the Frisbee, and return it. I saw him continue to allow the dog to run throughout the area as he walked southbound from Judah to my location at Noriega.” (Ocean Beach Wildlife Protection Area, January 11, 2010, Incident Report # 10-419)

“I observed an unrestrained brown Labrador Retriever type dog playing catch with its owner… on the Meadow at Fort Baker, within the Golden Gate National Recreation Area. I also observed two deer grazing within the same meadow. When the dog saw the deer it gave chase; chasing the deer west, into the trees.” (Fort Baker, August 23, 2010, Incident Report # 10-009283)

“I observed a medium sized, white/black colored, off-leash dog running unrestrained southbound on Ocean Beach near Pacheco St. This dog was chasing shore birds at the water line causing the birds to take flight.” (Ocean Beach, August 25, 2010, Incident Report # 10-009355)

“I observed a small, black off-leash dog running unrestrained after shorebirds northbound on Ocean Beach near Noriega St. I also observed a medium sized, white, off-leash dog running unrestrained northbound on Ocean Beach near Noriega St… At one point, I observed the black dog running approx. 50 feet ahead of [the owner] while chasing shorebirds and causing them to go into flight. During this contact, I observed this dog twice run uncontrolled after shorebirds.” (Ocean Beach, January 24, 2009, Incident Report # 09-000853)

Killing Wildlife:

“NPS Dispatch took a phone report of a dog attack in Rodeo Lagoon. The dog, described as a large black Labrador, chased a male deer into Rodeo Lagoon, where the deer subsequently drowned while trying to defend itself from the unleashed dog.” (Rodeo Beach, June 13, 2010, Incident Report # 10-006226)

## Coastal Communities

Dune and beach systems are predominantly comprised of sand. At Ocean Beach, the soil complex known as Sirdak Sands exists (NRCS 2004b, 12). Sirdak Sands are deposited in dunes, can reach a depth of 120 feet, are somewhat excessively drained and have a low available water capacity (NRCS 2004b, 12). Crissy Field also has dune systems. Other soils at the park are characterized as “Beach” in coastal areas at the following sites: Ocean Beach, Fort Funston, Mori Point, and Muir Beach (NRCS 2004b, 12). Muir Beach is a Holocene beach composed of sand deposits at the mouth of Redwood Creek (NPS 2007b, 3–11).

The remnant undeveloped coastal corridor supports exceptional native biodiversity and provides refuge for one of the largest concentrations of rare, threatened, and endangered species in the national park system (NPS 2011b, Volume I:17). The active foredunes and inner, stabilized dunes support a simple, yet unique, plant community. Dunes create unique habitats that support some of the park’s rare and endangered plant species (Elder n.d., 11).

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).

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).

The dunes around Crissy Field 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). Fort Funston has been designated as a San Francisco lessingia recovery and enhancement site (USFWS 2003, 52).

The sanderling, long-billed curlew, and the marbled godwit, commonly found at GGNRA, are considered watch list species by the American Bird Conservancy and the National Audubon Society; these species are not yet listed but are in need of conservation (American Bird Conservancy and National Audubon Society 2007, 2). 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, 11).

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.

A list of recent live animal reports for stranded animals in GGNRA from 2000 through 2011 was compiled from the Marine Mammal Center data and is presented in table 7 (MMC 2012a, 1). The Marine Mammal Center data indicate that the following marine mammals have been found stranded in GGNRA: whales (not identified to species level), the bottlenose dolphin (*Tursiops truncatus*), the northern right-whale dolphin (*Lissodelphis borealis*), the harbor porpoise (*Phocoena phocoena*), Pacific harbor seal, the California state fully protected northern elephant seal (*Mirounga angustirostris*), the federally listed threatened Guadalupe fur seal (*Arctocephalus townsendi*), the northern fur seal (*Callorhinus ursinus*), the California sea lion, the federally listed threatened southern sea otter (*Enhydra lutris nereis*), and the river otter (*Lontra canadensis*) (MMC 2012a, 1). Sites at GGNRA that experience marine mammal strandings based on Marine Mammal Center data are noted in table 7 (MMC 2012a, 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.

Dogs have been observed surrounding marine mammals, chasing them back to the water, and in one case, attacking a California sea lion (MMC 2012a, 1).

Southern sea otters are infrequently seen offshore, with numbers increasing as the population spreads north (NPS 1999, 13).

**Table 7. The Marine Mammal Center Total Number of Individual Live Animal Reports for Stranding in GGNRA, 2000–2011**

| **GGNRA Location** | **Whales, Dolphins, Porpoises** | **California Sea Lion** | **Northern Elephant Seal** | **Northern Fur Seal** | **Guadalupe Fur Seal** | **Pacific Harbor Seal** | **Otters (River or Sea)** | **Total\*** | **Average per year** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Muir Beach | 3 | 31 | 23 | 1 | 0 | 1 | 1 | **60** | **5.0** |
| Fort Baker | 3 | 25 | 4 | 0 | 0 | 3 | 0 | **35** | **2.9** |
| Crissy Field | 12 | 55 | 13 | 0 | 0 | 4 | 0 | **84** | **7.0** |
| Ocean Beach | 22 | 174 | 23 | 0 | 2 | 15 | 3 | **239** | **19.9** |
| Fort Funston | 6 | 53 | 13 | 0 | 1 | 4 | 0 | **77** | **6.42** |
| **Total** | **72** | **513** | **154** | **3** | **6** | **58** | **8** | **814** | **67.8** |
| Source: MMC 2012a.  \*Does not include unidentified species, carcasses, or animal reports from outside the project area. | | | | | | | | | | |

## Coastal Scrub and Chaparral

Therefore, plants living on serpentine soils are specially adapted to these unusual chemical conditions (NPS 2011b, Volume II:28). 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 1998a, I-10). These communities are often high in diversity and contain high numbers of rare, threatened, and endangered plant species (Elder n.d). At least 28 species of plants and animals occur either exclusively or primarily on serpentine soils in the Bay Area (USFWS 1998a, I-14). Of these, half are federally listed as threatened or endangered and the rest are species of concern (USFWS 1998a, I-13) (see “Special-status Species” for more detail on threatened or endangered plant species). The endemic Montara manzanita (*Artostaphylos montarensis*), and the brittle-leaf manzanita (*Artpstaphylos tomentosa* spp. *crustacea*) are found in the maritime chaparral at Rancho Corral de Tierra (POST 2001, 20).

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 2005b, 192).

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).

From bird point count censuses in 1999 and 2000 (PRBO 2002, 1), the most abundant species in the coastal scrub habitat were the white-crowned sparrow (*Zonotrichia leucophrys*) and spotted towhee (*Pipilo maculatus*).

## Grasslands

The grassland community forms a mosaic with the coastal scrub community and mixed evergreen forests (NPS 2005b, 194).

There are mapped occurrences of the San Francisco wallflower at Pedro Point and Rancho Corral de Tierra and suitable habitat exists for this species at Cattle Hill/Sweeney Ridge (URS Corporation 2010, Figure 17).

Suitable habitat also exists for Franciscan onion at Pedro Point, Rancho Corral de Tierra, and Cattle Hill/Sweeney Ridge (URS Corporation 2010, Figure 17).

Today, many grasslands in the park are dominated by non-native annual grasses and forbs adapted to the climate (NPS 2005b, 194).

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).

Dudley’s lupine (*Lupinus latifolius var. dudleyi*) is another lupine species found at Rancho Corral de Tierra (POST 2001, 28).

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

Wetlands, according to the definition developed by the U.S. Fish and Wildlife Service (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).

Deepwater habitats such as rivers, lakes, and estuaries are not technically wetlands, but are classified as aquatic sites using the same classification system (NPS 2006a, section 4.6.5).

Wetlands in GGNRA are generally located in valley bottoms, with seeps and small intermittent streams reaching into the higher portions of the watersheds (NPS 2005b, 203).

Hydric soils are defined as a soil formed under conditions of flooding, saturation, or ponding extended enough for the soil to develop anaerobic conditions (USACE 1987, 19) and are present in GGNRA areas characterized as wetlands.

These clay loam and clay 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) (NRCS 2004a, 17). There are hydric soils located at Tennessee Valley, inland of Tennessee Cove and along the Elk Valley Creek in the Marin Headlands (NRCS 2004a, 16). These soils are flat, very poorly drained, and have a very low available water capacity (NRCS 2004a, 16).

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 2005b, 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).

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 2010a, 1).

This small annual was introduced to the salt marsh at Crissy Field in 2001 (NPS 2010a, 1). 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 (Ward and Ablog 2006, 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 2010a, 1).

Central California steelhead trout (*Oncorhynchus mykiss*) occur in the drainages to Rodeo Lagoon (NPS 2005b, 211). Rodeo Lake provides suitable breeding habitat for California red-legged frogs (*Rana draytonii*), while both the lagoon and the lake are used outside the breeding season for rearing (Fong and Campo 2006).

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, with mallards representing 88 percent of the total number of individuals observed (Dybala 2002, 4).

## Native Hardwood Forest

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 2005b, 196).

As the community approaches 1,000 feet above msl, California bay, tanbark oak, and other hardwoods become common (NPS 2005b, 196).

Sudden oak death 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 2013a, 1). At GGNRA, sudden oak death has killed many of the tanbark oaks and has also affected other hardwood tree species (NPS 2009b, 1).

In forested habitats, bushtits (*Psaltriparus 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).

## Riparian Forests and Streams

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 draft plan/SEIS. At Easkoot Creek, the creek is densely vegetated with riparian plant species and generally difficult to access. These creeks are closed per the GGNRA Compendium (NPS 2008b, 9).

Non-native trees, including eucalyptus (*Eucalyptus* spp.) and Monterey cypress (*Cupressus macrocarpa*), have become established in some riparian forests in the park (NPS 2005b, 196).

Suitable habitat for both of these CNPS-listed species exists in riparian forests along streams at Rancho Corral de Tierra in the project area (URS Corporation 2010, Figures 14 and 24).

Riparian trees support many invertebrates, such as insects, that are important to resident and migrating songbirds (NPS 2009c, 205). 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 lagoon restoration at Muir Beach, discussed previously, also aims to improve the quality and quantity of coho salmon and steelhead trout habitat (NPS 2008c).

## Douglas-fir and Coast Redwood

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 2009c).

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 2011a, vii).

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 2009c).

## Monterey Cypress

While these trees provide habitat for some nesting bird species, the creation of a densely shaded canopy and acidic soils disrupt the natural distribution of native species at Rancho Corral de Tierra (POST 2001, 54).

**Special-status Species**

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 2005b, 1).

The constituent elements of critical habitat defined by the USFWS and National Oceanic and Atmospheric Administration 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.

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).

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 2009c).

**Table 8. Federally and State-listed Species Considered in this Draft Plan/SEIS**

| **Group** | **Scientific Name** | **Common Name** | **Federal Statusa** | **State Statusa** | **GGNRA Location of Mapped Occurrence or Potential Habitat** |
| --- | --- | --- | --- | --- | --- |
| Invertebrate | *Callophrys mossii bayensis* | San Bruno elfin butterfly | FE | — | Milagra Ridge and Rancho Corral de Tierra |
| Invertebrate | *Icaricia icarioides ssp. missionensis* | Mission blue butterfly | FE | — | Alta Trail / Orchard Fire Road / Pacheco Fire Road, Oakwood Valley, Marin Headlands Trails (Tennessee Valley), Fort Baker, Milagra Ridge, Sweeney Ridge / Cattle Hill, and Rancho Corral de Tierra |
| Fish | *Eucyclogobius newberryi* | Tidewater goby | FE, CH | — | Rodeo Beach (Rodeo Lagoon) |
| Fish | *Oncorhynchus kisutch* | Coho salmon—central California coast | FE, CH | SE | Muir Beach (Redwood Creek) |
| Fish | *Oncorhynchus mykiss* | Steelhead—central California coast | FT, CH | — | Stinson Beach (Easkoot Creek), Muir Beach (Redwood Creek), Rodeo Beach (Rodeo Lagoon), Marin Headlands Trails (Rodeo Creek and Gerbode Creek), and Rancho Corral de Tierra (Denniston Creek, Martini Creek, and San Vincente Creek) |
| Amphibian | *Rana draytonii* | California red-legged frog | FT, CH | — | Muir Beach, Marin Headlands Trails (Rodeo Lake, Rodeo Lagoon, and Tennessee Valley), Mori Point, Milagra Ridge, Sweeney Ridge / Cattle Hill, Pedro Point, and Rancho Corral de Tierra |
| Reptile | *Thamnophis sirtalis tetrataenia* | San Francisco garter snake | FE | SE | Mori Point, Milagra Ridge, Sweeney Ridge / Cattle Hill, Pedro Point, and Rancho Corral de Tierra |
| Bird | *Charadrius alexandrinus nivosus* | Western snowy plover | FT, CHb | — | Crissy Field, Ocean Beach |
| Bird | *Riparia riparia* | Bank swallow | — | ST | Fort Funston |
| Bird | *Strix occidentalis caurina* | Northern spotted owl | FT | — | Homestead Valley, Oakwood Valley, and Marin Headlands Trails |
| Plant | *Arenaria paludicola* | Marsh sandwort | FE | SE | Marin Headlands Trails |
| Plant | *Arctostaphylos franciscana* | Franciscan manzanita | FE |  | Fort Point and Baker Beach |
| Plant | *Lessingia germanorum* | San Francisco lessingia | FE | SE | Baker Beach and Fort Funston |
| Plant | *Potentilla hickmanii* | Hickman’s potentilla (Hickman’s cinquefoil) | FE | SE | Mori Point, Pedro Point, and Rancho Corral de Tierra |
| a FE = federally endangered, FT = federally threatened, CH = critical habitat, SE = state endangered, ST = state threatened.  b =Critical habitat has been designated for this species, but the critical habitat does not occur in GGNRA. | | | | | |

**Endangered, Threatened, and Candidate Species: Wildlife**

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

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) (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 (Newby 2000, 4). At Rancho Corral de Tierra, these sedum communities occur in rocky out-crops at the site, and the butterfly has been observed at the site and in the vicinity, though these observations have been unconfirmed (POST 2001, 34; URS Corporation 2010, 3-4 and Figure 8).

**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 2009d, 1): *Lupinus albifrons*, *L. formosus*, and *L. variicolor*.

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 2009d, 1).

Fire suppression and the loss of elk have potentially contributed to declines in both the quality and quantity of lupine habitat (NPS 2009d, 1).

The mission blue butterfly has been documented at Oakwood Valley, Fort Baker, Milagra Ridge, and Sweeney Ridge / Cattle Hill (Bennett 2008, 8; USFWS 1984, 1). Lupine host plants have been documented in inventories conducted at Sweeney Ridge (May & Associates, Inc. 2006). Small patches of the host plant *L. variicolor* for the mission blue butterfly can also be found at Rancho Corral de Tierra (URS Corporation 2010, Figure 6).

Habitat restoration efforts for the butterfly have continued annually, consistent with recovery objectives for the species (NPS 2009c).

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). It also directs managers to restore or rehabilitate habitat in the butterfly’s historical range (USFWS 1984, 48).

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), including along Mori Ridge Trail, Sweeney Ridge Trail, the Baquiano Trail, the Sweeney Horse Trail, and the Sweeney Meadow Trail (May & Associates, Inc. 2006).

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

The central California coast coho salmon evolutionarily significant unit is listed as federally endangered as well as state endangered (DFG 2004, ES.1).

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 (appendix G).

Coho salmon use Redwood Creek during many of their life stages (DFG 2004, 6.44).

Coho salmon have been declining in Redwood Creek in recent years (NPS 2008c, 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 2008c, 2). A historical reference of coho salmon is recorded at a location on Denniston Creek at Rancho Corral de Tierra. The species has not been recorded at this site since 1941, and there are currently barriers to fish migration at the site (URS 2010, 3-2).

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

In the study area, steelhead trout occurs in Stinson Beach (Easkoot Creek), Muir Beach (Redwood Creek), Rodeo Beach (Rodeo Lagoon), the Marin Headlands Trails (Rodeo Creek and Gerbode Creek), and Rancho Corral de Tierra (Denniston and Martini Creeks) (Becker and Reining 2008). Designated critical habitat for central California coast steelhead includes most of the coastal streams of Marin County, including Redwood Creek and Denniston Creek below Denniston Reservoir (NOAA 2005, 76).

The park monitors steelhead and is conducting research and restoration efforts, particularly in Redwood Creek, as described above for coho salmon (NPS 2008c, 2). There is also a historic record of steelhead trout in San Vicente creek at Rancho Corral de Tierra (POST 2001, 35-36), but there is little current evidence to suggest that the creek currently supports steelhead (Becker and Reining 2008). Currently, physical blockages to the creeks at Rancho Corral de Tierra affect steelhead use of the site (POST 2001, 35-36).

**California Red-legged Frog (*Rana 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).

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).

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).

The USFWS designated critical habitat units for the California red-legged frog in 2001 and revised the units in 2006, 2008, and 2010 (USFWS 2010). For the California red-legged frog, critical habitat covers most of Sweeney Ridge and Rancho Corral de Tierra (USFWS 2010). Designated critical habitat also occurs at Pedro Point (USFWS 2010).

Based on NPS winter breeding surveys, breeding populations of California red-legged frogs are present at Rancho Corral de Tierra at two known locations (NPS unpublished data).

Existing trails at Rancho Corral de Tierra cross upland and dispersal habitat for this species (URS Corporation 2010, Figure 3).

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

Cattails, bulrushes, and spike rushes (*Juncus* spp. and *Eleocharis* spp.) are plant species preferred as cover by the snake (NPS n.d.a, 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 1985, 9).

Essential habitat for a breeding San Francisco garter snake population includes open, grassy uplands and shallow marshlands with adequate emergent vegetation; an open water component is also important to the San Francisco garter snake (USFWS 2006, 9-10).

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.a, 1). Young snakes depend primarily on Pacific tree frogs for food (USFWS 2007b, 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). Habitat loss and the degradation of remaining habitat continue to be the primary threats to the recovery of the San Francisco garter snake (USFWS 2006, 15). Other threats include the increased presence of invasive species (such as bullfrogs mentioned above), water level fluctuations, vehicular strikes (USFWS 2006, 25) and since the Recovery Plan was established, the continued loss of grazing lands, the improper management of suitable habitat and the reduction in prey for the San Francisco garter snake (USFWS 2006, 30). Additionally, the San Francisco garter snake has historically been collected due to its rarity and beautiful coloration, and some amount of illegal collection likely still occurs (USFWS 2006, 20).

NPS recorded San Francisco garter snakes using these constructed ponds at Mori Point as areas for foraging for California red-legged frogs (USFWS 2006, 6).

In addition, habitat assessments have concluded that Sweeney Ridge and Cattle Hill are important to the overall conservation of the San Francisco garter snake because these sites provide connectivity between known populations of the snake or between high quality aquatic habitats that potentially supports the snake (Swaim Biological 2006).

There was a sighting of the San Francisco garter snake at Rancho Corral de Tierra in 1996 at the Denniston Reservoir (Swaim Biological 2007).

There was also a mapped occurrence of the San Francisco garter snake at Denniston Creek near a trail in the Rancho site (URS Corporation 2010, Figure 11). Rancho Corral de Tierra provides suitable aquatic habitat and adjacent upland dispersal habitat are crossed by trails throughout Rancho Corral de Tierra (URS Corporation 2010, Figure 11).

**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 2007a, 1).

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 2007a, vi).

There is a record from 1854 that a snowy plover (*Charadrius nivosus nivosus*) specimen was collected at the Presidio [in GGNRA] in early May (Grinnell 1932, 271-272), indicating that this bird was historically present on GGNRA beaches.

**Western Snowy Plover Monitoring**

NPS monitors snowy plovers at Ocean Beach and Crissy Field to determine changes in abundance and distribution, and to understand potential threats, including dogs, to plovers from recreational and maintenance activities (NPS 2008a, 1).

This monitoring protocol was peer reviewed by an external panel through the NPS Inventory and Monitoring Program peer review process (Merkle et al. 2011, ii).

The average number of plovers observed per survey during the winter was highest in the 1994 through 1995 survey period, at more than 54 plovers (with a maximum of 85 plovers), and was lowest in 1999, at less than 13 plovers (NPS 2008a). The winter population of western snowy plovers was on average above 30 plovers per winter survey in 2002 through 2006 (NPS 2008a). Maximum annual single survey counts of snowy plovers from 2000 through 2006 ranged from a low of 23 in 2000 to a high of 62 in 2003 (NPS 2006b, 8; Hatch et al. 2007a, 1; Hatch et al. 2007b). For the 2007 season (July 2007 through February 2008), the maximum number of snowy plovers counted on a survey was 49 (Hatch et al. 2008, 1). Western snowy plover numbers have still not matched those recorded in 1994 when a maximum of 85 snowy plovers and an average of 56 plovers were recorded (Hatch et al. 2007a, 8).

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 2008a, 1).

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 2008a, 2).

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

The western snowy plover monitoring program at GGNRA has focused on summarizing snowy plover distribution and relative abundance in the SPPA at Ocean Beach and the WPA at Crissy Field, as well as summarizing numbers and trends for people and dog use (Hatch et al. 2007b, 1). At GGNRA, there have been multiple instances of dogs flushing or chasing shorebirds, including western snowy plovers (Hatch 1996, ii; Hatch et al. 2007a, 4). As described in the collected law enforcement data previously and through the plover monitoring program, the seasonal leash restrictions designed to protect western snowy plovers at Ocean Beach are frequently violated and disturbance of shorebirds, including western snowy plovers by dogs and people has occurred (Hatch 1996; Hatch et al. 2007a, 2008; USFWS 2007a). During western snowy plover monitoring surveys conducted at Ocean Beach from December 1994 to May 1996, 362 dogs were observed chasing birds; 19 dogs were observed chasing at least 62 western snowy plovers; and roaming dogs inadvertently disturbed at least 100 additional western snowy plovers (Hatch 1996). During a long-term monitoring survey conducted from 1994 to 2006, 48 off-leash dogs were observed chasing western snowy plovers (Ward and Ablog 2006).

In June through July 2006, there were two observed instances of dogs chasing birds within the Crissy Field WPA (Hatch et al. 2007a, 14) and during the September 2006 through April 2007 surveys, there were three observations of dogs chasing shorebirds within the Crissy Field WPA (Hatch et al. 2007b, 5). There were no observations of dogs chasing shorebirds or plovers during the July 2007 through February 2008 surveys within the Crissy Field WPA (Hatch et al. 2008, 3).

The primary objectives of the snowy plover monitoring program are to determine trends in population size and spatial distribution of snowy plovers at the Crissy Field WPA and the Ocean Beach SPPA (Merkle et al. 2011, xi).

The low numbers of observational hours and the use of encounter rates in western snowy plover monitoring may underestimate instances of dogs disturbing western snowy plovers. Also, using median or average values to describe disturbance rates may not be useful in assessing disturbance at the sites. For example, averaging the number of dogs per hour observed chasing shorebirds (Hatch et al. 2007a, 10) obscures the fact that no or few disturbances have been averaged with great or high disturbances.

Below, are samples of some recent excerpts from 2009 and 2010 incident records from law enforcement. These quotes describe the issues and provide specific examples of dogs disturbing western snowy plovers in the Crissy Field WPA and the Ocean Beach SPPA. Additional quotes and examples of dogs disturbing other natural resources at GGNRA sites are included at the beginning of this chapter.

“I observed two medium sized brown dogs running unleashed throughout the Snowy Plover Protection area. I observed the dogs for at least five minutes run-at-large as they ran southward in my direction. One of the dogs ran well over one-hundred feet away from the owner who was jogging along the shore, I observed the dog chase several resting shorebirds as well as run directly through and disturb a small colony of resting Snowy Plovers.” (Ocean Beach, January 28, 2010, Incident Report # 09-981)

“I was dispatched to the Crissy Field Wildlife Protection Area (WPA) for a dog off leash. Furtado is a snowy plover monitor who reported to dispatch that a man was jogging with a group of kids and a dog off leash when they ran directly over the area were two snowy plovers were resting on the beach, and the plovers flew off.” (Crissy Field Wildlife Protection Area, October 21, 2009, Incident Report # 09-011750)

“While patrolling Ocean Beach I observed a dog (Labrador type) off leash on Ocean Beach north of Sloat Blvd, and south of Stair Well 21 in violation of numerous clearly visible posted signs stating Snowy Plover Wild Protection Area — Leash Pets… I watched the dog chasing a small flock of Snowy Plovers from 1350 hours until 1411 hours. The dog would charge into the flock of Plovers and cause them to take flight and then chase them as they flew above the beach and charge into them again when they landed. This went on unabated for 21 minutes (timed by my wristwatch). Nobody was near the dog and nobody attempted to stop the dog. I attempted to call the dog and stop the dog, but it would not heed my voice commands.” (Ocean Beach, January 29, 2009, Incident Report # 09-001038)

**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. Monitoring data indicate that disturbance of western snowy plovers due to off-leash dogs increased in both the Crissy Field WPA and the Ocean Beach SPPA following the *U.S. v. Barley* decision (NPS 2006e; NPS 2008a, 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 2008a, 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 2008a, 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 through 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 GGNRA Compendium (NPS 2009e, 31), was published on September 19, 2008.

#### **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 nests in 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). The bluffs just below Fort Funston are one of only two coastal cliff breeding sites for the bank swallow in coastal California (Chow 1996, 1; NPS 2007c, 1). The bank swallows dig holes in the bluffs which may be as much as 200 feet above sea level along the beach at Fort Funston. These bluffs consist of layers of sandstone, mudstones, and conglomerates and are known as the Merced and Colma formations. These formations are described as soft, easily erodible, sedimentary rocks and are very susceptible to disturbance.

The bank swallow colony at Fort Funston has been observed since at least 1905 (NPS 2007c, 3), has been documented at Fort Funston by California Department of Fish and Game since 1956 (DFG 1992, 20), and has been monitored since 1993 by NPS (Chow 1996, 1; NPS 2007c, 1). The bank swallow colony at Fort Funston runs from the north end of the beach (near the Great Highway across from the Oceanside Water Pollution Control Plant) to Panama Point, a rocky outcrop north of the main sand ladder (NPS 2007c, 2). The total number of bank swallow burrows observed at the site from 1993 to 2006 through the NPS monitoring program has ranged from a high of 924 burrows in 1994 (Chow 1996, 2) to a low of 140 burrows observed in 1998 (NPS 2007c, 3). The number of burrows was high for the years 1993 through 1996, with total counts above 500 burrows (NPS 2007c, 3). Storm events associated with El Nino conditions during the winter of 1997 into 1998 wiped out all the burrows through heavy erosion at the site (NPS 2007c, 3). The cliffs are subject to rapid erosion from storm events outside the breeding season (NPS 2007c, 1). This erosion removes burrows from the previous season. The bank swallows respond by digging new burrows in the soft cliffs each year. Years without large storm events often result in burrows remaining from previous years, and these are recounted in the monitoring, though these burrows are not always active with swallows. From 2000 through 2006, the number of burrows ranged from 142 in 2001 to a high of 255 in 2004 (NPS 2007c, 3). Approximately 40 to 60 percent of burrows are actively used for nesting in a given year based on burrow occupancy estimates for bank swallows in the western United States, including data for California and Fort Funston (Laymon et al. 1987, 25; DFG 1995, 4; Garrison 1999, 19-21). Records and monitoring indicate that the bank swallow colony at Fort Funston has always been fairly small (Etchell 2010, 2-3), the number of burrows varies each year, and bank swallows have shifted locations along the cliffs at Fort Funston over time (NPS 2007c, 3; Etchell 2010, 2-3). 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). 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 Sunset Trail due to erosion and a 12-acre Habitat Protection Area. The 12-acre fenced Habitat Protection Area was closed to protect bank swallows, protect geologic resources, provide visitor safety, and allow habitat restoration (NPS 2001b). The nesting colony is currently monitored about once per week by park personnel. Visitors can access areas surrounding the bluffs from above the beach in the area around the Funston Beach Trail, north at the junction with the Sunset Trail. Signage and fencing (currently mostly buried) have been installed along the trails adjacent to the closure area, and signs along the beach below the colony request that visitors voluntarily comply with restricted access to the northern section of the bluffs when the swallows are nesting. Fort Funston has high visitor use, and in 2007–2008 there were two pet citations, warnings, and reports taken related to wildlife disturbance at the site (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 2011a, vi).

Marin County, at the southern limit of the subspecies’ range, supports relatively high densities of this owl in appropriate habitat (NPS 2009b).

The dusky-footed woodrat is the primary prey for northern spotted owls (Hamm et al. 2007, 1).

The revised final recovery plan for the northern spotted owl developed in 2011 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 2011a, vii). The recovery plan recommends barred owl removal experiments to assess the best path to recovery for the northern spotted owl (USFWS 2011a, 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 2009b). The recovery plan was revised in 2011, which stated that many populations of spotted owls continue to decline, even with extensive maintenance and restoration of spotted owl habitat in recent years (USFWS 2011a, vi). The revised recovery plan continues to list barred owl management as the third of four steps in the recovery strategy (USFWS 2011a, vii). In addition to describing specific actions to address the barred owl threat, the revised recovery plan describes the importance of maintaining and restoring high value habitat for the recovery and long-term survival of the spotted owl (USFWS 2011a, vii).

**Threatened, Endangered, and Candidate Species: Plants**

**Marsh Sandwort (*Arenaria paludicola*)**

It was once found along much of the west coast of the United States, but there are now only approximately a dozen wild individuals, all in San Luis Obispo County. Management of this species is guided by the Recovery Plan for Marsh Sandwort (*Arenaria paludicola*) and Gambel’s Watercress (*Rorippa gambelii*) (USFWS 1998b).

In December of 2011, two new populations (over 800 individuals) were established in the Marin Headlands near the Rodeo Beach overflow parking lot and along the Miwok Trail in Rodeo Valley. Monitoring results as of July 2012 indicate that over half of these individuals are still surviving (Acierto et al. 2012).

**Presidio Clarkia (*Clarkia franciscana*)**

The Presidio clarkia (*Clarkia franciscana*) is a federally endangered herbaceous annual plant. The habitat of Presidio clarkia is generally described as being composed of serpentine soils, and is around 50 meters in elevation (Jepson Interchange 2013). This species occurs in coastal scrub, valley grassland, and foothill grassland plant communities (CNPS 2013). This plant is endemic to California, where it is restricted to San Francisco and Alameda counties, and is known from fewer than five occurrences (CNPS 2013).

#### **San Francisco Lessingia (*Lessingia german*orum**)

San Francisco lessingiais 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. Reintroduction of the species is precluded by the current unmanaged (or unrestricted) dog use at Fort Funston. 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). This species is seriously threatened by urbanization, recreational activities, non-native grasses, and grazing (CNPS 2009, 2). Suitable habitat to support Hickman’s potentilla occurs at both Mori Point and the Pedro Point Headlands (URS Corporation 2010, figure 19), but there are no mapped occurrences of this plant at either the Mori Point or Pedro Point Headlands sites. There are several known occurrences of Hickman’s potentilla at Rancho Corral de Tierra in the Montara Area, but most of the populations are located away from areas with heavy foot or vehicle traffic. However, there are two populations that are crossed by or are adjacent to current trails that experience regular use (POST 2001, 28). In addition, potential habitat is located throughout the Rancho site (URS Corporation 2010, Figure 19).

## Summary of Background Information Used to Determine Impacts to Natural Resources (from SEIS CH 4)

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### **Vegetation and Soils**

Site-specific, peer-reviewed studies have not been conducted at the GGNRA sites for the sole purpose of documenting impacts to vegetation or soils from dogs. While it is generally accepted and well documented that the presence of dogs in natural areas can result in disturbance to wildlife (as described in detail in the “Wildlife” section), specific published and peer-reviewed studies regarding impacts on soils and vegetation as a result of dogs are not as widely available as other studies documenting impacts as a result of domestic dogs. During the past six years, park staff has amassed scientific and technical information that is available on dog management–related topics. Data and information related to dog impacts on soils and vegetation, including waste issues, were collected from a variety of sources, including published journal articles and organizations that have conducted applicable studies. This section provides a general summary of the literature review conducted to determine the associations between dogs, soils, and vegetation, which are used for the purposes of the impacts analysis presented in this chapter. The potential disturbance from dogs to soils and vegetation at GGNRA is discussed in this section based upon the review and extrapolation of results from published and peer-reviewed studies. The results of this literature review therefore provide a general nexus for dog-related impacts to soils and vegetation. The existing credible scientific literature is discussed in detail below and the potential impacts to vegetation and soils are described as a result of this information.

It has been documented that recreational activities can affect vegetation and soils, resulting in damage to plant communities (Cole 1978, 281; Douglass et al. 1999, 9.2). In recreational/park settings, domestic dogs and people are generally not mutually exclusive and it is therefore difficult to isolate the impacts and effects of dogs alone on soils and vegetation. It is important to note that dogs are viewed as a contributing factor to impacts associated with soils and vegetation, but the total elimination of dogs in the park would not eliminate effects on soils and vegetation, because visitors without dogs would continue to visit the park and use the trails/roads at GGNRA. Disturbance by all manner of visitors as well as by dogs has occurred and currently occurs in GGNRA as an existing condition. However, visitors with dogs could impact natural resources to a greater extent than visitors without dogs.

Soils and vegetation can be both indirectly and directly affected by recreational activities. Vegetation can be affected indirectly by trampling through the consolidation of the soil and directly by treading upon the plant itself (Bates 1935, 476). Trampling, which initially bends and weakens leaves and branches, can ultimately cause breaking and injury to the plant (Douglass et al. 1999, 9.3; Bates 1935, 476). Some plant species can be damaged and completely destroyed by the action of treading, while other species are comparatively immune to harm of this kind (Bates 1935, 476). Vegetation along trails is particularly vulnerable to damage (Cole 1978, 281). Sensitive environments can be subject to physical disturbance by dogs (through digging or bed-making), and dogs could damage vegetation and soils, with resulting influences on vegetation, soils, and wildlife such as small mammal populations (Sime 1999, 8.9). “High foot traffic (both people and dogs) resulting from an off-leash area would result in trampling and disturbance of vegetation” (Andrusiak 2003, 5). In addition, heavy off-leash dog use increases deterioration of native dune communities (Shulzitski and Russell 2004, 5). As cited in Andrusiak (2003, 3.2), the Greater Vancouver Regional District collected observational data on dog walkers and dogs in individual regional parks and observed dogs in the water and uprooting beach and dune vegetation by digging. Both dog and human traffic compact the soil and crush vegetation and dogs can dig in the soils; this is unlikely to have significant effects on the unvegetated areas, but could contribute to degradation of vegetated areas (Andrusiak 2003, 3.2).

The preservation of natural resources is addressed in 36 CFR 2.1. Vegetation damage is described in 36 CFR 2.1 (a) (1) (ii)). The following is applicable to vegetation and soils, and is prohibited: possessing, destroying, injuring, defacing, removing, digging, or disturbing from its natural state. NPS rangers have recorded damages to vegetation from dogs at GGNRA that are in violation of the above regulation. Dog-related incidents were recorded at GGNRA using law enforcement’s criminal incident records. From 2001 through 2011, a total of 4,932 dog-related incident reports were filed at the park, which represents 11 percent of all incident reports filed during that period at GGNRA.

Trailside plant communities usually contain locally occurring species and invaders from other sources, which are favored by the environmental conditions adjacent to trails (Cole 1978, 282). Dogs (as well as horses and hikers) may also alter dispersal of native and non-native plants along trail corridors, as seeds that adhere to their paws and fur are then transported to other locations, possibly resulting in the spread and establishment of new populations of invasive and/or non-native plants (Sime 1999, 8.9-8.10). Park staff have observed the creation of social trails by dogs and dog walkers also increases erosion, damages root systems, further fragments habitat, and can alter reproductive success by isolating plants, thus reducing the opportunities for cross-pollination and effective seed dispersal. However, this has not been documented in peer-reviewed studies.

The primary detrimental soil impacts from recreation are loss of productivity, erosion, compaction, rutting, and displacement (Douglass et al. 1999, 9.5). Impacts to soils can generally result in impacts to vegetation. For example, the changes in soils as a result of trampling and compaction can affect plant growth and survival, although the effects are highly variable and dependent upon existing conditions (Kuss 1986, 643 and 647). 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 (Douglass et al. 1999, 9.3). 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. Trampling and digging by dogs can lead to accelerated erosion of cliffs and dunes at GGNRA, which can also be exacerbated by high visitor traffic. Heavy dog use can cause soil compaction or erosion. Although this has not been documented in peer-reviewed studies, these affects have been observed by park staff at GGNRA and are visible from aerial photography of Fort Funston. In areas with unconsolidated or unvegetated surficial deposits, dog traffic can physically move the soil, but other factors also influence soils such as human traffic, wind, and storm events. Dog traffic can compact the soil, which could kill vegetation and expose the soil to erosion although this has not been documented in peer-reviewed studies. 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 as well as hikers and equestrians 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 at GGNRA. This has occurred at Homestead Valley, Alta Trail, Oakwood Valley, Marin Headlands, Baker Beach, Lands End, Fort Funston, Mori Point, Sweeney Ridge/Cattle Hill, and Pedro Point Headlands.

Dog waste contains nutrients and can increase the amount of nitrogen and phosphorus in the soil (CRCCD 2009, 1). Soils and vegetation can be affected by dogs through defecation and urination, although this has not specifically been documented in peer-reviewed studies. The act of “marking” (scent marking with urine) could also affect vegetation by concentrating nutrients in particular areas. Although nitrogen and phosphorus are nutrients required for plant growth, dog waste could increase the amount of nutrients in the soil above natural levels; dog urine could increase the natural salinity of soil. An increase in nutrients from dog excrement in concentrated areas could result changes in plant species and distribution as well as changes in soil organisms. Nutrient addition to nutrient-poor serpentine soils can alter soil chemistry, which may result in changes to the plants that occur in these soils (USFWS 1998a, I-12). At sites with serpentine soils, adding nutrients could change soil composition and eventually cause detrimental effects on sensitive plant species adapted to serpentine soils.

At GGNRA, it is required by law that people clean up dog fecal matter, as stated in the GGNRA Compendium (appendix B). Violations have been written for park visitors at GGNRA who have not cleaned up after their dogs, under 36 CFR 2.34(a)(4), creating a “physically offensive condition” and 36 CFR 2.15 (a) (5), “failing to comply with pet excrement disposal conditions established by the superintendent.” When visitors fail to comply with pet excrement removal requirements, dog waste can accumulate in the soils and affect the vegetation. The total amount of waste can become substantial in certain areas, depending on the number of dog owners in the area and their frequency of use of the area as observed by park staff at GGNRA. Natural nutrient levels in the soils in the park can also be altered by dog waste (NPS 1999, 40).

In conclusion, very little peer-reviewed literature exists documenting disturbance to vegetation and soils specifically as a result of domestic dogs in recreational/park settings. However, NPS rangers have observed dogs affecting soils and vegetation at GGNRA sites. Dogs could affect vegetation and soils by trampling and digging. When dogs are on a 6-foot leash, it is unlikely that digging or bed-making would occur due to proximity to the owner and the physical restriction of the leash. When visitors fail to comply with pet excrement removal requirements, dog waste can accumulate in the soils and affect the vegetation. Management suggestions such as physically restraining dogs (on a leash), fencing sensitive areas, and prohibiting dogs from certain areas would protect vegetation and soils, similar to management suggestions included in the recently released *Environmental Impact Report****:*** *Significant Natural Resource Areas Management Plan* (SNRAMP)(SFPD 2011).

### **Wildlife**

Very few site-specific, peer-reviewed studies have been conducted at GGNRA for the purpose of documenting impacts to wildlife as a result of dogs. Numerous other studies from outside the park have documented disturbance to wildlife species as a result of domestic dogs in similar habitats, with similar species, or with similar conditions that occur in the park. During the past six years, park staff have collected available scientific and technical information on dog management–related topics. Types of information collected include dog management policies from other jurisdictions, shorebird data from scientists and organizations that monitor San Francisco Bay Area shorebird populations, and other topics including dog interactions with wildlife, diseases, and waste issues. The existing credible scientific literature is discussed in detail below and the potential impacts to wildlife were described as a result of this information.

This section provides some excerpts from recent incident records at the park regarding disturbances to wildlife followed by a general review and summary of the literature. The literature review was conducted to document associations between dogs, wildlife, and diseases associated with wildlife. The information has been used to supplement other information in the impacts analysis.

At GGNRA, 36 CFR 2.2 covers the protection of wildlife. Wildlife disturbance is described in 36 CFR 2.2 (a) (2) and the following is prohibited: feeding, touching, teasing, frightening or intentional disturbing of wildlife nesting, breeding or other activities. Dog-related incidents were recorded at GGNRA using law enforcement’s criminal incident records. From 2001 through 2011, a total of 4,932 dog-related incident reports were filed at the park, which represents 11 percent of all the incident reports filed for GGNRA.

Numerous studies have documented disturbance to wildlife species as a result of domestic dogs in recreational/park settings (Burger et al. 2004, 287; Davidson and Rothwell 1993, 101; George and Crooks 2006, 14; Kirby et al. 1993, 55; Lafferty et al. 2006, 2222; Lenth et al. 2008, 223; Miller et al. 2001, 131, 118; Smit and Visser 1993, 10; Thomas et al. 2003, 69; Yalden and Yalden 1990, 249). In recreational/park settings, domestic dogs and people are generally not mutually exclusive and it is therefore difficult to isolate the impacts and effects of dogs alone on wildlife. It is important to note that dogs are viewed as a contributing factor to impacts associated with wildlife, and the total elimination of dogs in the park would not eliminate effects on wildlife, because visitors without dogs would continue to visit the park and use the trails/roads at GGNRA. Disturbance by all manner of visitors and any associated recreation equipment as well as by dogs has occurred and currently occurs in GGNRA as an existing condition. Studies have shown that people with dogs disturb wildlife more than people alone (Yalden and Yalden 1990, 248-249) and that dogs may pose a different kind of threat compared to a pedestrian (Miller et al. 2001, 130). Studies have also suggested that dogs, particularly while off leash, increase the radius of human recreational influence or disturbance beyond what it would be in the absence of dogs (Banks and Bryant 2007, 2; Sime 1999, 8.4; Miller et al. 2001, 125; Lafferty 2001b, 318). For example, golden plovers (Yalden and Yalden 1990), marmots (Mainini et al. 1993, 162), mule deer (Miller et al. 2001, 131), squirrels, and rabbits (Lenth et al. 2008, 218) exhibited a greater response or reduced levels of activity when human hikers were accompanied by a dog compared to hikers without a dog. “Authors of many wildlife disturbance studies concluded that dogs with people, dogs on leash, or loose dogs all provoked the most pronounced disturbance reactions from their study animals” (Sime 1999, 8.2). Animals most often affected by disturbance from dogs include deer, small mammals, and birds (Denny 1974), although larger mammals such as bobcats and coyotes can also be affected by disturbance (George and Crooks 2006, 14-15).

The majority of domestic dogs in the United States are pets that have their food requirements met at home, thus allowing them ample energy to interact with wildlife (Lenth et al. 2008, 218). Domestic dogs behave as carnivores and at some level, still maintain instincts to hunt and/or chase (Sime 1999, 8.2) and are capable of catching and killing prey species (Lenth et al. 2008, 218). Dogs may disturb wildlife either accidentally or deliberately through chase (Andrusiak 2003). “Even if the chase instinct is not triggered, dog presence in and of itself may be an agent of disturbance or stress to wildlife” (Sime 1999, 8.3; Lenth et al. 2008, 218). “The response of animals to predation risk is exactly the same as the response to disturbance; a species with suitable habitat nearby may avoid disturbance simply because it has alternative sites to go to…By contrast, animals with no suitable habitat nearby will be forced to remain despite the disturbance, regardless of whether or not this will affect survival or reproductive success” (Gill et al. 2001, 266).

Potential direct impacts to wildlife as a result of interactions with or disturbance from domestic dogs are broadly classified into three categories: harassment, injury, or death. Secondary or indirect impacts include displacement, avoidance, abandonment of areas and habitat, physical alteration of habitat, and potential disease transmission. Harassment is defined as the disruption of normal maintenance activities, such as feeding, resting, or grooming and can include disrupting, alarming, or even chasing after wildlife. If dogs chase or pursue wildlife, injuries to wildlife could be sustained directly or indirectly as a result of accidents that occur during the chase rather than direct contact with the dog (Sime 1999, 8.4). Injuries sustained may result in death or may compromise the animal’s ability to carry on other necessary life functions resulting in eventual death, or reduced reproductive success (Sime 1999, 8.4). Dogs on leash disturb wildlife less frequently than dogs off leash, but actual direct injury or mortality to wildlife by dogs in either situation is rare (Andrusiak 2003).

The type and intensity of disturbance to wildlife by dogs is based upon many factors, including the type and sensitivity of wildlife species; environmental and seasonal conditions; individual animal experience and body condition; habitat type; type, level and regularity of visitor use; among other various factors. 2008, 222; Banks and Bryant 2007, 2-3). The modification of normal behaviors such as feeding, nesting, grooming, and resting can occur through repeated disturbance and wildlife may relocate from preferred habitat to other areas to avoid harassment (Sime 1999, 8.4).Additionally, wildlife behavioral responses to disturbance may include reduced prey intake rates, increased vigilance levels, reduction in levels of parental care, or increased time spent in flight, all of which have the potential to affect survival or fecundity, which could possibly affect overall population size (Gill et al. 2001, 266). From a population viewpoint, species most likely to be adversely affected by disturbance include wildlife with high fitness costs (Gill et al. 2001, 266), which influences the ability to survive and reproduce. The type and intensity of disturbance to wildlife by dogs is based upon many factors, including type of wildlife species (mammals versus shorebirds), habitat type (coastal habitat versus grassland), type of study (on-trail versus off-trail), among other various factors. Dog presence has been correlated with altered patterns of habitat use for wildlife species (Lenth et al. 2008, 222). The modification of normal behaviors such as feeding, nesting, grooming, resting can occur through repeated disturbance and wildlife may relocate from preferred habitat to other areas to avoid harassment, including the displacement of wildlife from public to private lands (Sime 1999, 8.4). Reactions are most often short term but may result in responses that range from direct and obvious (flight, confrontation) to covert and physiological (loss of energy, stress), which complicates the documentation of disturbance to wildlife from the presence of dogs (Sime 1999, 8.4). Although disturbances are generally nonlethal and temporary, the cumulative effects of disturbance may be significant, particularly to sensitive species (Lafferty et al. 2006, 2217). Chronic, cumulative disturbance could ultimately reduce shorebird reproduction and survivorship (Lafferty 2001a, 1949). Additionally, wildlife behavioral responses to disturbance may include reduced prey intake rates, increased vigilance levels, reduction in levels of parental care, or amount of time spent in flight, all of which have the potential to affect survival or fecundity, which could possibly affect overall population size (Gill et al. 2001, 266). From a population viewpoint, species most likely to be adversely affected by disturbance include wildlife with high fitness costs but little excess habitat available; these species are thus constrained to stay in disturbed areas and to suffer the costs in terms of reduced survival or reproductive success (Gill et al. 2001, 266).

Peer-reviewed literature has documented disturbance to wildlife species as a result of domestic dogs in recreational/park settings. Wildlife species have different threshold responses to disturbance (Pfister et al. 1992, 118), and therefore, a more detailed discussion of dog impacts to wildlife were separated into the following categories for this section: shorebirds, landbirds (or songbirds), land mammals, and marine mammals.

#### **Birds (Shorebirds and Landbirds)**

Birds usually are more sensitive to the approach of dogs than to the approach of human beings (Andrusiak 2003, ES) and the “presence of dogs may intensify bird responses to pedestrians” (Sime 1999, 8.10). Disturbance by dogs generally occurs when unleashed dogs chase feeding and roosting birds; however, birds can also be disturbed by the physical proximity of on-leash dogs and/or by barking (Andrusiak 2003, ES). It has been shown that birds react when dogs accompany walkers and that even dogs restrained on leashes can disturb birds sufficiently to induce displacement and cause a decrease in local bird fauna (Banks and Bryant 2007, 2). Although leashing makes it difficult for pets to chase birds and reduces the probability of disturbance and the number of birds impacted per disturbance, leashed pets still disturb birds (Lafferty 2001a, 1955). “Dogs can disrupt habitat use, cause displacement responses, and injure or kill birds” (Sime 1999, 8.10). In addition, the predictability of disturbance is reduced when dogs are off leash. Dogs that are off leash in natural areas during the breeding season can result in a higher level of disturbance to wildlife, including ground-nesting or colonially nesting birds (Andrusiak 2003, 20; Sime 1999, 8.4, 8.9). Birds may not habituate to dog disturbance because it is unpredictable and represents an actual physical threat (Andrusiak 2003, 3.2). Some studies have shown that local wildlife does not become habituated to continued disturbance by dogs (Banks and Bryant 2007, 2). Because shorebird species have different threshold responses to disturbance (Pfister et al. 1992, 118), the discussion of impacts to shorebirds was separated from impacts to landbirds (or songbirds) in this section as described in the paragraphs that follow.

#### **Shorebirds**

Beach nesting bird species are presumed to be the most sensitive species to disturbance, particularly several coastal plovers in the genus *Charadrius* that are endangered or threatened (Lafferty 2001b, 315) and are very likely to leave an area altogether if disturbed (Kirby et al. 1993, 56-57). Shorebirds such as the sanderling, long-billed curlew, marbled godwit, and elegant tern are considered watch list species that are sensitive to disturbance. One of the reasons that shorebirds are so vulnerable to disturbance is the lack of cover available along open beaches and shorelines, compared to more vegetated habitats that support dense cover (Andrusiak 2003, ES). Beach areas are susceptible to the usual beach activities, such as walking, jogging, fishing, and dog walking (Burger et al. 2004, 284) which can also affect shorebirds. Besides people, domestic dogs, equestrians, crows, and other birds have also been observed disturbing shorebirds (Lafferty 2001b, 318). Additional sources of disturbance to shorebirds on GGNRA beaches include aircraft, kite flying, hawks and falcons, equipment on the beach, and beach patrols. The presence of people on beaches where shorebirds congregate in foraging flocks is likely to be disruptive (Burger et al. 2004, 284) and some studies have suggested that the birds are not habituating to the presence of people (Burger et al. 2004, 286).

Although a variety of factors, including humans, cause disturbance, numerous studies have shown that shorebirds are particularly sensitive to dogs and have documented disturbance to shorebirds as a result of dogs at recreational/park settings (Kirby et al. 1993, 55; Smit and Visser 1993, 10; Yalden and Yalden 1990, 248-249; Thomas et al. 2003, 69; Lafferty 2001b, 318; Lafferty et al. 2006, 2222; Burger et al. 2004, 287; Davidson and Rothwell 1993, 101; Lafferty 2001a, 1955-1956). The sensitivity of shorebirds to disturbance by dogs may result from previous experiences of being chased or because birds instinctively view dogs as predators (Gabrielsen and Smith 1995). In a study of waterfowl and shorebirds, Davidson and Rothwell (1993) conclude that, on tidal flats, moving people and animals (especially dogs) generally creates greater disturbance than sedentary people (Davidson and Rothwell 1993, 101). Lafferty (2001a, 1958) states that in general, shorebirds at a Santa Barbara, California, beach study were very sensitive to dogs on the beach and some dogs may actively chase birds for prolonged periods (Lafferty 2001a, 1950). In a study conducted by Kirby et al. (1993) on sandy beaches with recreational activities, it was documented that shorebirds are disturbed by both walkers and dogs, with dogs responsible for 27 to 72 percent of actual disturbances and walkers responsible for 20 to 34 percent of disturbance to shorebirds (Kirby et al. 1993, 55). The same study recorded that the most common response of shorebirds to disturbances by dogs was to take flight but then return to the area once the disturbance had passed (Kirby et al. 1993, 56-57). A study by Smit and Visser (1993) observed that dogs running around on tidal flats are “very disturbing” to shorebirds (Smit and Visser 1993, 9-10). In Burger et al. (2004), research indicated (J. Burger, unpublished data 2002) that dogs are currently the prime and most important factor disturbing the shorebirds at protected beaches along Delaware Bay (Burger et al. 2004, 287). The effect of humans and dogs on the beaches can be disruptive, especially when human activity is intense, or people are on the beaches for long periods of time (Burger et al. 2004, 287). Although walking dogs on leash makes it difficult for dogs to chase birds and reduces the probability and the number of disturbances to birds, dogs walked on leash still disturb birds (Lafferty 2001a, 1955).

Dogs can disrupt habitat use, cause displacement responses, and possibly injure or kill birds (Sime 1999, 8.10), although as stated above, direct injury or mortality is rare (Andrusiak 2003). Migrating species, especially shorebirds, use stopover areas to rest and feed, replacing energy consumed between stops (Burger et al. 2004, 287; Pfister et al. 1992, 115). Dogs disturbing foraging birds may diminish a bird’s foraging time and can result in a loss of energy required to migrate, and can significantly affect their survival during migration (Andrusiak 2003). Even if dogs do not directly affect habitat or kill birds, disturbances cause birds to suspend feeding and/or expend energy in flight, movement, or vigilance (Lafferty 2001a, 1950). Shorebirds are known to have relatively high metabolic rates compared to other bird species and use more energy than other non-passerine birds of their size (Kersten and Piersma 1987, 182, 185). Therefore, even short-term disturbances to feeding and migration behavior could affect energy expenditure in shorebirds (Kersten and Piersma 1987, 182, 185).

Bird responses to “danger” through disturbance may involve becoming immobile or crouching down, rushing for cover, or even approaching the predator in a distraction display when defending young (Davidson and Rothwell 1993, 97). Many anti-predator responses, however, involve taking flight, which is a costly activity in terms of energy expenditure (Davidson and Rothwell 1993, 97). Waterfowl, especially on nonbreeding grounds, mostly live in open habitats and generally use flight as a response to being disturbed. Flying is a major natural element in the life of birds, but it uses a lot of energy and the increased need in order to fly to escape disturbance could affect survival (Davidson and Rothwell 1993, 97). Specifically, foraging can be disrupted by the presence of people and dogs on foraging beaches, and shorebirds respond by flying away (Burger et al. 2004, 287). It has been suggested that when migrant shorebirds have a limited period of time at a stopover place, with limited foraging space, behavioral disruptions during foraging have consequences in terms of needed weight gain (Burger et al. 2004, 287). Therefore, in response to flying away, shorebirds could either increase their energy intake at their present (disturbed) feeding sites when undisturbed, or move to an alternative feeding site (Davidson and Rothwell 1993, 97). An alternative feeding site may not necessarily be preferred habitat of the disturbed shorebirds. Shorebirds roosting or feeding in areas accessible to on-leash or off-leash dogs may relocate to areas of the beach where dogs are prohibited, or may use areas only when dogs are absent (Andrusiak 2003, ES). This relocation could use energy that birds require to survive during migration (Andrusiak 2003, ES). Therefore, any overall reduction in their energy balance as a result of these responses is the impact of disturbance on energy reserves and ultimately survival (Davidson and Rothwell 1993, 97). Studies have shown that disturbance at high tide resting areas at a coastal barrier beach displaced shorebirds and seemed to cause long-term declines in abundance (Pfister et al. 1992, 115). The most serious disturbance in a study conducted by Pfister et al. in 1992 was likely caused by pedestrians and dogs, but it is important to note that a vehicle count was used in this study as an index of disturbance (Pfister et al. 1992, 118). Disturbance has contributed to the decline in a number of shorebird species, including two species studied by Pfister et al. (1992), the red knot and short-billed dowitcher (Pfister et al. 1992, 123). Disturbances as a result of domestic dogs can also affect shorebird survival during the nesting period. Dogs can cause temporary abandonment of shorebird nests containing eggs or young, as well as crushing eggs or preying on young (USFWS 2007a, K-7). If a parent shorebird is forced away from a nest, its eggs may die due to exposure or predation (Lafferty 2001b, 315). Shorebird studies have also indicated that front-beach or low beach (near the water’s edge) species are more severely affected by disturbance than back-beach (or upper beach) species (Pfister et al. 1992, 123; Lafferty 2001a, 1960). Front-beach species are exposed to more direct human disturbance because recreational activities are concentrated on the front side of the beach.

Surveys conducted during the years 1993 through 2006 show that sanderlings are the most common shorebird on all beaches at GGNRA (Beach Watch 2006, 10). A study conducted by Thomas et al. (2003) in Monterey on the Central California coast found that the number of people, type of human activity, and the presence of free running dogs had a significant effect on the foraging time of sanderlings (Thomas et al. 2003, 69). Although the sample size was low, the most significant negative factor was the presence of free running dogs on the beach (Thomas et al. 2003, 67). At the study sites, leash laws were in existence, but the majority of people still let their dogs run free (Thomas et al. 2003, 71).

#### **Landbirds (Songbirds)**

This category encompasses landbird species such as songbirds in grasslands, forested lands, shrublands, and other non-coastal habitats. In a study of forested areas by Banks and Bryant (2007), ground-dwelling birds were the most affected by dogs (Banks and Bryant 2007, 2). This study suggested that birds were seeking refuge away from the immediate vicinity of the threat from dog walking and confirmed that birds responded uniquely and additively when dogs accompany walkers (Banks and Bryant 2007, 2). Even dogs restrained on leash can disturb birds sufficiently to induce displacement and cause a decrease in local bird fauna (Banks and Bryant 2007, 2). However, other studies conducted in grasslands for vesper sparrows (*Pooecetes gramineus*) and western meadowlarks (*Sturnella neglecta*) have shown that the smallest area of influence, the shortest flush distance, and the shortest distance moved resulted from the dog-alone treatment, and that these responses were greater for the pedestrian-alone and dog-on-leash treatments (Miller et al. 2001, 124). Even though the dog-alone treatment resulted in the smallest area of influence for grassland birds in the study, the authors state that the area of influence will increase if recreationists allow their dogs to roam away from a trail (Miller et al. 2001, 131). This study also stated that either dogs were not viewed as a threat to songbirds or that dogs may have posed a different type of threat in which the birds responded by holding their position until the last moment, trying to remain undetected (Miller et al. 2001, 129-130). One shortcoming of the study was that the authors did not stop and view the subjects for extended periods of time (Miller et al. 2001, 131). For American robins (*Turdus migratorius*) in the forested habitat, the area of influence, flush distance, and distance moved did not generally differ between the pedestrian-alone and dog-on-leash treatments (Miller et al. 2001, 130). This is possibly due to the fact that the domestic dog is not typically considered a significant predator on songbirds and these bird species may not have perceived dogs as a threat (Miller et al. 2001, 130). Another songbird study to document the effects as a result of on-leash and off-leash dog areas was completed by Forrest and St. Clair (2006) in deciduous, coniferous, and grassland communities of an urban park. The songbird species black-capped chickadee was the most abundant species observed in the study, accounting for 30 percent of all observations. Other common species, each accounting for at least 5 percent of all observations, were the least flycatcher, red-eyed vireo, red-breasted nuthatch, and yellow warbler (Forrest and St. Clair 2006, 55). The data showed no difference in the diversity and abundance of birds within on-leash and off-leash areas (Forrest and St. Clair 2006, 55). The results of this study concluded that off-leash dogs have no impact on the diversity or abundance of birds because these species are fairly tolerant of moderate levels of human activity (Forrest and St. Clair 2006, 61). In conclusion, it is possible that dogs can disturb landbirds such as songbirds, although ground-dwelling birds may be particularly affected by dogs (Banks and Bryant 2007, 2), while other songbirds may be more tolerant to disturbance by dogs (Forrest and St. Clair 2006, 55).

#### **Land Mammals**

As stated above, domestic dogs behave as carnivores (Lenth et al. 2008, 218) and animals that are prey of wild canids (carnivorous mammals of the family *Canidae*, which includes dogs, wolves, foxes, coyotes, and jackals) may perceive dogs as predators and may be subject to nonlethal, fear-based alterations in physiology, activity, and habitat use (Lenth et al. 2008, 218). When dogs participate in “marking” (scent marking with urine), it could also attract wildlife or cause wildlife to avoid an area. The “impacts of dogs on native carnivores are not well understood, but may include disruption of carnivore behavior through chasing after, barking, and scent marking via urine and scat” (George and Crooks 2006, 14). As cited in Lenth et al. (2008, 223), the City of Boulder Open Space and Mountain Parks has noted that dogs often defecate very soon after arriving at a trail, and many visitors do not walk dogs much beyond the trailhead. Recreational trails with abundant dog scent could appear to carnivores to be linear dog territories, necessitating increased vigilance and activity (Lenth et al. 2008, 219). In a study conducted by George and Crooks (2006, 14-15), coyotes specifically showed a trend of temporal displacement in response to dogs, and bobcats were also affected by the presence of dogs. These inverse correlations of dog and native carnivore activity in areas that allow dogs indicate that native carnivores may be avoiding trailheads where dog activity is concentrated (Lenth et al. 2008, 223). Lenth et al. (2008, 223) also found that wildlife species that are preyed upon by native canids demonstrated sensitivity to the presence of domestic dogs (Lenth et al. 2008, 223). Reed and Merenlender (2008 and 2011) studied the impacts of recreation on native and non-native carnivores (including domestic dogs) using scat samples from 28 parks and preserves in northern California (Reed and Merenlender 2008, 1; Reed and Merenlender 2011, 504). In the 2008 study, domestic dogs were detected (through scat samples) more frequently and in much greater densities than other carnivores in the recreation areas, but there was no evidence to suggest that native carnivores avoided recreational trails (Reed and Merenlender 2008, 7). The 2008 study concluded that native carnivore density was much higher in protected areas compared to areas with recreation (Reed and Merenlender 2008, 1). Similarly, the 2011 study found that native carnivore species richness was greater and the relative abundances of native coyotes (*Canis latrans*) and bobcats (*Lynx rufus*) were greater in the sites that did not allow human visitors or dogs (Reed and Merenlender 2011, 504). However, abundances of bobcats and all carnivores declined as the number of visitors increased (Reed and Merenlender 2011, 504). One shortcoming of the Reed and Merenlender studies was that the 2008 study did not describe how human recreation disturbs wildlife (Reed and Merenlender 2008, 7) and the 2011 study did not separate the effects of humans from the effects of dogs (Reed and Merenlender 2011, 513). Additionally, scat may be an unreliable indicator for sites that allow dogs, since dogs can eat or roll in scat of other wildlife.

In addition to affecting carnivore behavior, dogs can physically damage burrows used by ground-dwelling mammals (squirrels, pocket gophers, chipmunks, and other rodents) by digging up or collapsing the burrows. Although not occurring in GGNRA, a study of marmots by Mainini et al. (1993) provides some indication of potential responses of ground-dwelling mammals to the presence of dogs and/or people. This study showed that the reaction of marmots was least when hikers remained on trails and greatest from hikers with a free-running dog (Mainini et al. 1993, 163). With trail hikers and no dogs, the marmots hardly ever took refuge in the burrows; this happened more often in the experiments when these hikers had a leashed dog and with cross-country hikers (Mainini et al. 1993, 163). Even more animals took to their burrows in the experiments with burrow hikers (people walking off the trail and across the marmot burrow) or hikers with free-running dogs (Mainini et al. 1993, 163). A free-running dog elicited more whistles and more animals retreated into their burrows than in the experiments with a leashed dog on the trail, which shows that a free-running dog represents a greater risk than a leashed dog (Mainini et al. 1993, 164). Marmots observed were located in the vicinity of frequently used trails; comparison studies of marmots living in more remote areas had even stronger reactions (Sime 1999, 8.11). Other studies have shown that small mammals, including squirrels (*Sciurus* spp*.*) and rabbits (*Sylvilagus* spp.) have exhibited reduced levels of activity within 50 meters of trails in areas that allowed dogs when compared with areas without dogs (Lenth et al. 2008, 218).

In conclusion, dogs behave as carnivores (Lenth et al. 2008, 218) and could affect wildlife such as small mammals through chasing and occasionally capturing individuals as well as digging and collapsing burrows. Dogs have the potential to encounter larger mammals such as deer, bobcats, or coyotes and may either displace these larger mammals from high quality habitat that is degraded by the presence of dogs (George and Crooks 2006, 14-15) or cause increased vigilance or activity (Lenth et al. 2008, 219).

#### **Disease**

Domestic dogs that are not vaccinated can potentially introduce diseases (distemper, parvovirus, and rabies) and transport parasites from, or transmit diseases to, wild animals or wildlife habitats (Sime 1999, 8.2), although the role of dogs in wildlife diseases is not well understood (Sime 1999, 8.4). While dogs can be vaccinated against many of these diseases, adherence to recommended vaccination schedules is necessary for even adult dogs to maintain immunity (Sime 1999, 8.12). Domestic dogs can be vectors for transmission diseases as canine distemper, which can affect wild carnivore species (Sime 1999, 8.9). Viruses related to the canine distemper virus have been documented in the deaths of a wide variety of wild animals from seals, dolphins (Delphinidae), and porpoises (Phocoenidae) in Russia to lions in Africa, but there are fewer documented instances of deaths caused by canine distemper in areas where domestic animals are regularly vaccinated (Mills 1999). Dog feces have been implicated in the transmission of muscle cysts (*Sarcocystis* spp.), which can infect a variety of ungulate species, including mule deer and white-tailed deer. Dogs may also introduce diseases or parasites to small mammals. While dog impacts on wildlife likely occur at the individual scale, the results may still have important implications for wildlife populations (Sime 1999, 8.4). Rabies is a preventable viral disease transmitted in the saliva of infected mammals and is the most common source of infection for humans and domestic animals such as dogs (City and County of San Francisco 2010, 1). More than 90 percent of all animal rabies cases reported to the Centers for Disease Control and Prevention (CDC) each year occur in wild animals like raccoons, skunks, bats, and foxes (City and County of San Francisco 2010, 1). In California, domestic animals, farm animals, and pets such as dogs, cats, and cattle account for approximately 3 percent of the reported rabies cases (City and County of San Francisco 2010, 1). In San Francisco, all animal rabies cases in the past 60 years occurred in bats, recently at a rate of one to five confirmed cases per year from 2004 through 2009 (City and County of San Francisco 2010, 1). Studies by Riley et al. show that proximity to urban areas (which describes the situation for wildlife in GGNRA lands) or contact with humans and their pets can increase the risk of disease exposure for wild carnivore populations (e.g., canine parvovirus in foxes and feline calicivirus in bobcats) (Riley et al. 2004, 12, 18). However, the collection of dog waste and reducing feral and unaccompanied domestic animals in parks could help reduce the risk of transmission of many diseases (Riley et al. 2004, 19).

#### **Conclusion**

In summary, peer-reviewed literature has documented disturbance to wildlife species as a result of domestic dogs in recreational/park settings (Burger et al. 2004, 287; Davidson and Rothwell 1993, 101; George and Crooks 2006, 14; Kirby et al. 1993, 55; Lafferty et al. 2006, 2222; Lenth et al. 2008, 223; Miller et al. 2001, 131; Smit and Visser 1993, 10; Thomas et al. 2003, 69; Yalden and Yalden 1990, 249). Each of the wildlife species discussed in detail above, including shorebirds, landbirds (songbirds), land mammals, and marine mammals have different threshold responses to disturbance (Pfister et al. 1992, 118). Management actions such as closing or limiting areas to people and/or dogs have been suggested to reduce disturbance to wildlife species as demonstrated in studies discussed above (Banks and Bryant 2007, 2; George and Crooks 2006, 14; Lafferty et al. 2006, 2224; Miller et al. 2001, 131; Reed and Merenlender 2011, 513). Similarly, management actions such as enforcing or requiring leash laws have also been suggested to reduce impacts to wildlife as a result of domestic dogs (Burger et al. 2004, 287; Lenth et al. 2008, 223; Miller et al. 2001, 131; Thomas et al. 2003, 71). Because recreational activities that occur on trails can be defined as frequent and spatially predictable, animals may habituate to these activities, though some more sensitive species may not. However, off-trail recreation can be both infrequent and unpredictable; animals are not accustomed to activity in these areas, resulting in a greater area of influence, flush distance, and distance moved (Miller et al. 2001, 130). Specifically, the spatial behavior of off-leash dogs is unpredictable; and when dogs wander off trails, they are more likely to elicit flushing responses (Miller et al. 2001, 130; Lenth et al. 2008, 223). Some studies have shown that “local wildlife does not become habituated to continued disturbance” by dogs (Banks and Bryant 2007, 612).

When compliance is assumed, management alternatives that would prohibit dogs from accessing wildlife habitats would eliminate disturbance to wildlife from dogs chasing after wildlife and barking at wildlife, as well as potential direct or indirect mortality as a result of dog/wildlife encounters. Prohibiting dogs from areas also prevents habitat degradation and loss of species that are sensitive to the presence of dogs. On-leash dog walking restrictions would physically restrain dogs, reducing direct impacts on wildlife and wildlife habitat, and should also eliminate any potential chasing after wildlife. Additionally, dog waste, nutrient addition, trampling, digging, or spread of invasive species would either be reduced or eliminated if dogs were prohibited or leashed in certain areas. Because of mobility, wildlife can usually avoid areas with dogs present during peak activity or habituate to these activities, but the displacement of wildlife from high quality habitat and preferred habitat that is degraded by the presence of dogs would indirectly affect wildlife. On-leash dog walking restrictions would physically restrain dogs, which would protect wildlife and reduce chasing after shorebirds and marine mammals on the beach, but on-leash dogs would still be able to disturb wildlife and/or cause a flight response through their presence on the beach and by lunging/barking at roosting, resting, and feeding birds. This could cause birds to flee or relocate, using energy reserves unnecessarily, and could result in the loss of preferred habitat. Disease transmission that results from direct contact between dogs and wildlife, especially canids such as coyotes, would also be reduced but not necessarily eliminated as a result of dog waste removal requirements in this draft plan/SEIS. Management alternatives requiring on-leash dog walking on beaches would still result in impacts as a result of disturbance to resting and feeding shorebirds, waterfowl, and stranded marine mammals. Proposed ROLAs would result in the loss of habitat for wildlife species and may result in the temporary or permanent displacement of wildlife species from those areas. The ROLA may also lead to avoidance of the surrounding area by wildlife due to the concentration of dogs and noise, as well as the elevated amount of dog waste and scent marking. However, the concentration of off-leash dog use in a ROLA would reduce the likelihood of off-leash dogs disturbing wildlife or wildlife habitat outside of ROLAs when compliance is assumed.