Information Sheet on Ramsar Wetlands (RIS) – 2009-2012 version

1. Name and address of the compiler of this form:

Andrea Jones, Mike Perlmutter
Audubon California
4225 Hollis Street
Emeryville, CA 94608

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DD MM YY | Designation date | Site Reference Number

Contact for follow-up:
Beth Huning or Sandra Scoggin
San Francisco Bay Joint Venture
735 B Center Blvd.
Fairfax, CA 94930
(415) 259-0334, fax (415) 259-0340
bhuning@sfbayjv.org, sscoggin@sfbayjv.org

2. Date this sheet was completed/updated:
25 April, 2012

3. Country:
United States of America

4. Name of the Ramsar site:
San Francisco Bay/Estuary (SFBE)

5. Designation of new Ramsar site or update of existing site:
This RIS is for:
a) Designation of a new Ramsar site ☑

6. For RIS updates only, changes to the site since its designation or earlier update:
Not applicable.

7. Map of site:
a) A map of the site, with clearly delineated boundaries, is included as:
i) **a hard copy** (required for inclusion of site in the Ramsar List): ☑;
ii) **an electronic format** (e.g. a JPEG image) ☑;
iii) **a GIS file providing geo-referenced site boundary vectors and attribute tables** ☑.

b) Describe briefly the type of boundary delineation applied:
The SFBE boundary encompasses the lands and waters within the historical and modern boundaries of the high tides of San Francisco, San Pablo, and Suisun Bays. Government and conservation non-profit organization lands have been included and developed and private lands excluded. (See Maps 1 and 2.)

8. Geographical coordinates (latitude/longitude, in degrees and minutes):
The coordinates of SFBE are: approximate central coordinate of SFBE is located at 37°52'N, 122°23'W.
North: 38.280930 dd = 38° 16' 51.3474"
East: -121.748057 dd = -121° 44' 53.0052"
South: 37.410764 dd = 37° 24' 38.7504"
West: -122.642570 dd = -122° 38' 33.252"
The approximate central coordinate of SFBE is located at 37°52'N, 122°23'W.

9. General location:
SFBE is located along the Pacific Coast of central California, United States. It is bordered by counties: San Francisco, San Mateo, Santa Clara, Alameda, Contra Costa, Solano, Napa, Sonoma, and Marin. Situated at its shore, the most prominent large city is San Francisco, home to a human population of ~800,000.

10. Elevation: (in metres: average and/or maximum & minimum)
Elevation of the SFBE ranges from sea level within submerged habitats, to 10 meters above sea level (maximum) in bayland habitats (See Map 3). Some historic wetland areas have subsided 8-15 feet below sea level.

11. Area: (in hectares)

Protected lands and nominated open water within the SFBE used for this designation are 43,108.14 hectares. Open bay waters and tidal flats contribute an additional 115,602.743 hectares for a total of 158,710.883 hectares. 54,053 hectares of privately held baylands were not considered for this nomination.

12. General overview of the site:
San Francisco Bay is the largest estuary on the Pacific Coast of the United States, encompassing approximately 1,600 square miles, and draining about 40% (60,000 square miles) of the State of California through the Sacramento and San Joaquin Rivers, which pass through the San Francisco Bay-Delta to the Pacific Ocean. Despite losing one third of its size and approximately 85% of its wetlands to development, agricultural and salt flat conversion, and fill, SFBE remains critically ecologically important, accounting for 77% of California's remaining perennial estuarine wetlands[1]. SFBE is widely recognized as one of North America's most ecologically important estuaries, providing key habitat for a broad suite of flora and fauna, and a range of ecological services such as flood protection, water quality maintenance, nutrient filtration and cycling, carbon sequestration. SFBE is home to many plant species and over 1,000 species of animals[2], including endemic and conservation status species.

13. Ramsar Criteria: Tick the box under each Criterion applied to the designation of the Ramsar site.

1	2	3	4	5	6	7	8	9
☑	☑	☑	☑	☑	☑	☑	☑	☑

14. Justification for the application of each Criterion listed in 13 above:

SFBE meets or exceeds Ramsar criteria 1-9. Justifications for each criteria follow.

Criterion 1. Contains a representative, rare, or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region. Historically, wetlands accounted for 5% of California's land area, but approximately 91% have been lost, reducing their relative land cover to less than 0.5%. California retains 44,456 acres of perennial estuarine wetland habitat, with 77% in the SFBE[3]. These wetlands provide many ecological services such as flood control, aquifer recharge, regional climate mediation, and water quality maintenance[4].

Criterion 2. Supports vulnerable, endangered, or critically endangered species or threatened ecological communities. SFBE and associated wetlands support 21 animal and 5 plant species that are listed as threatened or endangered by the United States of America and/or California governments (Appendix 1). In addition to federal and state listed species, SFBE and associated wetlands also support 85 species considered endangered or occupying only a restricted range globally and/or within California as ranked by the California Natural Diversity Database (Appendix 2). Some of the vulnerable, endangered, or critically endangered species of the SFBE complete their entire life cycle within the Bay, while others spend portions of their lives in the Bay for forage and refuge, use the habitat as nursery grounds during early life stages, or as migratory staging grounds, for overwintering, or as stopover points.

Criterion 3: Supports populations of plant and/or animal species important for maintaining the biological diversity of a particular biogeographic region. SFBE wetlands support ten endemic taxa (eight animal and two plant) and also habitat for a number near-endemic or range-limited species, subspecies, and races of flora and fauna. See Appendix 3 for details.

Criterion 4: A wetland should be considered internationally important if it supports plant and/or animal species at a critical stage in their life cycles, or provides refuge during adverse conditions. SFBE is a renowned wintering location for migratory shorebirds and waterfowl along the Pacific Flyway. Hundreds of thousands of shorebirds reside in SFBE from approximately August-May for feeding and resting and building up fat reserves essential to supporting long-distance migrations to and from arctic or boreal forest breeding sites thousands of miles to the north. Similarly, waterfowl, especially diving ducks, depend on the Bay as a wintering ground to rest and feed. See Criterion 5 for more details on the SFBE's importance as a waterbird wintering ground.

SFBE is within close proximity to three Ramsar sites: Bolinas Lagoon, Tomales Bay, and the Laguna de Santa Rosa.. Bolinas Lagoon and Tomales Bay are also important feeding and resting grounds for migratory shorebirds and waterfowl en route to SFBE and beyond. The combined tidal wetlands of SFBE, Bolinas Lagoon, and Tomales Bay may buffer against localized disturbance impacts at any one site by offering alternative feeding and resting locations for waterbirds. SFBE, with its myriad aquatic habitats, is also a renowned fish spawning, rearing, and migratory habitat that supports many fish species at critical and vulnerable life stages. (See Criterion 8.) The Bay's subtidal habitats are also similarly important for approximately 500 species[5] of aquatic invertebrates.

Criterion 5: A wetland should be considered internationally important if it regularly supports 20,000 or more waterbirds. SFBE is noted for hosting more wintering and migrating shorebirds than any other estuary along the U.S. Pacific Coast south of Alaska[6]. For this, SFBE is recognized as a Site of Hemispheric Importance by the Western Hemispheric Shorebird Reserve Network. Bay-wide surveys conducted each fall of 2006-2008 averaged over 340,000 shorebirds, including 29 species[7]. 589,000-932,000 shorebirds were counted during spring surveys (during the height of migration) conducted between April 1988 and April 1993[8]. Compared to the major wetlands along the Pacific Coast, SFBE held an average of 55.7% (37.8 to 90.1%) of the total number of individuals of 13 key shorebird species. In particular, a significant portion of arctic-breeding Dunlin and Western Sandpipers winter in SFBE.

SFBE is also recognized as one of 67 Areas of Continental Significance for waterfowl by the North American Waterfowl Conservation Plan[9]. SFBE is the winter home for 50 percent of the diving ducks in the Pacific Flyway[10]. The U.S. Fish & Wildlife Service midwinter waterfowl counts from 1988-2006 documents SFBE as containing 49% of the scaup population and 43% percent of the scoters of the lower Pacific Flyway, from Washington State to southern California. About 99% of SFBE's scoters are Surf Scoters. Mid-winter SFBE waterfowl surveys from 1992-2007 averaged 182,818 birds in mid-January[11]. Additionally, from 2006-2009, Suisun Marsh in the eastern portion of the Estuary averaged 99,649 birds. Within the larger totals of birds, there are hotspots where over 20,000 waterbirds regularly congregate. San Pablo Bay hosts at least 20,000 ducks in early winter until mid-January. In the East Bay, San Leandro Bay is critically important for scoters all winter, but becomes increasingly more important over winter as the majority of the SFBE population moves there before migration.

The importance of SFBE and its wetlands has also been recognized by the National Audubon Society, which has designated portions of the Bay's habitats as nine distinct Important Bird Areas for the vast numbers of shorebirds, waterfowl, and endangered, threatened, and sensitive bird species populations.

Criterion 6: A wetland should be considered internationally important if it regularly supports 1% of the individuals in a population of one species or subspecies of waterbird. SFBE supports 1% or more of the individuals of populations from the 23 following waterbird species: Double-crested Cormorant, Northern Shoveler, Canvasback, Scaup (Greater and Lesser), Surf Scoter, Ruddy Duck, California Black Rail, California Clapper Rail, Black-necked Stilt, American Avocet, Black-bellied Plover, Semipalmated Plover, Dowitcher (Long and Short-billed), Marbled Godwit, Whimbrel, Long-billed Curlew, Willet, Western Sandpiper, Least Sandpiper, Dunlin, California Gull, Least Tern, and Forster's Tern. (See Appendix 4 for data and references. Due to the size of Appendix 4, it is included on a CD but not on the printed copy of this nomination.)

Specific criteria based on fish: **Criterion 7: A wetland should be considered internationally important if it supports a significant proportion of indigenous fish subspecies, species or families, life-history stages, species interactions and/or populations that are representative of wetland benefits and/or values and thereby contributes to global biological diversity.** SFBE supports three fish taxa endemic to the Bay and nearby waters: Delta smelt (*Hypomesus transpacificus*), San Francisco topsmelt (*Atherinops affinis affinis*), and Tule perch (*Hysterocarpus traskii traskii*) in addition to four local races of Chinook salmon (*Onchorhynchus tshawytscha*).

The federally endangered Delta smelt occurs only in the San Francisco Bay-Delta Estuary. The species spends much of its lifecycle in the Sacramento and San Joaquin Rivers and deltas which feed into SFBE. Juvenile and adult smelt also may spend time adjoining northern SFBE, where they have been observed in Suisun and San Pablo Bays and the Napa River[12]. Although exact population estimates are unknown[13], relative population levels have been monitored for several decades by federal and state water export facilities[14]. Counts from 2002-2007 showed low abundance[15].

Longfin smelt are widely but patchily distributed along North America's Pacific coast but historically occupied only three estuaries and the lower reaches of their larger tributary rivers in California: San Francisco Bay-Delta Estuary, Humboldt Bay, and Klamath River Estuary. Presently, the largest and southernmost self-sustaining longfin smelt population is in the SFBE-Delta Estuary. The Humboldt Bay and Klamath River populations are thought to be extinct, and the small numbers of fish recently reported in the Russian River do not likely represent a self-sustaining population.

There are three recognized subspecies of tule perch, one of which occurs from the Sacramento-San Joaquin River drainage through SFBE. The range of this subspecies has contracted from its historic distribution, which formerly extended beyond the Bay to the Pajaro and Salinas Rivers[16].

Sacramento-San Joaquin Chinook salmon are grouped within four distinct races, based on the timing of adult spawning migration: winter, spring, fall, and late-fall. Three of these races are presently of conservation concern and have the following status: winter run (federally and state endangered), spring run (California Class 1 qualified as threatened or endangered), and late-fall fun (California listed Class 2 special concern)[17].

Criterion 8: A wetland should be considered internationally important if it is an important source of food for fishes, spawning ground, nursery and/or migration path on which fish stocks, either within the wetland or elsewhere, depend. The extent and diversity of SFBE fish habitats (varying salinities, substrates, water depth, etc.) make

it important to over 130 species of resident and migratory marine, estuarine, and anadromous fish species[18] through many lifecycle stages. Marine species tend to use the Bay as spawning and nursery habitat while estuarine species reside in the Bay throughout their life cycle. For anadromous Chinook Salmon, steelhead, and sturgeon, the SFBE is a critical migratory pathway between foraging areas in the Pacific Ocean and spawning grounds upstream in the SFBE's tributary rivers[19]. SFBE is identified as Essential Fish Habitat for various fish species life stages managed under three Fisheries Management Plans of the National Marine Fisheries Service. Additionally, SFBE is designated as Habitat Areas of Particular Concern for various fish species within the Pacific Groundfish Fisheries Management Plan.[20] SFBE supports spawning Pacific Herring, which is not only a major fishery but the roe provide forage for diving waterfowl in the Central Bay.

Specific criteria based on other taxa

Criterion 9: A wetland should be considered internationally important if it regularly supports 1% of the individuals in a population of one species or subspecies of wetland-dependent non-avian animal species The tidal wetlands of SFBE support the entire population of the Salt Marsh Harvest Mouse (*Reithrodontomys raviventris)*, a federally-listed endangered species. This species has seen dramatic declines from over 150 years of habitat destruction and degradation of the tidal marshes. Salt Marsh Harvest Mice are extremely rare and difficult to monitor; the best population estimate comes from the Salt Marsh Harvest Mouse and California Clapper Rail Recovery Plan published by the U.S. Fish & Wildlife Service in 1984: "a few thousand individuals at the peak of their numbers each summer, distributed around the Bay marshes in small, disjunct populations, often in marginal vegetation and almost always in marshes[21] without an upper edge of upland vegetation.[22]"

The Salt Marsh Wandering Shrew (*Sorex vagrans haliocetes*), a subspecies of the vagrant shrew, is currently found only within the tidal marshes of South San Francisco Bay although historically it was found in marshes north to San Pablo Bay. Little is known of this subspecies which is currently listed as a "Mammalian Species of Special Concern" by the California Department of Fish & Game and as a candidate species for listing in Category 2 by the U.S. Fish & Wildlife Service[23].

The Suisun Shrew (*Sorex ornatus sinuosis*) is currently limited to scattered, isolated remnants of natural tidal salt and brackish marshes surrounding the northern borders of Suisun and San Pablo bays[24].

The endangered San Francisco Garter Snake (*Thamnophis sirtalis tetrataenia*) is endemic to the San Francisco Bay Area, with most of its population located in marshes and nearby habitats along the Bay side and Pacific Ocean side of San Mateo County. In 1993, the total population was estimated to be 1,500 snakes. Two marsh areas within SFBE provide current habitat for the San Francisco Garter Snake.

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15. Biogeography:

a) biogeographic region:

SFBE occurs within the Bay Area/Delta biogeographic region, one of the California regions identified by the Inter-agency Natural Areas Coordinating Committee in 2004 (See Map 4).

b) biogeographic regionalisation scheme (include reference citation):

The Inter-agency Natural Areas Coordinating Committee regions have been adopted for use as bioregion boundaries by the California Biodiversity Council. These regions were originally established in 1992 and were subsequently updated by the California Department of Forestry and Fire Protection in 2004[25].

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16. Physical features of the site: Describe, as appropriate, the geology, geomorphology; origins - natural or artificial; hydrology; soil type; water quality; water depth, water permanence; fluctuations in water level; tidal variations; downstream area; general climate, etc.

The present San Francisco Bay Estuary is approximately 10,000 years old and is a product of today's high sea level, which presently floods the ancient river drainage from California's Central Valley out to the Pacific Ocean through the Golden Gate[26]. About 90% of the freshwater entering the Bay comes from the Sacramento/San Joaquin Delta, with the remaining approximate 10% originating from local streams and creeks and from wastewater treatment facilities. Today's freshwater inflow to the Bay is about 60% less than the historic flows due to diversions of municipal water (responsible for about 9% of flow reductions) and for Central Valley agricultural uses (responsible for about 51% of flow reductions)[27].

The average depth of SFBE is 18 feet. With few exceptions, the waters are naturally deep only in parts of the central bay between San Francisco, Marin County, and Angel Island and in channels through Carquinez Strait (about 90 feet deep), Raccoon Strait (60 feet deep), and the Golden Gate (much of which is between 100-200 feet)[28]. The Bay is at its deepest at the outer mouth of the Golden Gate, where it plunges to 350 feet deep[29]. Dredged channels provide shipping access to ports in Oakland, Richmond, and Redwood City.

Water depth changes twice daily with the tides. SFBE's tides are of unequal height. Average difference between high and low tide heights is about 4 feet in the Central Bay, 5 feet in northern San Pablo Bay, and about 7 feet in the South Bay. These tides transport 1,300,000 acre feet of water, about 25% of the Bay's water volume every day[30].

SFBE was historically rimmed with tidal salt marshes, particularly in the northern and southern reaches. Although 80% of those marshes have been converted, many of the remaining marshes are now in protected status, and there are large-scale restoration efforts under way to return salt evaporation ponds, agricultural areas, and some urban areas back to tidal wetlands.

Sediment in the Bay primarily derives from upstream watershed erosion and subsequent transport and deposition into the Bay through freshwater tributaries. The first large storm of the year carries large sediment plumes into the bay, followed by smaller amounts of sediment during subsequent storms. Most suspended sediment is from the Sacramento and San Joaquin Rivers, but sediment also comes from the Yolo Bypass, Mokelumne River, Calaveras River, Cosumnes River, and several other smaller streams. Hydraulic mining in the Sierra Nevada resulted in hundreds of millions of cubic meters of sediment deposition into the Bay. Current deposition rates are much lower as hydraulic mining deposition has tapered off and additional sediment sources have been reduced (by stream flow restrictions) and trapped behind dams[31].

The Bay's floor is covered with sand, silt or clay, along with significant quantities of oyster shell fragments. In the north bay, channels are mostly sand, with shell fragments occurring in the southeastern and southwestern shallows of the South Bay. A few areas of bedrock rim the western part of the Central Bay and crop out at islands and a few shoreline locations. Artificial hard substrate is scattered across the Bay, including rip-rapped banks, jetties, breakwaters, seawalls, pilings, docks and piers, bridge and powerline supports, and debris.[32]

The general climate for SFBE and the surrounding region is categorized as Mediterranean. The climate features temperate wet winters and warm, dry summers.[33] Average annual rainfall in the region is 15-24 inches, which generally falls between November and April.[34]

Salinity in SFBE is mediated by the mixing of fresh water from rivers, creeks, and anthropogenic sources such as waste-water treatment plants, with saltwater entering the Bay from the Pacific Ocean. Salinity is approximately 30 parts per thousand near the mouth of the Golden Gate, whereas upstream sources in the Delta are fresher, at 1 part per thousand.[35]

SFBE water temperature variation generally follows the Pacific Ocean's which has a cool season of upwelling from April-July, a warmer season from August-November, and a cold storm season from December-March. The Bay's temperature swings however, are greater than the Ocean's due to the Bay's shallower water and river flow inputs, making the Bay generally colder than the ocean during the winter, and warmer than the ocean the rest of the year.[36]

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17. Physical features of the catchment area: Describe the surface area, general geology and geomorphological features, general soil types, and climate (including climate type).

The catchment area drains about 40% (60,000 square miles) of California through the Sacramento and San Joaquin Rivers, which pass from the San Francisco Bay-Delta to the Pacific Ocean. The watershed extends from the Cascade Range and Klamath Mountains in the north to the Tehachapi Mountains in the south, and from the Sierra Nevada crest on the east, to the Coast Ranges crests in the west (See Map 5)[37].

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18. Hydrological values: Describe the functions and values of the wetland in groundwater recharge, flood control, sediment trapping, shoreline stabilization, etc.

SFBE wetlands provide myriad hydrological values, detailed below:

- Flood control and shoreline stabilization - slowing down and absorbing water runoff, diminishing floodwater volume and heights and reducing shoreline and stream bank erosion; also helping reduce the need for artificial flood control structures.[38]
- Water quality enhancement –filtering nutrients, organic particles, and sediment. Wetland plants help break down and convert pollutants, although certain metals, notably Mercury, are made more biologically available and therefore toxic through anaerobic wetland decomposition processes[39].
- Increased groundwater availability - absorbing water during and after rainfall thereby recharging groundwater by passively "banking" water for use at a later date.[40]

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19. Wetland Types

a) Presence: Circle or underline the applicable codes for the wetland types of the Ramsar "Classification System for Wetland Type" present in the Ramsar site.

Marine/coastal: A • **B** • C • D • **E** • **F** • **G** • **H** • I • **J** • K • Zk(a)

Inland: L • **M** • **N** • O • P • Q • R • **Sp** • Ss • Tp **Ts** • U • Va •
Vt • W • Xf • Xp • Y • Zg • Zk(b)

Human-made: 1 • 2 • 3 • 4 • **5** • **6** • 7 • **8** • **9** • Zk(c)

b) Dominance: List the wetland types identified in a) above in order of their dominance (by area) in the Ramsar site, starting with the wetland type with the largest area. Calculate area then order by area

5. Salt ponds – **12,281.40 hectares** (28.49% of area) (30,348 acres)
H. Intertidal marshes; includes salt marshes, salt meadows, salt flats/pannes, raised salt marshes; includes tidal brackish and freshwater marshes – **8,336.928 hectares** (19.34% of area) (20601 acres)
F. Estuarine waters; permanent water of estuaries and estuarine systems of deltas. – **6,071.336 hectares** (14.08 % of area) (15002.6 acres)
Ts. Seasonal intermittent freshwater pools/marshes – (Moist grassland and associated seasonal wetlands as per the SFBJV definition)- **3,746.85 hectares** (8.69% of area) (9258.68 acres)
G. Intertidal mud, sand, or salt flats – **2,706.53 hectares** (6.278% of area) (6,688.14 acres)
8. Wastewater treatment areas – **540.255 hectares** (1.25% of area) (1335 acres)
B. Marine subtidal aquatic beds (eelgrass) – **457.294 hectares** (1.06% of area) (1130 acres)
M. Permanent rivers/streams/creeks and N. Seasonal/intermittent rivers/streams/creeks – **276.400 hectares** (0.64% of area) (683 acres)
J. Coastal Brackish/saline lagoons- **125.524 hectares** (0.291% of area) (310 acres)
9. Canals and drainage channels, ditches- **19.526 hectares** (0.04% of area) (48.25 acres)
E. Sand, shingle or pebble shores; includes sand bars, spits and sandy islets; includes dune systems and humid dune slacks – **3.33865 hectares** (0.007% of area) (8.25 acres)
6. Water storage areas; reservoirs/barrages/dams/impoundments (> 8 ha) – **3.24 hectares** (0.007 % of area) (8 acres)

Undefined Wetlands-
N. Transitional Habitats and Uplands - **1198.02 hectares** (2.278% of area) (2960.37 acres)
Undefined Baylands- **36.71 hectares** (0.085% of area) (90.72 acres)

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20. General ecological features: Provide further description, as appropriate, of the main habitats, vegetation types, plant and animal communities present in the Ramsar site, and the ecosystem services of the site and the benefits derived from them.

The main native habitats in SFBE are primarily: open water of varying depths based on tidal conditions and location, tidally influenced mudflats, submerged eelgrass beds, vegetated marshes, sand and salt flats, and sandy and cobble beaches. There are also several rock islands within SFBE. Pickelweed (*Salicornia pacifica*) and Cord Grass (*Spartina foliosa*) predominate the marshes in more saline waters and bulrush (*Scirpus spp.*) predominates in more freshwater marshes. Many parts of the bay have been altered by human activities but still provide habitat for many species; they include diked marshes, agricultural baylands (grazed and farmed), and salt ponds. Upland habitats exist within the bay in the form of islands – some are manmade (fill) and some are natural and still contain native upland plant communities consisting of grasslands, shrublands and woodlands.

The predominant animal communities are those associated with open water, tidal flats and tidal marshes. Open water provides habitat for wintering diving and seaducks, and migratory corridors for anadromous fish to reach freshwater spawning areas. Tidal flats are important for thousands of migratory and overwintering shorebirds and waterfowl. Tidal marshes also provide habitat for a diverse assemblage of migratory shorebirds and waterfowl, various fish species, and tidal marsh specialists such as the California Clapper Rail and Salt Marsh Harvest Mouse. Tidal marshes provide important ecosystem services by producing organic nutrients, sequestering carbon, reducing shoreline erosion, and providing a nursery for some fish species. Rock islands provide nesting habitat for colonial water birds. (See Appendix 5 for detailed descriptions of SFBE's major habitat types.)

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21. Noteworthy flora:

Submerged aquatic plant communities of the shallow subtidal habitats and tidal flats of SFBE are important food sources for estuarine fish, invertebrates, and birds. Submerged plants such as Eelgrass (*Zostera marina*) and certain macroalgae also provide important cover, spawning, and rearing grounds for invertebrates and estuarine fish, such as migrating salmon and Pacific herring[41]. Eelgrass, Surfgrass (*Psyllospadix scouleri* and *P. torreyi*), Widgeon Grass (*Ruppia maritima*), and Sago Pondweed (*Potomegeton pectinatus*) provide important nursery and foraging habitats, dampen wave energy and aid in sediment capture[42]. See Appendix 3.

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22. Noteworthy fauna: Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in 14. Justification for the application of the Criteria) indicating, e.g., which species/communities are unique, rare, endangered or biogeographically important, etc., including count data.

Eight animal species are endemic to SFBE and associated wetlands and also provides habitat for a number near-endemic or range-limited species, subspecies, and races of flora and fauna. The Bay supports three endemic fish taxa: the federally endangered Delta Smelt (*Hypomesus transpacificus*), San Francisco Topsmelt (*Atherinops affinis affinis*), and Tule Perch (*Hysterocarpus traskii traskii*), in addition to four local races of Chinook Salmon (*Onchorhynchus tshawytscha*).

The tidal wetlands support the endemic Salt Marsh Harvest Mouse (*Reithrodontomys raviventris)* populations, a federally endangered species; and the majority of the California Clapper Rail populations, a federally endangered subspecies. The best mouse population estimate comes from the Salt Marsh Harvest Mouse and California Clapper Rail Recovery Plan published by the U.S. Fish & Wildlife Service in 1984: "a few thousand individuals at the peak of their numbers each summer, distributed around the Bay marshes in small, disjunct populations, often in marginal vegetation and almost always in marshes[43] without an upper edge of upland vegetation.[44]" California Clapper Rails are now almost entirely restricted to the marshes of the San Francisco Estuary, where the only known breeding populations occur. When first listed, the population was considered to be 4,200-6,000 individuals, but today's estimates appear to be about 1,200 individual birds. Numbers of scaup, scoters, and Canvasback vary by year and season, but SFBE hosts 44% of the Pacific Flyway diving duck population during winter months. See Appendix 4 for data on waterbird use of SFBE.

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23. Social and cultural values:

a) Describe if the site has any general social and/or cultural values e.g., fisheries production, forestry, religious importance, archaeological sites, social relations with the wetland, etc. Distinguish between historical/archaeological/religious significance and current socio-economic values:

SFBE provides for a host of social and economic values through ports and industry, agriculture, fisheries, archaeological and cultural sites, recreation, and research.

- The industrial port of Oakland is one of the world's largest ports, ranking among the top four in the United States and 20th in the world in terms of annual container traffic[45]. Other water-related industries such as refineries, factories, and dredged material re-handling plants utilize the Bay.
- In addition to water-related industries, about 4,400 acres of diked baylands in the South Bay continue to be used for salt production by Cargill Salt. Salt production in the Bay historically occurred on over 41,000 acres, but since the 1960's about 90% of these lands have been publicly acquired for conservation and restoration[46], part of the largest wetland restoration on the west coast of the United States[47]. These salt ponds, both in converted and restored conditions, provide important habitat function for a wide suite of species and the restoration aims to balance the habitat needs of each species, while simultaneously providing for public access and flood protection.
- Agriculture on diked baylands continues today, especially in northern San Pablo Bay where farming includes: oat hay (sometimes double-cropped with beans), dairy, row crops, vineyards, orchards, livestock, and irrigated pastureland[48].
- SFBE fisheries have suffered dramatic declines in the last few years. In 2009, the Bay's last commercial fishery, herring, was shut down. A reduced number of commercial fishing boats continue to operate in the Bay as do sport fisheries[49].
- Many important cultural and archaeological sites documented in the Bay include over 425 Native American shellmounds mapped by Nels Nelson[50]. More modern historic sites include: the immigration and detention center at Angel Island, the World War II era naval shipyard at Rosie the Riveter/WW II Home Front National Historic Park, and Alcatraz Island lighthouse and penitentiary, and the Presidio of San Francisco, in what is now Golden Gate National Recreation Area.
- SFBE hosts a large body of scientific research and numerous universities (Question 29).

b) Is the site considered of international importance for holding, in addition to relevant ecological values, examples of significant cultural values, whether material or non-material, linked to its origin, conservation and/or ecological functioning?

Yes. At the time of European settlement, tens of thousands of Native American Ohlone people inhabited SFBE south to Monterey Bay in villages and camps. The Muwekma Ohlone tribe were the original inhabitants of San Francisco and the surrounding Bay Area. The Spanish established a fort (the Presidio) in San Francisco in 1776, and by the mid 1800's, the immigrant human population had swelled as a result of gold mining, which began the reshaping and changes in the SFBE watershed that we see today.

If Yes, tick the box ☑ and describe this importance under one or more of the following categories:

i) sites which provide a model of wetland wise use, demonstrating the application of traditional knowledge and methods of management and use that maintain the ecological character of the wetland: n/a

ii) sites which have exceptional cultural traditions or records of former civilizations that have influenced the ecological character of the wetland: Shellmounds from the Ohlone people are still present around the bay: over 400 mounds were mapped in the early 1900's before development covered many of them. Some of these are located within tidal marshes and contain artifacts, fish and bird remains, and were considered burial sites. These mounds were built up over thousands of years across the tidal landscape[112] and can be quite large. The way in which these sites influenced the local ecosystems is poorly understood but efforts are being made to preserve the remaining sites.

iii) sites where the ecological character of the wetland depends on the interaction with local communities or indigenous peoples: n/a

iv) sites where relevant non-material values such as sacred sites are present and their existence is strongly linked with the maintenance of the ecological character of the wetland: Some of the shellmounds are thought to have been burial sites, and thus contain sacred values. Members of Native American tribes continue to gather bull rushes and other reeds for traditional basket-making.

24. Land tenure/ownership:

a) within the Ramsar site:

Land ownership within the Ramsar site is divided between United States, California, county, city, and special district agencies; and non-profit organizations.

b) in the surrounding area:

Private lands are scattered throughout the surrounding area, comprised of residential, commercial, and industrial uses. Most of the waters of SFBE are owned by the California State Lands Commission. Public land ownership is divided between United States, California, county, city, special district, and non-profit agencies (See Map 6; absence of color-coding indicates private land holdings).

25. Current land (including water) use:

a) within the Ramsar site: GIS needed – use land use layer –The attached Protected Lands map identifies the land use within and nearby the proposed 43578.731 hectares (107685.39 acres) of the proposed SFBE Ramsar site. The SFBE Ramsar site is currently includes various wetland habitats that are protected and managed for wildlife and associated recreation by state and federal agencies, state and regional parks districts, local and regional governments, and NGO"s. Open water and subtidal habitats include those identified as significant for waterfowl and other wildlife and do not include commercial or transportation use (shipping channels, ports, etc.) Grazing rotations manage for optimal vernal pool and wetland vegetation on a limited area diked seasonal wetlands owned by the Sonoma Land Trust and Department of Fish & Game.

b) in the surroundings/catchment – See attached Protected Lands Map 8.

Approximately 7 million people (estimated at 6,960,079 by 2008 census) live in the 9 counties surrounding SFBE. San Francisco is the original urban center of the region; the city has an estimated population of 815,358 (2009)[51], although San Jose is the largest city (1,023,0830. Land use in the SFBE region in modern times has been increasing urban development and industry, agriculture (farming and grazing) and salt extraction. Specifically, nearly 50% of the estuary's watershed has been converted to agriculture; about 4% has been urbanized, and 10% is now industrial sites. Large areas of former marshlands were filled during urbanization and diked for agriculture or converted to salt evaporation ponds, thus dramatically reducing the overall acreage of tidal wetlands in the watershed today[3]. Salt ponds do provide some habitat for shorebirds.

Riparian woodlands in the Sacramento-San Joaquin Delta that feeds into SFBE were cut down for homes, power, and fuel wood, and today's delta is a series of levees to reclaim land for farming and housing.

Open water areas of the estuary are used as shipping and ferry channels and approximately 7 million cubic yards of sediment are dredged annually to maintain shipping channels and marinas; some of the sediment is being re-used to bring wetland areas back up to elevation during the restoration process.

26. Factors (past, present or potential) adversely affecting the site's ecological character, including changes in land (including water) use and development projects:

a) within the Ramsar site

Habitat Loss

Approximately 85% of the marshes and much of the intertidal mudflats of SFBE have been lost to salt pond conversion, agricultural diking, and filling for urbanization. These losses reduced the area open to the tides from 800 to 500 square miles[52] and fragmented once large expansive marshes into many smaller isolated remnants[53] and natural upland

edges and transition zones[54]. Development pressures on remaining wetlands and adjacent uplands continue to threaten habitats not owned or managed for conservation.

Tidal Wetland Habitat Protection and Restoration

Approximately 135,000 acres have been targeted for tidal wetland protection, restoration, and enhancement. Approximately 70,000 acres have been protected and are being restored.

Invasive Species

SFBE is one of the most invaded aquatic ecosystems in the world[55]. As of 2003 at least 167 species have been introduced and established into the marine and brackish waters (see Appendix 7), and new species continue to be introduced so that the number of introduced species may be closer to 200 today[56]. Invasive plant species and the algae *Sargassum muticum* (Japanese Wireweed)[57] cause competition with native vegetation, altering vegetation species composition and structure, diminishing or eliminating values for wildlife. See Appendices 6[58,59] and 7[60,61] for more detail.

Major invasive plants of high concern:

- Atlantic Smooth Cordgrass (*Spartina alternaflora)* was introduced to SFBE in the 1970's[62] and has since invaded SFBE wetlands and hybridized with the native *Spartina foliosa*. These hybrids threaten to transform and alter SFBE wetland habitats in numerous ways: clogging marsh sloughs important to maintaining marsh hydrology and also used by endangered California Clapper Rail, converting mudflat shorebird foraging sites to cordgrass meadows, and causing local extinction of *Spartina foliosa*[63].
- *Spartina patens* competes with the endangered *Cordylanthus mollis* sp. *mollis*, and both *Spartina patens* and *densiflora* colonize upper and middle marsh pickleweed habitat used by the endangered Salt Marsh Harvest Mouse[64].
- Pepperweed (*Lepidium latifolium)* was first found in SFBE in small numbers in the 1970's[65] but has since expanded in many marshes. Pepperweed has the potential to create monospecific stands, displacing native vegetation and structure, and potentially displacing native marsh fauna. Pepperweed typically grows in habitats higher than where pickleweed grows, however pepperweed has invaded some pickleweed marshes such as in the Alviso Slough area, and thus poses a threat to the habitat of Salt Marsh Harvest Mouse, California Black Rail, and California Clapper Rail. In waterfowl nesting areas pepperweed outcompetes grasses that provide food.
- *Dittrichia graveolens* (stinkweed) was first found in California first in 1984 in Alviso, Santa Clara County, along a levee/railroad track. Since then it has expanded throughout the SFBE Area and beyond[66]. Invasion of seasonal wetlands threatens to displace shorebirds, waterfowl, and other animals. Invasion of upper marsh edges by stinkweed could displace native vegetation used as high tide refuge by marsh mammals and birds.
- The algae *Sargassum muticum* (Japanese wireweed), first collected in SFBE in 1973, has potential to displace native algaes and seagrasses (including eelgrass), in part by reducing light levels through shading. Other impacts include the fouling of propellers and fishing lines, and of waterways and marinas. It is also a pest on oyster beds and to commercial fishermen, fouling their nets[67].

Invasive animals:

- Norway rat (*Rattus norvegicus*) was introduced to North America around 1775. Norway rats, as well as invasive roof rats, have colonized SFBE tidal marshes, especially in the Central and South Bays along urban edges and where urban garbage is present. Norway rats can predate on Clapper Rail eggs and chicks, other small mammals, amphibians, reptiles, terrestrial invertebrates, and ground nesting birds. Invasive rats also can be disease vectors to native wildlife[68].
- Red fox (*Vulpes vulpes regalis*), first seen in SFBE in 1986, has a broad diet inclusive of birds, small mammals, reptiles, amphibians, insects, vegetation, and refuse. Red fox has decimated ground nesting bird populations through predation on eggs, young, and adults. Red fox has been implicated in the decline of California Clapper Rail, Western Snowy Plover, Least and Caspian Terns, and colony nesters. A predator management program instituted in 1991 has contributed to significant increases in California Clapper Rails[69].
- Feral and domestic house cats (*Felis domesticus*) are frequently seen along salt-pond levees and edges of tidal sloughs. House cats are known predators of tidal marsh birds and mammals. The San Francisco Bay National Wildlife Refuge began a feral cat removal program in 1991[70].
- Asian clams (*Corbula amurensis*) were introduced through ballast water discharge[71]. This species can physically displace native shellfish[72] and may contribute to water quality degradation through concentration of Selenium[73]. However, USGS has documented this species to be the prime forage for diving waterfowls in the northern SFBE during the early winter months (publication pending)

Pollution

Pollution has been recognized as a problem in the Estuary since at least 1879, when a California resource agency bemoaned the "constant fouling of the waters and consequent destruction of life by the foetid inpourings of our sewers.[74]" Pollution continues to be a problem and threatens Bay ecosystems at all levels, both from current discharges as well as legacy pollutants accumulated from past discharges.

Mercury carried in runoff from Bay Area and Sierra Nevada gold mining (where an estimated 3,500 tons of[75] mercury was used for processing) beginning in the mid 1800's, has accumulated in Bay sediments. Through decomposition in the wetlands, mercury is methylated, becomes more toxic and can be more available – biomagnifying up the food web and causing acute nervous system toxicity in fish, birds, and mammals and/or reproductive impairment[76]. Biologists from USGS, USFWS, PRBO Conservation Science, and San Francisco Bay Bird Observatory initiated a study in 2005 to investigate mercury in shorebirds and seabirds, and initial results indicate higher levels in fish-eating birds but found levels that are a cause of concern in all species sampled. USGS has recently found, by studying small fish, that mercury levels fluctuate over short periods of time, with peaks coinciding with the Forster's Tern breeding season.[113]

Other metals of concern include Selenium, which enters the bay from oil refineries and agricultural effluent. This metal can cause reproductive failure or birth defects. Discharges from refineries have decreased from 6.8kg/day to 1.4 kg/day as a result of environmental regulation, although agricultural inputs continue to range between 20.4 and 53.2kg/day[77].

Oil spills pose severe acute and long-term risk for SFBE health. The first oil refinery in SFBE was constructed in 1896[78]. At present five oil refineries are located within the Bay area and comprise nearly 40% of California's total oil production. Additionally, more than 1,000 tanker ships pass through the Bay annually along with container ships, recreational boats and other vessels. As recently as 2007 a major oil spill of 58,000 gallons of crude oil into the Bay occurred as a result of a shipping accident of the Cosco Busan container ship. Other spills such as the 1,500,000 gallon spill from the tanker the Puerto Rican in 1984, or the 1998 Shell Oil storage tank spill of 420,000 gallons have caused both acute and long-term environmental impacts.[79]

Discharges and spills from wastewater and sewage treatment plants also pose threats to the Bay. These sources affect local salinity levels and can also contribute organic waste, oil and grease, metals, and disease microorganisms such as *Coliform* bacteria. Despite improvements, about 50 municipal and 65 large industrial facilities still dump substantial quantities of wastes into the Estuary, including an average of 300 tons of trace metals each year[80]. Accidental spills, such as the 2008 spill of 2.7 million gallons of partially treated sewage into Richardson Bay[81] are also a liability.

Large amounts of pollutants also enter the Estuary from storm water runoff. Urban runoff carries metals, floatable debris (predominantly plastic and polystyrene pellets[82]), polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs) and pesticides washed from streets, lawns and industrial properties. Agricultural runoff contains pesticides and herbicides, nitrates and phosphates and selenium[83].

Other sources of pollutants include chemical spills, leachate from landfills, and pesticides sprayed into the water to control aquatic weeds. Sediments at various "hot spots" show elevated concentrations of contaminants including metals (such as mercury, lead, copper, silver and chromium) and organic compounds (including various pesticides, PCBs and PAHs)[84].

Sediment Dynamics

Sediment dynamics in the Bay have been dramatically altered by upstream land use. Hydraulic mining in the Sierra Nevada during the Gold Rush period resulted in hundreds of millions of cubic meters of sediment deposition into the Bay. Sediment surge resulted in increased mudflat and marsh build out, especially in the North Bay. Current additional sediment sources have been reduced (by stream flow restrictions) and trapped behind dams[85]. This decrease in sediment has resulted in shrinking mudflats. Some of the approximately 6,120,000 cubic meters[86] of dredged sediment currently goes for beneficial reuse at habitat restoration sites and this resource could be utilized more extensively, provided the sediments are unpolluted. For example, the South Bay Salt Pond Project latest research has indicated that sediment load will likely keep up with sea level rise. In the North Bay, the marsh habitats will change, but there appears to be sediment available. Also re-use of dredge materials to create wetlands (Hamilton, Sonoma Baylands, Bair Island) The Long Term Management Strategy (LTMS) for dredging is requiring future re-use of dredge material by large dredging operations.

Climate Change

Climate change represents a suite of challenges to SFBE such as altered species viabilities and phenologies, sea level rise, shifts in salinity content and fresh water flows, notable rises in temperature and an increase in the severity of storms. Climate change is expected to result in sea level rise in SFBE of 16 inches (40 cm) by mid-century and 55 inches by the end of the century.

By mid-century, 180,000 acres of SFBE shoreline will be vulnerable to flooding, and 213,000 acres will be vulnerable by the end of the century. Vulnerability within today's 100-year floodplain will increase from a one percent

chance of flooding per year to a 100% chance of flooding per year by midcentury[87]. Higher seas as well as more frequent and intense storm events threaten to increase shoreline damage, erosion, and inundation. Depending upon sediment availability and the rate of sea-level rise, modeling has indicated that tidal marshes may be able to accrete and keep pace with higher waters, if large-scale restoration projects are completed and adjacent uplands protected. In the urbanized areas where the SFBE edges are developed, there is little opportunity for marsh transgression.

Freshwater runoff from mountain snowmelt is projected to flow earlier and more intensely in the year as warmer temperatures speed snowmelt. Resulting increased winter freshwater inputs and decreased spring and summer freshwater inflows will decrease salinities in the wet season and, by a larger degree, increase salinity levels in the dry season[88]. Sea level rise could further drive saltwater gradients upstream in the SFBE compounding the salinity changes.

These shifts in the quantity, timing, and quality of freshwater flowing into the Bay and the resulting habitat changes could cause declines of fish species and populations. The reduced freshwater inflow and resulting increase in salinity causes more salt-tolerant species to move upstream while freshwater species retreat. Additionally, lower freshwater flows and higher water temperatures may disrupt fish transport[89].

Some bird species behavior, distribution and population dynamics, are susceptible to climate change (Berthold *et al.*, 2004). Sedentary taxa of SFBE such as Song Sparrows, Common Yellowthroats, and California Clapper Rails endemic to San Francisco tidal marshes may face additional declines if more tidal marsh habitat is impaired or lost through factors such as climate change induced sea level rise, storm damage, or associated increased invasive species pressures. Recent efforts by conservation groups and government agencies to increase acreage of tidal marsh habitat and improve tidal actions through levees might help alleviate pressures from sea level rise and storm damage.

Disturbance to Wildlife

The habitats of SFBE face a variety of human disturbances, which can pose direct degradation impacts to habitat as well as to flora and fauna. Human access through wetlands can trample habitats and facilitate access by predators. Trail use near wetland habitats, as well as nearby boat or aircraft use, may cause animals to flush, exposing them to predators and impinging on rest and feeding behaviors[90]. Plans for a non-motorized water trail are under consideration, which could either result in concentrating impacts away from wildlife and sensitive habitats or could create more water-use days and disturbances. Impacts on wetland habitats and sensitive species are addressed through the EIR/S, and via public education at launch and take-out points. Current and future access points and trails in San Pablo Bay have been identified and are planned to be re-routed away from sensitive habitats. Extensive access planning is happening with the South Bay Salt Pond Restoration Project, utilizing studies on the impacts of human disturbance on waterfowl to guide trail location and design. Such studies are also used to plan future access trails elsewhere and water transportation routes to minimize disturbance through recreation and transportation[91].

Disease

"Avian species are faced with the greatest known, or anticipated, threats from disease among all wildlife populations in the [San Francisco Bay] estuary." Diseases of highest concern are West Nile Virus, avian cholera, and avian botulism[92].

b) in the surrounding area:
Surrounding habitats face similar concerns such as habitat loss, invasive species, pollution, climate change, disturbance to wildlife, and disease. Additional threats include overgrazing and fire.

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27. Conservation measures taken:

a) national and/or international category and legal status of protected areas, with the Ramsar site:

- Angel Island and Alcatraz Island within SFBE are part of the Golden Gate Biosphere Reserve, established in 1988 through the UNESCO Man in the Biosphere Reserve program[93].
- San Francisco Bay is recognized as a Site of Hemispheric Importance by the Western Hemispheric Shorebird Reserve Network (See Map 7)[94].

b) IUCN areas: N/A

c) Does an officially approved management plan exist; and is it being implemented?: Each of the regulatory agencies has its plan for the Estuary. An extensive planning process involving government agencies, NGO's and scientists, the *Baylands Habitat Goals Project*, was completed in 1999 and became the basis for the tidal wetlands goals of the San Francisco Bay Joint Venture. The US Fish & Wildlife Service published its plan for SFBE in 2010.

d) Describe any other current management practices. Also describe any other conservation measures taken at the site, such as restrictions on development, management practices beneficial to wildlife, closures of hunting, etc. Include information here on any monitoring schemes and survey methods in place at the site.

Management Practices: The San Francisco Bay Joint Venture has developed a Monitoring and Evaluation Plan, available on the Joint Venture web site, www.sfbayjv.org/. Site-specific management occurs at the following locations:
Federally protected and managed lands:
United States Fish & Wildlife Refuges:

- Don Edwards National Wildlife Refuge – established in 1974 and comprising 30,000 acres[95]. A Comprehensive Conservation Plan to guide all aspects of Refuge management is planned for 2010[96].
- San Pablo Bay National Wildlife Refuge – established in 1974[97] and comprising 13,200 acres. A Comprehensive Conservation Plan is being prepared. Hunting is allowed on open bay and navigable sloughs, accessed by boat only. Fishing piers are planned for construction[98].
- Marin Islands National Wildlife Refuge – established in 1992[99] and comprising 337 acres. A Comprehensive Conservation Plan was published in 2006. The Refuge is closed to the public. Management goals include maintenance and restoration of natural resources and establishment of official visitation and environmental education for the site[100].
- Antioch Dunes National Wildlife Refuge – established in 1980[101] and comprising 55 acres owned and managed, plus 10 additional acres privately owned but managed by the Refuge. A Comprehensive Conservation Plan was completed in 2002. The Refuge is closed to the public outside of official monthly docent-led tours[102].

United States National Park Service lands:

- Golden Gate National Recreation Area – established in 1972[103] and comprising 75,500 acres. 623.5 of those acres are within SFBE along 6.7 miles of shoreline[104].
- The Presidio of San Francisco – 2 acres of wetlands were restored in 2001.

National Estuarine Research Reserve:

- SFBE National Estuarine Research Reserve – established in 2003 at China Camp and Rush Ranch and comprising 3,710 acres. The reserve is a partnership among National Oceanic and Atmospheric Administration, San Francisco State University, California State Parks, Solano Land Trust and the SFBE Conservation and Development Commission.[105]

National Audubon Society (national non-profit):

- Richardson Bay Audubon Center & Sanctuary – established in 1957 and comprising 911 acres, 900 of which are within SFBE[106]. A conservation action plan guides management of the site and includes Bay environmental education and science-based habitat restoration and monitoring of Bay resources. The Sanctuary closes its waters to boat traffic annually from October 1-March 31 to protect feeding and resting waterbirds[107].

In addition to national organizations the state of California, local governments, and non-governmental organizations also protect and manage significant portions of SFBE as parks and reserves.

Other Conservation Measures:

- SFBE is recognized as an Area of Continental Significance for waterfowl by the North American Waterfowl Conservation Plan[108].
- The National Audubon Society has designated nine distinct Important Bird Areas within SFBE (See Map 7)[109].

b) If appropriate, list the IUCN (1994) protected areas category/ies which apply to the site (tick the box or boxes as appropriate):

Ia ❑;Ib ❑; II ☑ ; III ❑; IV ☑ ; V ❑; VI ❑

28. Conservation measures proposed but not yet implemented:
e.g. management plan in preparation; official proposal as a legally protected area, etc.?
• The San Francisco Bay Conservation and Development Commission: adopted San Francisco Bay Plan Amendment No. 1-08 Concerning Amendment of Various Sections of the Bay Plan to Address Climate Change and to Add A New Climate Change Section with New Findings and Policies to be approved on September 1, 2011, to be implemented when the initial proposal for a permit for development within the Baylands is submitted.
• The San Francisco Bay Joint Venture Implementation Plan and project tracking database call for protection, restoration, and enhancement of approximately 65,000 additional acres, either in the planning stages or have been identified. The SFBJV completed Phase 1 of a monitoring and evaluation plan in fall, 2011, with Phase II currently under development as science and management partners implement Phase 1.
• In 2008 the San Francisco Regional Water Quality Control Board introduced a stream/riparian protection policy that have been through the public process and is expected to be implemented within the next year.

29. Current scientific research and facilities:
e.g., details of current research projects, including biodiversity monitoring; existence of a field research station, etc.

SFBE is the site of many ongoing research and biodiversity and ecosystem monitoring projects conducted by public agencies, non-governmental organizations, universities, and private citizens. A partial listing of major institutions conducting research follows: United States Geological Survey's San Francisco Bay Field Station and California Water Research Center, San Francisco Estuary Institute, Audubon California, PRBO Conservation Science, San Francisco Bay Bird Observatory, local universities including San Francisco State University, San Jose State University, University of California at Berkeley, and Stanford University.

30. Current communications, education and public awareness (CEPA) activities related to or benefiting the site:
e.g. visitors' centre, observation hides and nature trails, information booklets, facilities for school visits, etc.

There are many communications, education, and public awareness activities related to and benefiting SFBE. A search of the California Regional Environmental Education Community database yielded over 100 pages of environmental education programs offered within the SFBE Area[110]. These and other such programs serve to educate and connect the public to the Bay and its surrounding watersheds, helping to instil a cultural ethos of conservation.

SFBE nature centers include: Don Edwards San Francisco Bay National Wildlife Refuge, Richardson Bay Audubon Center & Sanctuary, Hayward Area Recreation Department's Hayward Shoreline Interpretive Center, the City of Palo Alto's Baylands Nature and Interpretive Center, Golden Gate National Recreation Area's Crissy Field Center, the East Bay Regional Park District's Crab Cove, Coyote Hills Regional Park, and Literacy for Environmental Justice's EcoCenter at Heron's Head Park.

Various nature trails provide access to SFBE. Most prominently around the Bay is the San Francisco Bay Trail, which consists of 500 miles of shoreline trail. A SFBE Water Trail is planned for watercraft recreation access throughout SFBE.

31. Current recreation and tourism:
State if the wetland is used for recreation/tourism; indicate type(s) and their frequency/intensity.

The SFBE Area is a renowned international tourist destination. Attractions such as the Golden Gate Bridge, acclaimed as one of the world's most beautiful bridges, attract an estimated 9 million tourists annually[111]. Alcatraz Island attracts more than 1.3 million visitors annually.[112] Other destinations in and around the Bay, including the city of San Francisco, Napa and Sonoma county vineyards, and national, California, and local parks, events, and festivals draw many more tourists to and around SFBE.

The Bay is a popular destination for water-oriented recreation such as boating and open-water swimming. Waterfront parks and trails, such as the San Francisco Bay Trail, provide opportunity for recreation and nature appreciation, such as birdwatching, along the shoreline. A variety of public and private access points and facilities are located throughout the Bay for water entry and shoreline access. These opportunities have expanded greatly in recent decades as public planning and policy has prioritized public access.

32. Jurisdiction: (See Maps 2, 6, 8, and 9)
Provide the full name and address of the government authority with:

a) *territorial jurisdiction* over the wetland, e.g., the state, region or municipality;
Federal Agencies:
U.S. Fish and Wildlife Service: San Francisco Bay Wildlife Refuge Complex, 9500 Thornton Avenue, Newark CA 94560
National Park Service: Golden Gate NRA, Fort Mason, San Francisco, CA 94123
State Agencies:
California State Coastal Conservancy, 1330 Broadway, Suite 1300, Oakland, CA 94612
California State Lands Commission: 100 Howe Ave., Suite 100-South, Sacramento, CA 95825
California Department of Fish and Game: 1416 9th Street, 12th Floor, Sacramento, CA 95814
California Department of Parks and Recreation: PO Box 942896, Sacramento, CA 94296
Regional Agencies:
San Francisco Recreation and Parks: 501 Stanyan Street, San Francisco, CA 94117
Sonoma County Agricultural and Open Space District: 747 Mendocino Ave., Suite 100, Santa Rosa, CA 95401
City of San Rafael: P.O. Box 151560, San Rafael, CA 94915-1560
East Bay Regional Park District: 2950 Peralta Oaks Court, PO Box 5381, Oakland, CA 94605
City of Albany: 1000 San Pablo Ave., Albany, CA 94706
City of Brisbane: 500 Park Place, Brisbane, CA 94005

b) the name of the authority with *functional jurisdiction* for conservation purposes :

Federal agencies: United States Fish & Wildlife Service, National Marine Fisheries Service, National Park Service, United States Army Corps of Engineers.
State agencies: San Francisco Bay Conservation and Development Commission, California Coastal Conservancy, Department of Fish & Game, California Water Quality Control Board, State Lands Commission
Regional agencies: San Francisco Bay Regional Water Quality Control Board

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33. Management authority (Appendix 8 to correspond with Map 9):
Provide the name and address of the local office(s) of the agency(ies) or organisation(s) directly responsible for managing the wetland. Wherever possible provide also the title and/or name of the person or persons in this office with responsibility for the wetland (See Appendix 8).

Because of the large number of agencies and organizations managing portions of San Francisco Bay, we provided this information, including local contact person, in attached Appendix 8, RamsarMgmtAuth.xlsx.

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34. Bibliographical references: Scientific/technical references only.

Documents:

1. Baye, Peter. 2007. Selected Tidal Marsh Plant Species of the San Francisco Estuary A Field Identification Guide.
2. California's Wetland Demonstration Program Pilot. California Resources Agency. 2008.
3. Cohen, Andrew. An Introduction to the San Francisco Bay, Save The Bay, San Francisco Estuary Project, San Francisco Estuary Institute. 2000.
4. Goals Project. 1999. Baylands Ecosystem Habitat Goals. A report of habitat recommendations prepared by the San Francisco Bay Area Wetlands Ecosystem Goals Project. U.S. Environmental Protection Agency, San Francisco, Calif./S.F. Bay Regional Water Quality Control Board, Oakland, Calif.
5. Goals Project. 2000. Baylands Ecosystem Species and Community Profiles: Life histories and environmental requirements of key plants, fish, and wildlife. Prepared by the San Francisco Bay Area Wetlands Ecosystem Goals Project. P.R. Olofson, editor. San Francisco Bay Regional Water Quality Control Board, Oakland, Calif. P 309.
6. Greening the Bay. Financing Wetland Restoration in San Francisco Bay. Save the Bay 2007.
7. Leidy, Robert. 2007. Ecology, Assemblage Structure, Distribution, and Status of Fishes in Streams Tributary to the San Francisco Estuary, California. San Francisco Estuary Institute, Oakland, CA.
8. Page, G., Stenzel, L., and Kjelmyr, J. 1999. Overview of Shorebird Abundance and Distribution in Wetlands of the Pacific Coast of the Contiguous United States. The Condor. Volume 101, Number 3, August 1999. pp 461-471.
9. San Francisco Bay Conservation and Development Commission. San Francisco Bay Plan. San Francisco, CA. 2008.
10. San Francisco BayJoint Venture. Restoring the Estuary – Implementation Strategy for the Joint Venture.
11. San Francisco Estuary Project. 2007. Comprehensive Conservation and Management Plan.
12. Shuford, W.D. and Gardali, T., editors. 2008. California Bird Species of Special Concern. A ranked assessment of Species, Subspecies, and Distinct Populations of Birds of Immediate Conservation Concern in California. Studies of Western Birds 1. Western Field Ornithologists, Camarillo, California, and California Department of Fish and Game, Sacramento.
13. Stenzel, L., Hickey, C., Kjelmyr, J., and Page, G. 2002. Abundance and Distribution of Shorebirds in the San Francisco Bay Area. Western Birds. Volume 33, Number 2, 2002. pp 69-98.
14. Takekawa, J., Woo, I., Spautz, H., Nur, N., Grenier, L., Malamud-Roam, K., Nordby, C., Cohen, A, Malamud-Roam., F., Wainrwight-de La Cruz., S. 2006. Environmental Threats to Tidal-Marsh Vertebrates of the San Francisco Bay Estuary Studies in Avian Biology.
15. U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, San Francisco Bay Conservation and Development Commission, San Francisco Bay Regional Water Quality Control Board. 2001. Long-Term Management Strategy for the Placement of Dredged Material in the San Francisco Bay Region. Management Plan 2001.
16. United States Fish & Wildlife Service. 1984. "Salt marsh harvest mouse and California Clapper Rail Recovery Plan." Portland, Oregon.

Websites:

1. California Department of Fish and Game Bay-Delta Region. http://www.dfg.ca.gov/regions/3/
2. California Natural Diversity Database. http://www.dfg.ca.gov/biogeodata/cnddb/
3. California Regional Water Quality Control Board. San Francisco Bay Region. http://www.swrcb.ca.gov/rwqcb2/
4. California Wetland Tracker www.wetlandtracker.org
5. Don Edwards San Francisco Bay National Wildlife Refuge. http://www.fws.gov/DESFBAY/index.htm
6. Interagency Ecological Program. http://www.water.ca.gov/iep/
7. PRBO Conservation Science. San Francisco Bay Tidal Marsh Project. http://www.prbo.org/cms/135; South San Francisco Bay Habitat Conversion Model. http://www.prbo.org/cms/131; Pacific Flyway Project. http://www.prbo.org/cms/119; San Francisco Bay Salt Ponds Studies. http://www.prbo.org/cms/134
8. San Francisco Bay Area Upland Goals Project. http://www.openspacecouncil.org/programs/index.php?program=3
9. San Francisco Bay Area Wetlands Regional Monitoring Program. http://www.wrmp.org/index.html
10. San Francisco Bay Bird Observatory. http://www.sfbbo.org/
11. San Francisco Bay Conservation and Development Commission. http://www.bcdc.ca.gov/
12. San Francisco Bay Estuary Field Station, US Geological Survey. http://www.werc.usgs.gov/sfbe/
13. San Francisco Bay Joint Venture. http://www.sfbayjv.org/
14. San Francisco Bay National Estuarine Research Reserve. http://sfbaynerr.org/
15. San Francisco Estuary Project. http://www.sfestuary.org/
16. San Pablo Bay National Wildlife Refuge Complex. http://www.fws.gov/sfbayrefuges/
17. Subtidal Habitat Goals Project. http://www.bcdc.ca.gov/planning/shg/subtidal_habitat.shtml

Biogeographic reference citation:

1. California Department of Forestry and Fire Protection. 2004. "California Bioregions." http://frap.fire.ca.gov/data/frapgisdata/download.asp?rec=inaccreg.

Please return to: **Ramsar Convention Secretariat, Rue Mauverney 28, CH-1196 Gland, Switzerland**
Telephone**: +41 22 999 0170** • Fax: **+41 22 999 0169** • e-mail: **ramsar@ramsar.org**

Endnotes

[1] California's Wetland Demonstration Program Pilot. California Resources Agency. 2008. p 76.
[2] Goals Project. 1999. Baylands Ecosystem Habitat Goals. A report of habitat recommendations prepared by the San Francisco Bay Area Wetlands Ecosystem Goals Project. U.S. Environmental Protection Agency, San Francisco, Calif./S.F. Bay Regional Water Quality Control Board, Oakland, Calif. Inside front cover.
[3] California's Wetland Demonstration Program Pilot. p 76.
[4] Save the Bay 2007. Greening the Bay – Financing Wetland Restoration in San Francisco Bay. Oakland, CA. p 7.
[5] Goals Project 1999. p. inside front cover.
[6] Stenzel, L., Hickey, C., Kjelmyr, J., Page, G. "Abundance and Distribution of Shorebirds in the San Francisco Bay Area." Western Birds Volume 33, Number 2, 2002. p. 1.
[7] Julian Wood, San Francisco Bay Program leader, PRBO Conservation Science. Personal communication August, 2009.
[8] Stenzel, et. al. eds. p 1.
[9] United States Fish & Wildlife Service, Canadian Wildlife Service, Secretaria de Medio Ambiente y Recursos Naturales. North American Waterfowl Management Plan. 2004. p 15.
[10] Goals Project. 2000. Baylands Ecosystem Species and Community Profiles: Life histories and environmental requirements of key plants, fish, and wildlife. Prepared by the San Francisco Bay Area Wetlands Ecosystem Goals Project. P.R. Olofson, editor. San Francisco Bay Regional Water Quality Control Board, Oakland, Calif. P 309.
[11] Susan Wainwright-De La Cruz, United States Geological Survey. Personal communication May 27, 2009.
[12] Goals Project. 2000. p 105.
[13] Moyle, P. B. 2002. Inland fishes of California. Revised and expanded. University of California Press, Berkeley p 230.
[14] Bennett, W. A. 2005. Critical assessment of the delta smelt population in the San Francisco Estuary, California. San Francisco Estuary and Watershed Science 3(2):1-71. p. 5).
[15]Armor, C., R. Baxter, B. Bennett, R. Breuer, M. Chotkowski, P. Coulston, D. Denton, B. Herbold, K. Larsen, M. Nobriga, K. Rose, T. Sommer, and M. Stacey. 2005. Interagency Ecological Program synthesis of 2005 work to evaluate the Pelagic Organism Decline (POD) in the upper San Francisco Estuary. p. 3.
[16] Goals Project. 2000. p 134.
[17] Goals Project. 2000. p. 91.
[18] San Francisco Bay Conservation and Development Commission. "San Francisco Bay Estuary." http://www.bcdc.ca.gov/bay_estuary.shtml. Last accessed October 8, 2009.
[19] Bay Institute 2003. Ecological Scorecard
[20] Letter from the National Oceanic and Atmospheric Administration to the United States Fish & Wildlife Service regarding the South Bay Salt Pond Restoration Project. 2008. http://www.southbayrestoration.org/pdf_files/Comment%20Letters/NOAA_FEIS_SBSP0001.pdf. Last accessed October 7, 2009.
[21] Howard Shellhammer personal communication May 15, 2009.
[22] United States Fish & Wildlife Service. 1984. "Salt marsh harvest mouse and California Clapper Rail Recovery Plan." Portland, Oregon. p. 44.
[23] Goals Project. 2000. pp232-233.
[24] Goals Project 2000. p. 234
[25] California Department of Forestry and Fire Protection. 2004. "California Bioregions." http://frap.fire.ca.gov/data/frapgisdata/download.asp?rec=inaccreg. Last accessed on October 8, 2009.
[26] Sloan, Dorris. Geology of the San Francisco Bay Region, University of California Press, Berkeley. 2006. p.134.
[27] Sloan. p. 135.
[28] Sloan. p. 135.
[29] Cohen, Andrew. An Introduction to the San Francisco Bay, Save The Bay, San Francisco Estuary Project, San Francisco Estuary Institute. 2000 p 4.
[30] Cohen. p. 5.
[31] National Oceanic and Atmospheric Administration. Report on the Subtidal Habitats and Associated Biological Taxa in San Francisco Bay. 2007. p. 13.
[32] National Oceanic and Atmospheric Administration p. 4.
[33] National Park Service. "A Climate of Contrasts" http://www.nps.gov/prsf/naturescience/climate.htm Last accessed on Sept 30 2009.
[34] Western Regional Climate Center. "San Francisco Bay Area Climate Summaries." http://www.wrcc.dri.edu/summary/climsmsfo.html Last accessed on September, 30 2009.
[35] National Oceanic and Atmospheric Administration p. 6.
[36] National Oceanic and Atmospheric Administration p. 7.
[37] Sloan. p 135.
[38] San Francisco Bay Joint Venture. Restoring the Estuary – Implementation Strategy for the San Francisco Bay Joint Venture. p. 15.
[39] San Francisco Estuary Institute. "Regional Monitioring Program Update. December 2008. The South Baylands Mercury Project: Helping Managers Restore Tidal Marsh in the Face of Mercury Concerns."
http://www.sfei.org/rmp/rmp_news/Estuary%20Insert/RMP_ESTUARYinsert_Dec08_f.pdf. Last accessed October 8, 2009.
[40] San Francisco Bay Joint Venture. P. 16.
[41] Goals Project. 2000. pp. 1- 5.
[42] National Oceanic and Atmospheric Administration p. 6.
[42] National Oceanic and Atmospheric Administration pp. 58-59.

[43] Howard Shellhammer personal communication May 15, 2009.
[44] United States Fish & Wildlife Service. 1984. "Salt marsh harvest mouse and California Clapper Rail Recovery Plan." Portland, Oregon. p. 44.
[45] Port of Oakland. "About us: Revenue Division." http://www.portofoakland.com/portnyou/overview.asp. Last accessed October 8, 2009.
[46] San Francisco Bay Conservation and Development Commission. San Francisco Bay Plan. San Francisco, CA. 2008. p. 64.
[47] South Bay Salt Pond Restoration Project. "Project Description." http://www.southbayrestoration.org/Project_Description.html. Last accessed October 8, 2009.
[48] North Bay Water Reuse Authority. "North San Pablo Bay Restoration and Reuse Project Engineering and Economic/Financial Analysis Report." http://www.nbwra.org/docs/pdfs/NBWRP_Draft_Phase3_section3_part1of2.pdf. Last accessed on October 8, 2009.
[49] Rogers, Paul. "San Francisco Bay's last commercial fishery closes." Silicon Valley Mercury News. September, 5 2009. http://www.mercurynews.com/bay-area-living/ci_13278722
[50] Nelson, Nels. 1909. Shellmounds of the San Francisco Bay region. University Press (Berkeley, Calif)
[51] San Francisco Bay Area Census. http://www.bayareacensus.ca.gov/bayarea.htm Last accessed October 7, 2009.
[52] Cohen. p. 4.
[53] California's Wetland Demonstration Program Pilot. p 59.
[54] Takekawa, J., Woo, I., Spautz, H., Nur, N., Grenier, L., Malamud-Roam., K., Nordby, C., Cohen, A., Malamud-Roam, F., Wainwright-de la Cruz., S. 2006. Environmental Threats to Tidal-Marsh Vertebrates of the San Francisco Bay Estuary. Studies in Avian Biology No. 32:176–197.
[55] Cohen, A., Carlton, J. Accelerating Invasion Rate in a Highly Invaded Estuary. Science Vol. 279 23 January 1998, pp555-558
[56] Andrew Cohen, Director of the Biological Invasions Program, San Francisco Estuary Institute. Personal communication October 15, 2009.
[57] Cohen, Andrew N. 2005 *Guide to the Exotic Species of San Francisco Bay*. San Francisco Estuary Institute, Oakland, CA, www.exoticsguide.org. Last accessed October 8, 2009.
[58] Baye, Peter. 2007. Selected Tidal Marsh Plant Species of the San Francisco Estuary A Field Identification Guide
[59] San Francisco Estuary Invasive Spartina Project. "Field Identification Guide." http://www.spartina.org/species/SparIDFlyer_2006.pdf. Last accessed October 8, 2009.
[60] Baye, Peter. 2007. Selected Tidal Marsh Plant Species of the San Francisco Estuary A Field Identification Guide
[61] San Francisco Estuary Invasive Spartina Project. "Field Identification Guide." http://www.spartina.org/species/SparIDFlyer_2006.pdf. Last accessed October 8, 2009.
[62] Strong, D., Ayres., D. 2005. "Dynamics and Ecosystem threats of Bidirectional Cordgrass Hybridization in San Francisco Bay Donald Strong Debra Ayres Research Completion Reports." University of San Diego, San Diego, CA. http://repositories.cdlib.org/cgi/viewcontent.cgi?article=1033&context=csgc. Last accessed October 8, 2009.
[63] San Francisco Estuary Invasive Spartina Project. "Invasion Impacts." http://www.spartina.org/invasion.htm#3. Last accessed October 8, 2009.
[64] San Francisco Estuary Invasive Spartina Project. "Invasion Impacts." http://www.spartina.org/invasion.htm#3. Last accessed October 8, 2009.
[65] Renee Spenst, Regional Biologist, Ducks Unlimited. Personal communication. October 7, 2009.
[66] Calflora. "Taxon Report 8482: *Dittrichea graveolens*." http://www.calflora.org/cgi-bin/species_query.cgi?where-calrecnum=8482. Last accessed October 8, 2009.
[67] Cohen. 2005. "Species page: *Sargassum muticum*." Last accessed October 8, 2009.
[68] Goals Project. 2000. pp. 249-250.
[69] Goals Project. 2000. pp. 251-252.
[70] Takekawa et. al. 2006. p. 192.
[71] Global Invasive Species Database. *Corbula amurensis*. http://www.issg.org/database/species/ecology.asp?si=136&fr=1&sts=. Last accessed on October 15, 2009.
[72] University of California Davis. Reducing the Introduction and Distribution of Aquatic Non-Native Invasive Species Through Outreach and Education Project. Non-Native Invasive Species of Concern in San Francisco Bay-Delta. http://www.ridnis.ucdavis.edu/NISofConcern1.html. Last accessed October 15, 2009
[73] Takekawa et. al. 2006. p. 186.
[74] Cohen pp. 28-29.
[75] National Oceanic and Atmospheric Administration. p. 15.
[76] Takekawa, J. et. al. eds. p. 185.
[77] Takekawa, J. et. al. eds. p. 185.
[78] Cohen. 2000. pp. 28-29.
[79] Takekawa, J. et. al. eds. p. 186.
[80] Cohen pp. 28-29.
[81] "2.7 million gallons of sewage spill into Richardson Bay." Marin Independent Journal. February 1, 2008. http://www.marinij.com/ci_8142620. Last accessed October 15, 2009.
[82] National Oceanic and Atmospheric Administration. p 15.
[83] Cohen pp. 28-29.
[84] Cohen pp. 28-29..
[85] National Oceanic and Atmospheric Administration. p. 13.
[86] Takekawa, J. et. al. eds. p. 182.
[87] San Francisco Bay Conservation and Development Commission. 2009.
[88] Knowles, N., and Cayan, D., 2004, Elevational dependence of projected hydrologic changes in the San Francisco estuary and watershed: Climatic Change, v. 62, p. 319-336
[89] Duke University. "Climate Change and its Effects on the Salinity and Fish of the San Francisco Bay Estuary." http://www.duke.edu/web/nicholas/bio217/lsm11/index.html. Last accessed on October 8, 2009.
[90] Takekawa et. al. 2006. p. 188.
[91] White, H. R. *Wintering duck response to trail use at former San Francisco Bay salt ponds* Master's Thesis thesis, San Jose State University, (2009).
[92] Takekawa et. al. 2006. p.195.
[93] UNESCO – Man in the Biosphere Reserve Directory. http://www.unesco.org/mabdb/br/brdir/directory/biores.asp?mode=gen&code=USA+42. Last acceded on October 16, 2009.

[94] Western Hemisphere Shorebird Reserve Network. San Francisco Bay. http://www.whsrn.org/site-profile/san-francisco-bay. Last accessed on October 16, 2009.
[95] Don Edwards National Wildlife Refuge. http://www.fws.gov/desfbay/. Last accessed on October 16, 2009.
[96] Christy Smith, San Pablo Bay National Wildlife Refuge Manager. Personal communication. October 16, 2009.
[97] San Pablo Bay National Wildlife Refuge. http://www.fws.gov/sfbayrefuges/San%20Pablo/. Last accessed on October 16, 2009.
[98] Christy Smith, San Pablo Bay National Wildlife Refuge Manager. Personal communication. October 16, 2009.
[99] Marin Islands National Wildlife Refuge. http://www.fws.gov/sfbayrefuges/Marin_Islands/. Last accessed October 16, 2009.
[100] Christy Smith, San Pablo Bay National Wildlife Refuge Manager. Personal communication. October 16, 2009.
[101] Antioch Dunes National Wildlife Refuge. http://www.fws.gov/sfbayrefuges/antioch/. Last accessed October 16, 2009.
[102] Christy Smith, San Pablo Bay National Wildlife Refuge Manager. Personal communication. October 16, 2009.
[103] National Park Service. Golden Gate National Recreation Area History and Culture. http://www.nps.gov/goga/historyculture/creation-of-golden-gate-national-recreation-area.htm. Last accessed on October 16, 2009.
[104] Michael Norelli, GIS Coordinator, Golden Gate National Parks Conservancy, and Craig Scott, GIS Specialist, Golden Gate National Recreation Area. Personal communication October 16, 2009.
[105] National Estuarine Research Reserve System. San Francisco, California. http://nerrs.noaa.gov/SanFrancisco/welcome.html. Last accessed on October 16, 2009.
[106] Kerry Wilcox, Richardson Bay Audubon Sanctuary Manager. Personal communication October 16, 2009.
[107] Richardson Bay Audubon Center & Sanctuary. Sanctuary boat closure. http://www.tiburonaudubon.org/conserve_boat.html.
[108] United States Fish & Wildlife Service, Canadian Wildlife Service, Secretaria de Medio Ambiente y Recursos Naturales. North American Waterfowl Management Plan. 2004. p 15.
[109] Audubon California. Important Bird Areas. http://ca.audubon.org//iba/index.php. Last accessed on October 16, 2009.
[110] California Regional Environmental Education Community. Resource Directory. http://creec.edgateway.net/cs/creecp/search/creec_res. Last accessed on October 15, 2009.
[111] Golden Gate Bridge Highway and Transportation District. "Visitors." http://www.goldengatebridge.org/visitors/. Last accessed October 8, 2009.
[112] San Francisco Board of Supervisors December 6, 2005 Memorandum, Public forum for comment on the future of the National Park Service's Alcatraz Ferry Service
[112] Luby, Edward M. , Drescher, Clayton D. and Lightfoot, Kent G.(2006). Shell Mounds and Mounded Landscapes in the San Francisco Bay Area: An Integrated Approach', The Journal of Island and Coastal Archaeology, 1:2, 191- 214; Environ. Sci. Technol., 2009, 43 (24), pp 9048–9049.