UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802-4213

January 14, 2009

In response refer to:
2007/08128
2008/02283

Lieutenant Colonel Laurence M. Farrell
District Engineer
U.S. Department of the Army
San Francisco District, Corps of Engineers
1455 Market Street, 16th Floor
San Francisco, California 94103-1398

Dear Colonel Farrell:

Thank you for your letters of December 18, 2007, and April 15, 2008, requesting consultation pursuant to section 7 of the Endangered Species Act of 1973 as amended (16 U.S.C. 1531 *et seq.*) for the South San Francisco Bay Salt Ponds Restoration Project in San Mateo, Santa Clara and Alameda counties. The U.S. Army Corps of Engineers (Corps) has requested consultation for the proposed issuance of permits to the U.S. Fish and Wildlife Service (FWS) and California Department of Fish and Game (CDFG) for implementation of Phase 1 actions (NMFS Tracking Number 2007/08128, Corps File No. 27703S) and on-going maintenance activities (NMFS Tracking Number 2008/02283, Corps File No. 00103S). This response transmits NOAA's National Marine Fisheries Service's (NMFS) biological opinion (Enclosure 1) for these projects. The biological opinion describes NMFS' analysis of the effects of the project's Phase 1 actions and on-going maintenance activities on threatened Central California Coast (CCC) steelhead (*Oncorhynchus mykiss*), the southern Distinct Population Segment (DPS) of North American green sturgeon (*Acipenser medirostris*), designated critical habitat for CCC steelhead, and proposed critical habitat for the southern DPS of green sturgeon.

In the enclosed biological opinion, NMFS concludes the issuance of Corps permits for the South Bay Salt Ponds Project's Phase 1 actions and on-going maintenance are not likely to jeopardize the continued existence of threatened CCC steelhead or the southern DPS of green sturgeon. NMFS has also concluded the proposed projects are not likely to result in the destruction or adverse modification of designated critical habitat for CCC steelhead or proposed critical habitat for green sturgeon. However, NMFS anticipates take of CCC steelhead and green sturgeon will occur during project implementation. An incidental take statement which applies to Phase 1 actions and on-going maintenance with non-discretionary terms and conditions is included with the enclosed biological opinion.

This letter also transmits NMFS' Essential Fish Habitat (EFH) Conservation Recommendations (Enclosure 2) as required by the Magnuson-Stevens Fisheries Conservation and Management Act (MSA) (16 U.S.C. 1801 *et seq.*). NMFS has reviewed the proposed project for potential effects on EFH and determined that the proposed project would adversely affect EFH for various federally managed fish species under the Pacific Salmon, Coastal Pelagics, and Pacific Groundfish Fishery Management Plans.

Section 305(b)(4)(B) of the MSA requires the Corps to provide NMFS with a detailed written response within 30 days to these EFH Conservation Recommendations, including a description of the measures adopted by the Corps for avoiding, minimizing, or mitigating the impact of the project on EFH (50 CFR 600.920(j)). In the case of a response that is inconsistent with NMFS' recommendations, the Corps must explain its reasons for not following the recommendations, including the scientific justification for any disagreements with NMFS over the anticipated effects of the proposed action and the measures needed to avoid, minimize, or mitigate such effects.

If you have any questions concerning this biological opinion or EFH Conservation Recommendations, please contact Gary Stern at (707) 575-6060 or by email at gary.stern@noaa.gov.

Sincerely,

Rodney R. McInnis
Regional Administrator

Enclosures (2)

cc: Russ Strach, NMFS, Sacramento, CA
Korie Schaeffer, NMFS, Santa Rosa, CA
Joseph Dillon, NMFS, Santa Rosa, CA
Paula Gill, Corps-San Francisco, CA
Eric Larson, California Department of Fish and Game, Yountville, CA
Melisa Helton, U.S. Fish and Wildlife Service, Sacramento, CA
Steve Ritchie, URS Corporation, Oakland, CA
Copy to File: ARN #151422SWR2007SR00577: (Corps File No. 27703S)
Copy to File: ARN #151422SWR2008SR00155: (Corps File No. 00103S)

Enclosure 1

BIOLOGICAL OPINION

ACTION AGENCY:	U.S. Army Corps of Engineers
ACTION:	South San Francisco Bay Salt Ponds Restoration Project Phase 1 Actions (Corps File No. 27703S) 10-year Permit for Operations and Maintenance (Corps File No. 00103S)
CONSULTATION CONDUCTED BY:	National Marine Fisheries Service, Southwest Region
TRACKING NUMBER:	2007/08128 – Phase 1 Actions 2008/02283 – 10-year Permit for Operations and Maintenance
DATE ISSUED:	January 14, 2009

I. CONSULTATION HISTORY

In June 2003, the U.S. Fish and Wildlife Service (FWS) and the California Department of Fish and Game (CDFG) prepared the Initial Stewardship Plan (ISP) that described the interim maintenance plan for 15,100 acres of South Bay salt ponds until a long-term restoration plan was developed. The ISP provided guidance on ceasing commercial salt operations, introducing tidal hydrology to ponds where feasible, maintaining existing high quality open water and wetland wildlife habitat, maintaining ponds in a restorable condition to facilitate future long-term restoration, minimizing management costs, and meeting regulatory requirements to maintain water quality standards in the South Bay. By letter dated June 6, 2003, the U.S. Army Corps of Engineers (Corps) requested consultation pursuant to section 7 of the Endangered Species Act ((ESA), 16 U.S.C. 1531 *et seq.*) with NOAA's National Marine Fisheries Service (NMFS) regarding the South Bay Salt Ponds ISP. During consultation, NMFS worked with representatives of the Corps, FWS, CDFG, and the U.S. Geological Survey (USGS) to develop measures to avoid or eliminate potential adverse effects to listed fish species. By letter dated May 10, 2004, consultation for the ISP was concluded informally with a finding that the ISP was not likely to adversely affect listed species or designated critical habitat under the jurisdiction of NMFS.

Beginning in 2006 and continuing through 2008, NMFS worked extensively with FWS and CDFG's consultant, H.T. Harvey & Associates, on various components of the long-term plan for the South Bay Salt Ponds Restoration Project (SBSP Restoration Project). On July 11, 2006,

representatives from Philip Williams and Associates, CDFG, and FWS met with NMFS to introduce NMFS staff to the SBSP Restoration Project.

On October 27, 2006, the NMFS was provided an administrative draft of the Project's Environmental Impact Statement/Report (EIS/EIR).

On November 21, 2006, NMFS attended a meeting of the Project's Regulatory and Trustee Agency group. The meeting focused on the project schedule and environmental review process.

In January 2007, NMFS provided written comments on the administrative draft EIS/EIR by letter dated January 9, 2007. NMFS requested the project provide more information regarding the fisheries monitoring plan and include more information about the project's potential effects on fish in San Francisco Bay. A meeting with H.T. Harvey & Associates to discuss NMFS' comments was held on January 18, 2007.

The public draft EIS/EIR was released in March 2007. On March 14, 2007, and April 12, 2007, NMFS attended meetings with FWS and H.T. Harvey & Associates regarding the draft EIS/EIR and development of the Project's biological assessment. By letter dated April 23, 2007, NMFS provided written comments on the fisheries monitoring plan and adaptive management plan presented in the public draft EIR/EIS.

On April 23, 2007, NMFS met with representatives of H.T. Harvey & Associates to discuss the Project's Phase 1 actions at Pond A8. Methods to avoid the entrainment of fish at Pond A8 were explored including the use of fish screens and the seasonal closure of the intake structure.

In July 2007, H.T. Harvey provided by email to NMFS a preliminary draft biological assessment for the long-term program and draft biological assessments for several Phase 1 actions. A meeting with representatives from H.T. Harvey & Associates and NMFS was held on October 15, 2007, to discuss the Project's biological assessment and conservation measures for fish.

A revised set of biological assessments for Phase 1 actions was provided to NMFS on November 7, 2007, by H.T. Harvey & Associates. NMFS provided comments on these revised drafts to H.T. Harvey & Associates by email on December 14, 2007. NMFS requested additional information and clarification regarding several project facilities including the proposed operation of water control structures at managed ponds.

NMFS attended the December 3, 2007, meeting of the Project's Regulatory and Trustee Agency group.

By letter dated December 18, 2007, the Corps initiated formal consultation with NMFS for the permitting of the Project's Phase 1 actions. The Corps' letter presented a brief description of the overall program and general nature of the Phase 1 actions. Although the project's consultant had

provided NMFS several draft versions of biological assessments for each Phase 1 action, the Corps did not provide a biological assessment with their request for consultation.

On December 19, 2007, NMFS attended another meeting of the Project's Regulatory and Trustee Agency group. The group discussed schedules for completing section 7 consultations with NMFS and FWS, and the subsequent Corps' permitting of the project's Phase 1 actions.

By letter dated April 15, 2008, Corps initiated formal consultation for the proposed issuance of a 10-year permit to FWS and CDFG for on-going maintenance at the South Bay salt ponds. The Corps' letter requested NMFS use the project description and biological assessments provided by H.T. Harvey & Associates in June 2007. H.T. Harvey & Associates had transmitted by email draft biological assessments to NMFS in July 2007.

On April 29, 2008, NMFS convened a telephone conference call with biologists from CDFG, FWS, and H.T. Harvey & Associates to discuss the potential risks of fish entrainment at the SBSP Restoration Project's managed ponds. Work initiated by this telephone conference call continued in July 2008 with four weekly telephone conference calls between H.T. Harvey and NMFS. This group developed information to assess the potential risk of fish entrainment at managed ponds.

In late July 2008, the SBSP Restoration Project's Fish Monitoring Plan Framework dated July 28, 2008, was provided to NMFS. A revised version of the Fish Monitoring Plan Framework was provided to NMFS on August 18, 2008.

In August 2008, revised draft biological assessments for long-term program and Phase 1 actions were provided by H.T. Harvey & Associates.

During early November 2008, representatives from NMFS, Corps, CDFG, and FWS finalized the operational protection measures for water intake structures at managed ponds. These operational measures were incorporated into final biological assessments for the project. By letter dated November 24, 2008, the Corps transmitted the project's final biological assessments and project description to NMFS. NMFS and the Corps also agreed that the Corps' consultation request of December 18, 2007, for the permitting of Phase 1 actions and the Corps' request of April 15, 2008, for the issuance of a 10-year maintenance permit should be combined and effects evaluated together. Therefore, NMFS has addressed the effects of the two proposed Corps permit actions in this single biological opinion.

This biological opinion is based primarily on information contained in the following documents:

(1) *Final Environmental Impact Statement/Report for the South Bay Salt Pond Restoration Project*. December 2007. Prepared by EDAW, Philip Williams and Associates, Ltd., H.T. Harvey & Associates, Brown and Caldwell, and Geomatrix.

(2) Fish Monitoring Plan Framework dated November 19, 2008.
(3) Biological Assessment for South Bay Salt Pond Restoration Project, Phase 1, Pond SF2 dated November 19, 2008.
(4) Biological Assessment for South Bay Salt Pond Restoration Operations and Maintenance Activities for U.S. Fish and Wildlife Service and California Department of Fish and Game dated November 19, 2008.
(5) Biological Assessment for South Bay Salt Pond Restoration Project, Phase 1, Pond A6 dated November 20, 2008.
(6) Biological Assessment for South Bay Salt Pond Restoration Project, Phase 1, Ponds A16 and A17 dated November 19, 2008.
(7) Biological Assessment for South Bay Salt Pond Restoration Project, Phase 1, Ponds A5, A7, and A8 dated November 20, 2008.
(8) Biological Assessment for South Bay Salt Pond Restoration Project, Phase 1, Ponds E8A, E8X, and E9 dated November 17, 2008.
(9) Biological Assessment for South Bay Salt Pond Restoration Project, Phase 1, Ponds E12 and E13 dated November 20, 2008.
(10) South Bay Salt Pond Restoration Project, Phase 1 Monitoring Plan dated October 14, 2008.
(11) South Bay Salt Pond Restoration Project, Conservation Measures Addendum dated November 17, 2008.
(12) South Bay Salt Pond Restoration Project Administrative Draft Adaptive Management Plan dated November 14, 2008.

Additional information regarding the Project was provided to NMFS through meetings; written, telephone, and electronic communications; and other sources of information. A complete administrative record of this consultation is on file in the NMFS Santa Rosa Area Office (ARN #151422SWR2007SR00577 and ARN #151422SWR2008SR00155).

Section 7 of the ESA and its implementing regulations also require biological opinions to determine if Federal actions would destroy or adversely modify critical habitat. On August 6, 2004, the Ninth Circuit Court of Appeals rendered a decision in *Gifford Pinchot Task Force v. U.S. Fish and Wildlife Service* that the Service's regulatory definition of "destruction or adverse modification" of critical habitat is contrary to law. This biological opinion does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 CFR 402.02. Instead, we have relied upon the statutory provisions of the ESA to complete the following analysis with respect to critical habitat.

II. DESCRIPTION OF PROPOSED ACTION

The SBSP Restoration Project is a long-term, comprehensive plan to restore and enhance wetlands in South San Francisco Bay (South Bay) while providing for flood management and

wildlife-oriented public access and recreation within ponds formerly owned by Cargill Corporation Inc. (Cargill). The project area includes 15,100 acres of former salt evaporation ponds along the margins of the South Bay in San Mateo, Santa Clara, and Alameda counties. FWS and CDFG currently own and manage the land in the project area; FWS manages the Ravenswood and Alviso pond complexes, and CDFG manages the Eden Landing pond complex. The SBSP Restoration Project is intended to be implemented in several phases over a 50-year timeframe. Phase 1 is scheduled for implementation between 2009 and 2012, and the remaining phases will be developed and occur later in time. At this time, FWS and CDFG have only developed detailed plans for six Phase 1 actions and on-going operations and maintenance (O&M). Applications have been submitted to the Corps for Phase 1 actions and on-going O&M. The Corps proposes to issue permits to FWS and CDFG under section 404 of the Clean Water Act (CWA) for construction of Phase 1 actions. The Corps also proposes to issue a 10-year CWA section 404 permit for FWS and CDFG to conduct O&M activities in the 15,100-acre project area over the next 10 years. During consultation, NMFS analyzed Phase 1 construction actions (2009-2012) and operations and maintenance for the next 10 years. As actions are developed for subsequent phases of the long-term restoration plan, including operations and maintenance, FWS and CDFG will apply to the Corps for permits and additional section 7 consultations between NMFS and the Corps will be performed for those actions as appropriate.

A. Phase 1 Actions

The Corps proposes to issue permits to FWS and CDFG to perform six Phase 1 actions within the project area. Phase 1 actions include the reconfiguration of four sites to be "managed ponds" (Ravenswood SF2; Alviso A5/A7A8; Alviso A16/17; and Eden E12/E13), and two areas to be "tidal habitat" (Alviso A6, Eden E8A/E8X/E9). Managed ponds are diked wetlands with water control structures in perimeter levees that maintain shallow water habitat for birds. Tidal habitat is wetlands with freshwater, brackish water, or saltwater along tidal shores that are not confined by perimeter levees. The following Phase 1 actions are proposed for permitting by the Corps:

1. Ravenswood Pond SF2

Ravenswood Pond SF2 will be reconfigured as a managed pond. This pond is owned by FWS and is part of the Don Edwards San Francisco Bay National Wildlife Refuge. Islands will be created for nesting terns and shorebirds, and the remainder of the pond will be managed as shallow water habitat for shorebird and dabbling duck foraging. The design for the site includes three management cells. Nesting islands will be constructed in the central and eastern cells, and water levels will be managed to provide optimal depths for shorebird foraging. The third, western-most cell will be managed as a seasonal wetland. Water control structures will be used both to manage water levels and flows into and out of Pond SF2 from San Francisco Bay, and between cells, for shorebird foraging habitat and to meet water quality objectives.

Water would flow into and out of Pond SF2 through two new water control structures at the

northern and southern ends of an existing levee between Pond SF2 and the Bay. A small linear fringe marsh exists between the existing levee and the south Bay. Pilot channels will be excavated from the SF2 levee to San Francisco Bay through the fringe marsh outboard of the new water control structures to facilitate flow of water into and out of the pond. The southern pilot channel will be about 1,000 feet (ft) in length. The invert elevation through the outboard marsh will be -1.5 ft North American Vertical Datum (NAVD), and the invert elevation across the mudflat will be 0.5 ft NAVD. The width of the southern pilot channel will be approximately 65 ft through the outboard marsh, and 50 ft across the mudflat. The northern pilot channel will be approximately 250 ft in length, and the bottom width will be about 35 ft. Material excavated from the pilot channels will be placed within Pond SF2 or disposed off-site. Within Pond SF2, material will be placed in the borrow ditch,[1] inboard of the bayfront levee. Material may also be placed on the pond bed (*e.g.*, lower elevation areas in the southern portions of the cells). Except in locations where the material may be used to construct berms or islands, material will not be placed above elevation 5.0 ft NAVD.

The new southern and northern water control structures between the Bay and Pond SF2 will be operated to manage water circulation and water depths in Pond SF2. The new structure located near the southern end of the bayfront levee will consist of six new 4-ft diameter culverts with flap gates. At the northern end of the bayfront levee, the second new water control structure will consist of five new 4-ft diameter culverts with flap gates. Average summer inflow will be approximately 35 cubic feet per second (cfs), and maximum summer inflow will be approximately 365 cfs. Winter inflows are expected to be lower due to the presence of rainwater in the pond. Both water control structures will be operated as "2-way" flow to create muted tidal conditions from February 1 through May 31 (see Table 1). From June 1 through January 31, the southern water control structure will be operated as one-way outlet and the northern water control structure will be operated as a one-way intake. If alternative management scenarios require either of the new water control structures to be operated for one-way flow year-round, fish screens will be installed prior to their year-round use for one-way flow.

Within Pond SF2, an outlet canal would be created to convey flow out of the individual cells. The canal would be located along the southeast edge of the pond in portions of the deep existing borrow ditch. The seasonal wetland area will have one structure consisting of an 8-ft long flashboard weir. In addition to the cell weir structure, three cell outlet culvert structures will be located where the berms cross deeper, historic channels, and borrow ditches (total of four structures including the seasonal wetland area structure). These culvert structures will drain deeper water from these channels for periodic maintenance and be operated to manage water quality. Water would be circulated through the cells in Pond SF2 at rates sufficient to maintain adequate dissolved oxygen (DO) levels, salinity, and pH in the cells and at the outlet structure.

Additionally, the Pond SF2 design will incorporate trails and interpretative displays for

[1] A borrow ditch is an excavated ditch adjacent to the pond levees where material was excavated in order to create or maintain the pond levees.

recreation and public access. The public access and recreation plan for this area includes an upgrade of the existing Bay Trail spur along the bayfront of Pond SF2, and the construction of two viewing platforms and interpretive stations along this trail. The interpretive stations will describe the restoration process of developing a managed pond as well as the relationship to the Bay and future tidal marsh restoration in this location. The rehabilitated trail will be incorporated within the existing levee, and the process will involve re-grading and re-surfacing for compliance with the Americans with Disabilities Act. The viewing platforms would be raised above the existing grade of the levee trail to allow visitors a panorama view of the Bay and the large expanse of adjacent managed pond.

Table 1. SBSP Water Intake Structures at Managed Ponds - Operational Measures to Protect Juvenile Salmon and Steelhead[2]

Water Control Structure #	Pond Location	Intake Waterbody Location	Summer/Fall Operations	Winter/Spring Operations
B2-1 (existing)	E1	Old Alameda Creek	No restrictions	No restrictions
B2-2 (existing)	E1	Old Alameda Creek	No restrictions	No restrictions
B2C-16 (existing pumping plant)	E1C	Alameda Creek Flood Channel	No restrictions June 1 to Jan 31	Pumped intake only - Intake closed Feb 1 to May 31 beginning 2012[3].
B2-11	E2	San Francisco Bay	No restrictions June 1 to Jan 31	Two-way flow only from Feb 1 to May 31
B2C-14 (existing)	E2C	Alameda Creek Flood Channel	No restrictions June 1 to Jan 31	Intake closed Feb 1 to May 31 beginning 2012[3]; Outlet only Feb 1 to May 31
B6A-10 (existing)	E6A	Old Alameda Creek	No restrictions	No restrictions
B6B-NC (existing)	E6B	North Creek	No restrictions	No restrictions

[2] Restrictions on operations will be revisited if studies evaluating juvenile salmonid behavior indicate that juveniles do not enter ponds, or if juveniles do enter ponds they find egress in a timely manner. Studies will be conducted within 2 years of the issuance of this Biological Opinion or within 2 years of the restoration action, whichever is later. If FWS, CDFG, or the Corps propose revision of any operational restrictions, Section 7 consultation with NMFS shall be reinitiated to address these changes, and no operational changes will be made until the reinitiated consultation has been completed.

[3] Alameda Creek does not currently support a run of steelhead due to an impassable barrier in the lower reach of the Federal Flood Control Channel. Plans are under development to install a fish ladder at this barrier in 2010-11.

B6A-1 (existing)	E8	North Creek	No restrictions	No restrictions
B11-1 (existing)	E10	Mt. Eden Creek	No restrictions	No restrictions
B11-3 (existing)	E11	Mt. Eden Creek	No restrictions	No restrictions
Proposed (E13-1)	E12	Mt. Eden Creek	No restrictions	No restrictions
Proposed (E13-2)	E13	Mt. Eden Creek	No restrictions	No restrictions
Proposed (E13-3)	E12/13	Pond E8X	No restrictions	No restrictions
A2W-1 (existing)	A1	Charleston Slough	No restrictions	No restrictions
A2W-4 (existing)	A2W	San Francisco Bay	No restrictions June 1 to Jan 31	Two-way flow or outlet only from Feb 1 to May 31
A3W-1 (existing)	AB1	San Francisco Bay	No restrictions June 1 to Jan 31	Two-way flow or outlet only from Feb 1 to May 31
A3W-2 (existing)	AB-1	San Francisco Bay	No restrictions June 1 to Jan 31	Two-way flow or outlet only from Feb 1 to May 31
A3W-10 (existing)	A3-W	Guadalupe Slough	No restrictions	No restrictions
A7-1 (existing)	A5	Guadalupe Slough	No restrictions	No restrictions
A7-7 (existing)	A7	Alviso Slough	No restrictions June 1 to Jan 31	Intake closed Feb 1 to May 31; Outlet only Feb 1 to May 31
Proposed Armored Notch (replaces existing A7-8)	A8	Alviso Slough	No restrictions June 1 to Nov 30	Notch closed from Dec 1 to May 31
A14-1 (existing)	A9	Alviso Slough	No restrictions June 1 to Jan 31	Intake closed Feb 1 to May 31; Outlet only Feb 1 to May 31
A14-13 (existing)	A14	Coyote Creek	No restrictions June 1 to Jan 31	Outlet only Feb 1 to May 31
A14-10 (existing)	A15	Coyote Creek	No restrictions June 1 to Jan 31	Intake closed Feb 1 to May 31; Outlet only Feb 1 to May 31
Proposed (A16-5b)	A16	Artesian Slough	No restrictions June 1 to Jan 31	Outlet only Feb 1 to May 31
A16-5 (existing)	A16	Artesian	No restrictions	Outlet only Feb 1 to

		Slough	June 1 to Jan 31	May 31
Proposed (A16-1b)	A17	Coyote Creek	Fish screens installed	Fish screens installed
A16-1 (existing)	A17	Coyote Creek	Fish screens installed	Fish screens installed
A23-1 (existing)	A22	Mud Slough	No restrictions	No restrictions
A23-3 (existing)	A23	Mud Slough	No restrictions	No restrictions
WB-1 (existing)	R1	Ravenswood Slough	No restrictions June 1 to Jan 31	Two way flow or outlet only Feb 1 to May 31
WB-1A (existing)	R1	Ravenswood Slough	No restrictions June 1 to Jan 31	Two way flow or outlet only Feb 1 to May 31
WB-4 (existing)	R2	Ravenswood Slough	Outlet only; Not used as intake	Outlet only; Not used as intake
WB-2 (existing)	R3	Ravenswood Slough	Outlet only; Not used as intake	Outlet only; Not used as intake
Proposed (replaces existing WB-6) (SF2-1)	SF2	San Francisco Bay	No restrictions June 1 to Jan 31	Two-way flow or outlet only from Feb 1 to May 31
Proposed (SF2-2)	SF2	San Francisco Bay	No restrictions June 1 to Jan 31	Two-way flow or outlet only from Feb 1 to May 31

2. Alviso Pond A6

Pond A6 will be restored to tidal habitat by breaching and lowering the outboard levee, excavating pilot channels through the fringe marsh outboard of the breaches, and constructing ditch blocks in the perimeter borrow ditch. This pond is owned by FWS and is part of the Don Edwards San Francisco Bay National Wildlife Refuge. Since the time the levees were built around Pond A6 to create a salt pond, it has subsided by approximately 5 ft to an average elevation of 2.3 ft NAVD. This pond elevation is below Mean Tide Level (MTL) at 3.3 ft NAVD and below the elevation at which marsh vegetation colonizes emerging mudflats. The Pond A6 restoration plan would initially create large areas of emergent mudflat habitat. Over time, tidal channel and vegetated salt marsh habitats are expected to develop in Pond A6 as sediment accumulates and vegetation establishes on the emerging mudflats.

Approximately 2,200 ft of the existing levee between Pond A6 and Guadalupe Slough (Guadalupe Slough levee) will be lowered to the marsh plain elevation (Mean Higher High Water (MHHW) or 7.5 ft NAVD) by excavation. An additional 1,300 ft of the outboard levee will be lowered at one location on Alviso Slough, and approximately 150 ft of the Alviso Slough levee will be lowered at a second location. Both sites of lowered levees on Alviso Slough will

provide high tide conveyance into Pond A6. Other portions of the Pond A6 outboard levees will not be lowered. Material generated from lowering these levees will be used to construct the ditch blocks. Ditch blocks are fill material installed in channels of tidally restored ponds to direct water flow. Ditch blocks will be used by the SBSP Restoration Project to promote the re-establishment of the historic tidal drainage system within the ponds. Ditch block locations are selected to provide complete drainage of the borrow ditch at low tide and avoid the potential standing of fish in isolated pools within the pond.

Breaches through the outboard levees and pilot channels through the outboard marsh will be excavated at the locations of the four major remnant historic tidal channels. Two breaches are located on Guadalupe Slough, and two breaches are located on Alviso Slough. Two breach excavations will be 30 ft wide at the top of the levee and 5 ft deep below the top of the levee (0.7 ft NAVD invert elevation). The other two breaches will be larger, with top widths of 80 to 100 ft and depths of 8 ft (-2.3 ft NAVD invert elevation). Pilot channels will be excavated to the depth of the breach (long-term equilibrium depth), with side slopes of 3:1. Internal pilot channels widths at the pond bed are approximately 15 to 20 ft. Excavations may occur by hydraulic dredging and spoils would be pumped into the pond to locations that would avoid excessive filling of remnant channels and turbidity after restoration.

Within Pond A6, four new segments of boardwalk will be constructed to allow access to Pacific Gas and Electric's (PG&E) electrical transmission towers and to provide access to two platforms that will be constructed by PG&E. These 40x40-ft platforms will be used for laydown of materials transported to the site by helicopter. The new boardwalk segments include a 40-ft extension of the existing boardwalk into Guadalupe Slough, a 100-ft extension of the existing boardwalk into Coyote Slough, and two 100-ft boardwalk segments extending perpendicular from the existing boardwalk within Pond A6 to the new platforms. In addition to the 100-ft extension of the existing boardwalk into Coyote Slough, the existing 200-ft long boardwalk at this location may need to be rebuilt.

Restoration construction is expected to occur over a two-year period. The Project proposes to schedule construction and excavation activities during the non-breeding season for gulls, Clapper rails, and snowy plovers.

3. Ponds A5, A7, and A8

The A8 complex consisting of Ponds A5, A7, and A8 will be reconfigured as managed ponds with muted tidal action to create approximately 1,400 acres of shallow water habitat. These ponds are owned by FWS and are part of the Don Edwards San Francisco Bay National Wildlife Refuge. Water levels in Pond A8N (409 acres) would exceed elevations of internal levees and spill into adjacent Ponds A5, A7, and A8S (1,023 acres), modifying the existing hydrologic regime in these ponds as well. Water levels during the tidal cycle would fluctuate evenly across all the ponds, but depths would vary due to differences in pond bed elevations. Depths would

generally exceed those at which the ponds are presently managed (<1 ft in most areas) over the majority of the project site. The expected 1-ft increase in water depths will also require improvements to the small levee around the sump inlet pond (*a.k.a.*, "donut") in Pond A4.

Muted tidal connection to the pond complex would be provided primarily by construction of an armored notch through the perimeter levee that separates Pond A8 and upper Alviso Slough. Earth excavated to construct the notch would be placed within Pond A8 or used for maintenance of nearby levees. This structure would be designed to allow the width of the notch (*i.e.*, the opening that allows water to flow in and out of the pond) to be adjustable, with a maximum width of approximately 40 ft. The depth of the notch would extend to approximately one foot above the average bed elevation of Pond A8 (-0.5 ft NAVD88). The size of this structure has been selected to maximize the potential volume of water exchange between the slough and the pond while controlling water levels within the pond. Due to structural considerations, the notch would consist of eight 5-ft bays that can be opened and closed independently, allowing tidal exchange between Pond A8 and Alviso Slough to be adjusted based on monitoring data.

An approximately 475-ft-long pilot channel will be constructed to connect Pond A8 to Alviso Slough. This channel will be excavated through existing fringe freshwater marsh from upper Alviso Slough to the site of the proposed armored notch on the existing Pond A8 levee. This channel would facilitate tidal exchange through the notch by providing an initial flow path and removing erosion-resistant marsh vegetation so the channel can gradually enlarge through tidal scour. The top width of the constructed pilot channel will be over-excavated to approximately 130 ft to minimize the erosion of sediment that may be contaminated with mercury. The depth of the pilot channel will extend through the erosion-resistant vegetation and root mass to approximately 9 ft below existing grade. Rock armor will be placed immediately adjacent to the notch to limit erosion. Construction of the armored notch and pilot channel is estimated to take 30-36 weeks and will primarily occur between April and mid-October.

The eight operable 5-ft bays at the armored notch will be operated in two different seasonal modes (Table 1). The winter/spring operational mode of the armored notch will extend from December 1 to May 31, and the summer/fall operational mode will extend from June 1 to November 30. During the period between December 1 and May 31, all eight bays of the constructed notch will be fully closed to maintain flood storage capacity in Pond A8 and prevent the entrainment of juvenile salmon and steelhead into the managed pond complex. From June 1 through November 30, the armored notch will be operated as partially open gates to fully open gates to allow for muted tidal exchange. Flow through the Pond A8 notch would occur during both flood and ebb tides in summer/fall period. This partial restoration of tidal prism is expected to promote channel scour and increase salinity along Alviso Slough.

The seasonal operational modes of the Pond A8 armored notch will be coordinated with the operation of two existing water control structures at Ponds A5 and A7 (Table 1). During the period from February 1 to May 31, the Pond A5 water control structure (Structure #A7-1) on

Guadalupe Slough will be operated as an intake and the Pond A7 water control structure (Structure #A7-7) on Alviso Slough will be operated for outflow only. This winter/spring operation is expected to circulate water through the pond complex while the armored notch on Pond A8 is fully closed. During the period from June 1 to January 31, both the A5 water control structure (Structure #A7-1) and A7 water control structure (Structure #A7-7) will be operated as intakes only, and the armored notch will serve as both an intake and outlet structure until December 1. Intake flows through the Pond A5 and A7 structures are expected to be approximately 22 cfs, with a maximum of 69 cfs. FWS proposes to install fish screens that are designed to meet NMFS and CDFG criteria on water control structure #A7-7 no later than October 2015.

Monitoring of fish, water quality, mercury levels, and scouring of downstream levees in Alviso Slough will be performed to evaluate the operation and configuration of the Pond A8 armored notch. Restoration of muted tidal action at Pond A8 is designed to be reversible so that in the event that unacceptable ecological impacts begin to occur, such as an increase in mercury bioavailability, tidal exchange in Pond A8 can be eliminated to prevent long-term adverse impacts, and water management at Ponds A5 and A7 can revert to ISP operations. For Phase 1, the SBSP Restoration Project proposes to operate the complex as a managed pond with muted tidal conditions. Any change in the seasonal operation of the constructed notch would require review and approval from state and federal resource agencies. If alternative management scenarios require the Pond A7 water control structure to be operated as an intake year-round prior to October 2015, fish screens will be installed prior to its year-round use.

Applied research studies will be implemented as part of Phase 1 at Ponds A5, A7, and A8 to answer questions regarding key project uncertainties related to ecosystem restoration. The key research questions for the A8 complex include assessment of mercury levels in sentinel species found in both managed and tidal marsh habitat, and fish entrainment studies associated with the water management regime and configuration of the ponds.

4. Ponds A16 and A17

Alviso Pond A16 will be reconfigured to create 242 acres of managed pond habitat, and Pond A17 will be modified to provide water to Pond A16. These ponds are owned by FWS and are part of the Don Edwards San Francisco Bay National Wildlife Refuge. Islands will be created for nesting birds and shallow water habitat for foraging shorebirds. Water in Ponds A16 and A17 will be managed with a new internal water circulation system using a series of berms and control structures such as flashboard weirs.

A new water control structure will be built between Coyote Creek and Pond A17 to bring water from Coyote Creek into the A16/A17 pond system (Table 1). The new structure will consist of two 4-ft diameter intake culverts with combination slide/flap gates on each end (*i.e.*, on both sides of the culverts). The existing single 4-ft culvert with combination slide/flap gates will

remain in place at the site (Structure #A16-1). The average summer inflow through the new and existing culverts at Pond A17 will be 63 cfs, with a maximum of 353 cfs. Average and maximum winter inflows will be 23 cfs and 118 cfs, respectively. A pilot channel will be excavated from Coyote Creek to the new Pond A17 intake structure through the existing fringe marsh. The preliminary design includes a 20-ft long trapezoidal pilot channel with 3:1 side slopes. The channel is anticipated to have a 75-ft top width and a 28-ft bottom width. The channel will be excavated to a depth of approximately 7.5 ft below the adjacent marsh plain; the channel bottom will be about 1 ft below the culvert invert.

In addition to trash racks on the Coyote Creek side of the Pond A17 intakes, FWS proposes to install fish screens to prevent the entrainment of fish from Coyote Creek into Pond A17. The new fish screen structure will be installed directly on the new and existing culverts, or the screen may be installed across the mouth of the pilot channel on Coyote Creek. The fish screen design and placement location will be provided to NMFS for review and approval prior to construction.

Within the Pond A16/17 complex, three new 4-ft diameter culverts will be constructed between Pond A17 and Pond A16. This structure will be located in the existing channel cut between the ponds and allow for water in Pond A17 to flow into Pond A16. To control the flow of water between cells in Pond A16, weirs with adjustable flashboard risers (flashboard weirs) will be constructed. Each cell in Pond A16 will have two intake and two outlet structures, each consisting of multiple 4-ft wide weirs. Cell 1 will have two 4-ft wide flashboard weirs per intake and outlet structure, and Cells 2 and 3 will have three 4-ft wide flashboard weirs per intake and outlet structure. Additional flashboard weirs may be included and buried in the adjacent berm to provide stability.

Between Pond A16 and Artesian Slough, six new 4-ft diameter outlet culverts, with combination slide/flap gates on both ends of each culvert, will be constructed. This new structure will be located to the south of the existing outlet culvert #A16-5, which is a single 4-ft diameter outlet culvert with combination slide/flap gates. A pilot channel will be excavated through the existing fringe marsh from the structure to the Artesian Slough side channel along the southeastern edge of Pond A16. The preliminary design includes a 50-ft long trapezoidal channel with 3:1 side slopes. The channel is anticipated to have a 105-ft top width and a 48-ft bottom width. The channel will be excavated to a depth of approximately 9.5 ft below the adjacent marsh plain; the channel bottom will be about 1 ft below the culvert invert. Both the new structure, consisting of six culverts, and the existing single culvert will be operated as outlets year-round.

Public access elements include the construction of a viewing platform and two interpretive stations at Pond A16. Proposed applied studies will test the effects of different island spacing and shapes on use by, and reproductive success of, nesting and roosting birds. In addition, different water management regimes will be tested to determine the best method for managing the pond for the target wildlife during the breeding and non-breeding seasons. The effects of public access on bird use of, and reproductive success on, nesting islands will also be studied.

5. Ponds E8A, E8X, and E9

Ponds E8A, E8X, and E9 will be restored to create approximately 630 acres of tidal salt marsh and tidal channel habitat. These ponds are owned by the CDFG and are part of the Eden Landing Ecological Reserve (ELER). Tidal restoration will be achieved through levee breaching, levee lowering, excavation of pilot channels, and the installation of borrow ditch blocks. A series of outboard levee breeches and pilot channels will connect to existing historic channels in the ponds, as well as internal levee breaches. Material generated from Ponds E8A, E8X, and E9 levee lowering will be used to construct an earthen levee between Ponds E12 and E13 and around Pond E14 as well as creation of islands and internal dikes in E12/13 as described more fully below. Levees will be lowered to elevations suitable for establishment of vegetation in the high marsh plain. The lowered outboard levees along Old Alameda Creek and North Creek and internal levees between Ponds E8A, E8X and E9 are expected to rapidly be colonized by pickleweed and create marsh habitat. Depressions will be excavated in lowered internal levees to create tidal marsh pond habitat, similar to historic marsh ponds that previously existed in the area. Levee improvements will be made along the existing alignments of the Ponds E9/E8X/E14 and E13/E14 levees. Mt. Eden Creek will be enlarged by dredging and reconfiguring the Pond E10 levee.

Applied research studies in Ponds E8A, E8X, and E9 will be implemented to answer questions regarding key project uncertainties related to ecosystem restoration. The key research questions for this site include an examination of sediment accretion in restored tidal areas, the effectiveness of marsh restoration in decreasing flood hazards, and the ecological value of tidal marsh ponds.

6. Ponds E12 and E13

The Eden Landing Ponds E12 and E13 will be reconfigured as managed ponds to create 230 acres of high quality shallow water foraging habitat for migratory shorebirds, with a range of salinities. These ponds are owned by the CDFG and are part of the ELER. Proposed actions include the operation of a new water pump, installation of four new water control structures, development of an internal water circulation system using a series of small levees (berms) and small flashboard weirs, and the construction of a six nesting and roosting islands. Within Ponds E12 and E13, the site will be divided into seven total cells, with six cells in tandem managed for progressively increasing salinity levels in each paired set of cells. Of the six cells, two cells will be managed to maintain low salinity levels (approximately 20 to 40 parts per thousand (ppt)) similar to Bay salinity levels; two cells will be managed to maintain moderate salinity levels (approximately 40 to 80 ppt); and the remaining two cells will be managed to maintain high salinity levels (approximately 80 to 120 ppt) during the dry season. The seventh cell will be a muted tidal mixing basin designed to reduce water salinities prior to discharge.

Water levels and flows in Ponds E12 and E13 will be managed using passive water control

structures, such as concrete "rice-box" type weirs or slide flap and weir structures, with supplemental pumping as needed. The elevation of the ponds gently slopes from east to west and averages 5.7 ft NAVD, which is approximately 1.3 feet below MHHW. As Ponds E12 and E13 are high in elevation relative to the tides, the potential for gravity flows into the ponds is limited, especially during neap tides when high tides are below MHHW. Gravity flows will occur through new intake structures located between Mt. Eden Creek and Pond E12, and between the northern extension of Pond E8X and Pond E13. The structures are still in design, but conservatively may consist of up to five new 4-ft diameter intake culverts with combination slide/flap gates on each end of the culvert. Water from Mt. Eden Creek and the pump forebay will flow into the low salinity cells. The existing culverts at Ponds E12 and E13 will be replaced with new water control structures with combination slide/flap gates.

A water distribution canal will be constructed between Ponds E12 and E13, with water control structures connecting the canal to each of the six cells, the historic salt works, and the discharge mixing basin. This distribution canal will allow bay salinity water to be pumped directly into any cell in order to dilute the higher salinity water as needed to maintain salinity targets. The canal will be created by constructing a new earth berm south of the existing borrow ditch between Ponds E12 and E13 and rebuilding the remnant levee north of the borrow ditch as needed. Part of the berm (first lift) will be built as part of the Ponds E8A, E8X, and E9 Phase 1 restoration, prior to Pond E12/E13 actions, to segregate Pond E12 from E13. This will enable Pond E12 to be managed for western snowy plovers during Ponds E8A, E8X, and E9 restoration actions.

Water for Ponds E12/E13 will be provided at three locations (Table 1). New 4-ft diameter culverts between Eden Creek and the eastern end of Pond E12 will be installed to access water from Mt. Eden Creek. At the western end of Pond E13, a new pilot channel will be excavated through existing outboard marsh to facilitate flow from Mt. Eden Creek into the existing water control structure. This existing water control structure will be replaced with a new structure during Phase 1. The third source of water will be from Pond E8X. As part of Ponds E8A, E8X, and E9 restoration actions, a new culvert with tide gates will be installed between Pond E8X and a managed forebay will be created. This forebay will limit tidal sedimentation and provide storage for both passive flows into Pond E13 and pumping into Ponds E12 and E13. A new 12,000 gallons per minute (gpm) pump will be installed in the existing pump house on the forebay and periodically operated to supplement gravity tidal intake flows into Ponds E12 and E13.

The intake structure at the western end of Pond E13 will be connected to Mt. Eden Creek by the excavation of a new pilot channel. The pilot channel will be approximately 220 ft long and will have side slopes of 3:1, with a depth of approximately 8 ft. The pilot channel top width will be approximately 150 ft. The pilot channel will be excavated by either land- or water-based equipment. Excavated material will be strategically placed in nearby borrow ditches or other restoration areas.

Recreational and public access facilities are proposed for Ponds E12 and E13. Trails and viewing areas will be constructed around these ponds. Both year-round and seasonal trails will link to the Bay Trail Spine segment. The historic Oliver Salt Works will be accessible to the public by the new trail, and will be open year-round. A viewing platform and interpretive station will be designed to tell the history of the salt works at this location, explain how salt is produced, and explain the salt work's cultural, economic, and social linkage to the greater San Francisco Bay Area.

Applied research studies will be conducted at Ponds E12 and E13 related to ecosystem restoration. Studies will utilize the proposed cell design to test the effects of salinity (low, moderate, or high) on shorebird species composition and density, on foraging behavior by these birds, and on the species composition and density of the prey on which these shorebirds feed. Other applied studies will test the effects of trail use on shorebirds using the ponds' foraging habitats.

B. Operations and Maintenance of the SBSP Restoration Project

FWS and CDFG propose to periodically perform O&M activities at reconfigured and managed ponds, recreational/public access facilities, and (less frequently) tidal habitat restoration sites. The Corps proposes to issue a separate 10-year CWA permit to FWS and CDFG for these O&M activities. Most of the proposed O&M is currently being conducted under the on-going ISP. Levees, ponds, and water control structures will be routinely operated and maintained according to the best management practices developed for the ISP and described below. Levees will be maintained for flood protection and habitat protection purposes; water control structures will be maintained for proper operation; trails and boat launches will be maintained for management and recreational use; inlet and outlet channels through tidal marsh to these structures will require periodic dredging; trash racks and fish screens will be cleaned; islands created for nesting and roosting habitat will need periodic vegetation control and rebuilding with sediment; and FWS/CDFG will need to respond to emergency situations. Each of these activities will require access (by land and/or sea), staging areas, and storage areas.

FWS and CDFG propose to continue to manage the ponds with in the SBSP Restoration Project area to provide habitat values while the long-term restoration plan is being developed. Bay waters will continue to be circulated through water control structures, and existing levees will be maintained. The operation of each pond system is generally described below. Details regarding proposed operations are presented in Table 1 and in the Projects' *Biological Assessment for Operations and Maintenance Activities for the U.S. Fish and Wildlife Service and California Department of Fish and Game November 19, 2008.*

At the Alviso Complex, water circulation patterns within ponds are generally maximized through the use of directional systems. Water control structures will typically be operated in a one-way fashion, with water entering through the intake in one pond, then flowing through the entire

system until exiting through a one-way outlet in another pond. However, some systems, particularly Pond A3W, may occasionally be operated as two-way muted tidal systems to improve water quality. Additionally, flows may be reversed, for two to four week durations, during winter or summer months to flush out sediment that accreted in trash racks and other water control structures. For the protection of steelhead and salmon in the Guadalupe River and Coyote Creek, existing water control structures at Pond A9 (Structure #A14-1), Pond A14 (Structure #A14-13), and Pond A15 (Structure #A14-10) will only be operated as outlets from February 1 through May 31. Fish screens which are designed to meet NMFS and CDFG criteria will be installed on structures #A14-1, A14-10, and A14-13 no later than October 2015. If alternative management scenarios require these water control structures to be operated as intakes year-round prior to October 2015, fish screens will be installed prior to their year-round use.

At the Ravenswood Complex, ponds on the north side of Highway 84 will be operated as seasonal ponds with rainfall as the primary source of water. Existing water control structures at Pond R1 (Structures #WB-1 and WB-1A) will be operated for "two-way" flow or as an outlet only from February 1 through May 31. Existing structures at Pond R2 (Structure #WB-4) and Pond R3 (Structure #WB-2) will be operated year-round as outlets to drain the ponds. New water control structures would be required to operate for alternative management scenarios, but FWS has no specific proposals to install new water control structures at this time. If alternative management scenarios require any of the existing water control structures or new structures to be operated as intakes, fish screens will be installed prior to their use as intakes. CDFG and FWS will provide design plans for each proposed fish screen to NMFS for review and approval prior to construction. Pond SF2 will be reconfigured to be a managed pond and operated as described above.

In the Eden Landing Complex, CDFG operates most ponds in the ELER as managed ponds. The majority of water control structures on the bay and on sloughs are operated as two-way structures that serve as both intakes and outlets. The remaining ponds are operated as seasonal ponds with one-way water control structures. CDFG has a number of pump stations (7,660-10,000 gpm) in the Eden Landing Complex, which were historically used by Cargill as supplemental intakes for salt pond operations. CDFG has not regularly used the pumps for ISP operations because of high energy costs, and the ISP pond systems have been managed primarily with passive tidal intake and discharge. Routine maintenance of pumps has been performed, which entails operating the pumps for five minutes on an approximately monthly basis to ensure pumps remain functional for occasional use for specific management purposes. During the first five years of ISP operations, only the #1 Baumberg Intake pump on Old Alameda Creek into Pond E1 was used for approximately one week to increase depths in an attempt to improve low dissolved oxygen conditions in that system. Increased intake and depth resulted in only moderate improvement of water quality in that system, and operating costs were significantly high to preclude such operations as routine. The Cal Hill intake pump at water control structure #B2C-16 which diverts water from the Alameda Creek Flood Control Channel into Pond E1C has not been used except for routine maintenance. CDFG proposes to periodically operate the 7,660 gpm pumps at

water control structure #B2C-16. At Pond E2C, CDFG proposes to continue to operate the two 4-ft diameter culverts at water control structure #B2C-14 as a passive tidal intake to convey flows from the Alameda Creek Flood Control Channel.

As plans proceed with the restoration of salmon and steelhead in Alameda Creek, concerns have been raised regarding the potential future entrainment of salmonid smolts at water control structures #B2C-14 and #B2C-16 along the Alameda Creek Flood Control Channel. Therefore, CDFG has proposed to not operate structures #B2C-14 and #B2C-16 as intakes from February 1 through May 31 beginning in 2012. The year 2012 was selected, because the existing impassable fish barrier in the Alameda Creek Flood Control Channel is scheduled to be equipped with a fish ladder in 2010-11. During the period between June 1 and January 31, the structures may be operated as intakes or outlets. Fish screens which are designed to meet NMFS and CDFG criteria will be installed on structures #B2C-14 and B2C-16 no later than October 2015. Proposed fish screen designs will be provided to NMFS for review and approval prior to construction. If alternative management scenarios require either water control structures #B2C-14 or #B2C-16 to be operated as intakes year-round prior to October 2015, fish screens will be installed prior to their year-round use.

As described above, Ponds E8A, E8X, and E9 will be restored to full tidal action during Phase 1 and Ponds E12 and E13 will be managed ponds with varying salinity for foraging shorebirds.

Various maintenance activities include levee fortification, pilot channel dredging, use of and maintenance of dredge locks, dock and boat launch maintenance, vegetation management, and nuisance species management.

C. Conservation Measures, Monitoring and Applied Studies

1. Conservation Measures

The following measures are a sub-set of those proposed by the SBSP Restoration Project to avoid and/or minimize adverse effects on federally- and/or state-listed species. The measures listed below reduce impacts to listed fish within the tidal sloughs, bays and marshes of the project area. These measures will be implemented, when appropriate, for each SBSP Restoration Project action.

- Construction activities in, or directly adjacent to waters, where steelhead are likely to be present, will be performed between June 1 and November 30.
- NMFS personnel will be immediately notified of any observed fish mortality events.
- Levee breaching will not occur between February 1 and May 31 for the protection of juvenile steelhead.
- Treated wood will not be used in structures that come in contact with water.
- All existing and new water control structures on outboard levees (Stevens Creek,

Guadalupe River, Coyote Creek, and Alameda Creek), which may be used to divert water, will be fitted with fish screens that meet NMFS and CDFG criteria by October 2015. Fish screen designs will be provided to NMFS for review and approval.

- Tidally restored ponds will contain channels that are adequate for the ingress and egress of fish with tidal circulation.
- A hazardous spill plan will be developed prior to construction of each action. The plan will describe what actions will be taken in the event of a spill. The plan will also incorporate preventative measures to be implemented, such as the placement of refueling facilities, storage and handling of hazardous materials, *etc.*
- Vehicle staging, cleaning, maintenance, refueling, and fuel storage will be located 150 feet or more from any stream, water body, or wetland. If an action cannot meet this 150-foot requirement, additional best management practices (BMPs) may be required and will be described for each action.
- All equipment will be maintained free of petroleum leaks. No equipment will enter live water except for aquatic equipment (*e.g.*, the "Mallard") or amphibious equipment designed specifically for aquatic or amphibious use.
- All vehicles operated within 150 feet of any water body will be inspected daily for leaks and, if necessary, repaired before leaving the staging area. Inspections will be documented in a record that is available for review on request.
- All disturbed areas will be stabilized within 12 hours of any break in work unless construction will resume work within 7 days. Earthwork will be completed as quickly as possible, and site restoration will occur immediately following use.
- Final design drawings of water control structures, wildlife viewing platforms, and any other public access elements will be included in each action's project-level biological assessment and submitted to FWS (and NMFS if the element in question may affect EFH or listed fish habitat) for review and approval.

2. Monitoring and Applied Studies

a. *Fish Monitoring*

The Project proposes to monitor fish assemblages and habitat conditions in ponds restored to tidal action and in South San Francisco Bay itself. The goal of monitoring in restored tidal ponds is to document fish assemblages that use restored areas as the ponds evolve toward mature tidal marshes with well defined channel systems. Within the South Bay, the goal of monitoring is to record changes in the abundance and diversity of fish and the invertebrates upon which they forage. Additionally, monitoring protocols are proposed in the event that fish mortality is observed in the project ponds. The project proposes monitoring which targets pelagic fishes, demersal fishes, creel census, and fish kill events.

For pelagic fishes (anchovy, topsmelt, juvenile striped bass, shiner perch, white croaker, jack smelt, and herring), sampling sites will be established inside ponds, outside and adjacent to

ponds, and potentially at levee breaches. Proposed gear types for monitoring pelagic fish include purse seining, fyke nets at levee breaches or in intertidal channels, beach seining where substrate is appropriate or at fixed stations where substrate can be hardened, pop nets, throw nets, or gill nets. In addition, the project may use DIDSON (Dual frequency Identification Sonar; http://www.soundmetrics.com/) to enumerate fish in specific habitat types.

For demersal fishes (leopard shark, yellowfin goby, longjaw mudsucker, carp, diamond turbot, rainwater killifish, threespine stickleback, bat rays, California halibut, and staghorn sculpin), sampling sites will be established inside ponds as well as outside and adjacent to ponds. Proposed gear types for monitoring demersal fishes include beach seines, small, light-weight beam trawls, traps, and gill nets.

Fish creel census will be performed to record fish species encountered by fishermen. The intent of this monitoring will be to improve understanding of the species composition in the South Bay and salt ponds, not to evaluate fishing efforts. Creel surveys of fishermen will be conducted using standard methodologies (NRC 2006). Surveys should occur at boat ramps, fishing piers, and other concentrated fishing access points during times (weekends, holidays, summer) to maximize encounters with fishermen. Censuses should evaluate species, sizes, locations, and gear types used to catch fish.

Fish mortality event monitoring will be performed when fish kill are observed. Sampling methods will consist of "random" subsampling of dead fish (when fish mortality events are noted by FWS/CDFG staff or other project personnel) using seines or long handled scoop nets to gather, identify, count, and measure fish species. "Random" samples taken in a known area will provide information on the numbers of dead fish per unit area. Water quality measurements will be taken including DO, salinity, and temperature, and habitat type will be noted. Fish mortality event monitoring will document and approximate the total area where dead fish occur by estimating the area by eye and/or by mapping onto aerial photos. Sampling methods will be used to estimate total numbers of dead fish, if possible. Sampling will be conducted when fish mortality is noted by FWS/CDFG staff or other project personnel.

In addition to fish monitoring, the SBSP Restoration Project proposes to monitor water quality and habitat characteristics in selected managed ponds and receiving waters. Water quality monitoring for the overall Project area will be conducted by USGS and/or others. Site-specific water quality characteristics will be evaluated during fish monitoring described above. Water quality characteristics to be monitored include temperature, salinity, pH DO, and turbidity or secchi depth using sondes or other hand held meters. In addition, benthic and/or planktonic prey organisms will be collected using grab samples for benthic prey or plankton tows or plankton pipe traps or other similar methods for planktonic prey organisms.

b. *Habitat Monitoring*

The evolution of habitat restoration in the SBSP Restoration Project area will be monitored using the following methods (or equivalent) based on responses to a Request for Proposals (RFP) to be issued by the Project sponsors. Mapping will be performed to develop accurate representations of vegetative marsh associations and extent of intertidal mudflat in the Project area and to serve as a baseline from which restoration can assess year-to-year changes in those habitats. Mapping will include all intertidal mudflat and subtidal habitats south of the San Bruno Shoal area. Marsh habitat mapping will be limited to tidal marsh areas from Steinberger Slough on the west side of the Bay, to the Hayward Shoreline area on the east side of the Bay that corresponds to the FWS Endangered Species Recovery Unit.

c. *Applied Studies*

Applied studies are planned for individual Phase 1 actions (by pond or pond complex), and described in Appendix D of the SBSP Restoration Project EIS/EIR. Twenty-one applied studies questions have been developed and may be used as the basis for future research for the Project. The applied studies will be performed as needed to help assist in management decisions and future pond design. The exact timing and study design for each study will be based on timing of the particular Phase 1 action, availability of funding, and results of the RFP process(es) that the SBSP Restoration Project expects to use to identify the exact study approach in each case.

Applied studies questions pertain to birds, mammals, fish, water quality, and physical processes within the SBSP Restoration Project area. Only three applied studies questions relate to fish and fish habitat, and have the potential to affect listed fish and critical habitat. These three questions are briefly presented below:

Applied Studies Question #1. Will sediment accretion in restored tidal areas be adequate to create and to support emergent tidal marsh ecosystems within the 50-year project time frame? These investigations will likely include measurement of sediment supplies arriving in Project areas and development of algorithms for the relationship of precipitation, tributary discharge, tides, and wind to sediment supply. Measurements of sediment accretion and vegetation colonization will also be used to develop a model for restored pond evolution.

Applied Studies Question #2. Will sediment movement into restored tidal areas significantly reduce habitat area and/or ecological functioning (such as plankton, benthic, fish and bird diversity or abundance) in the South Bay? Geomorphic studies would be performed to measure changes in bathymetry in slough channels, mudflats, and subtidal areas.

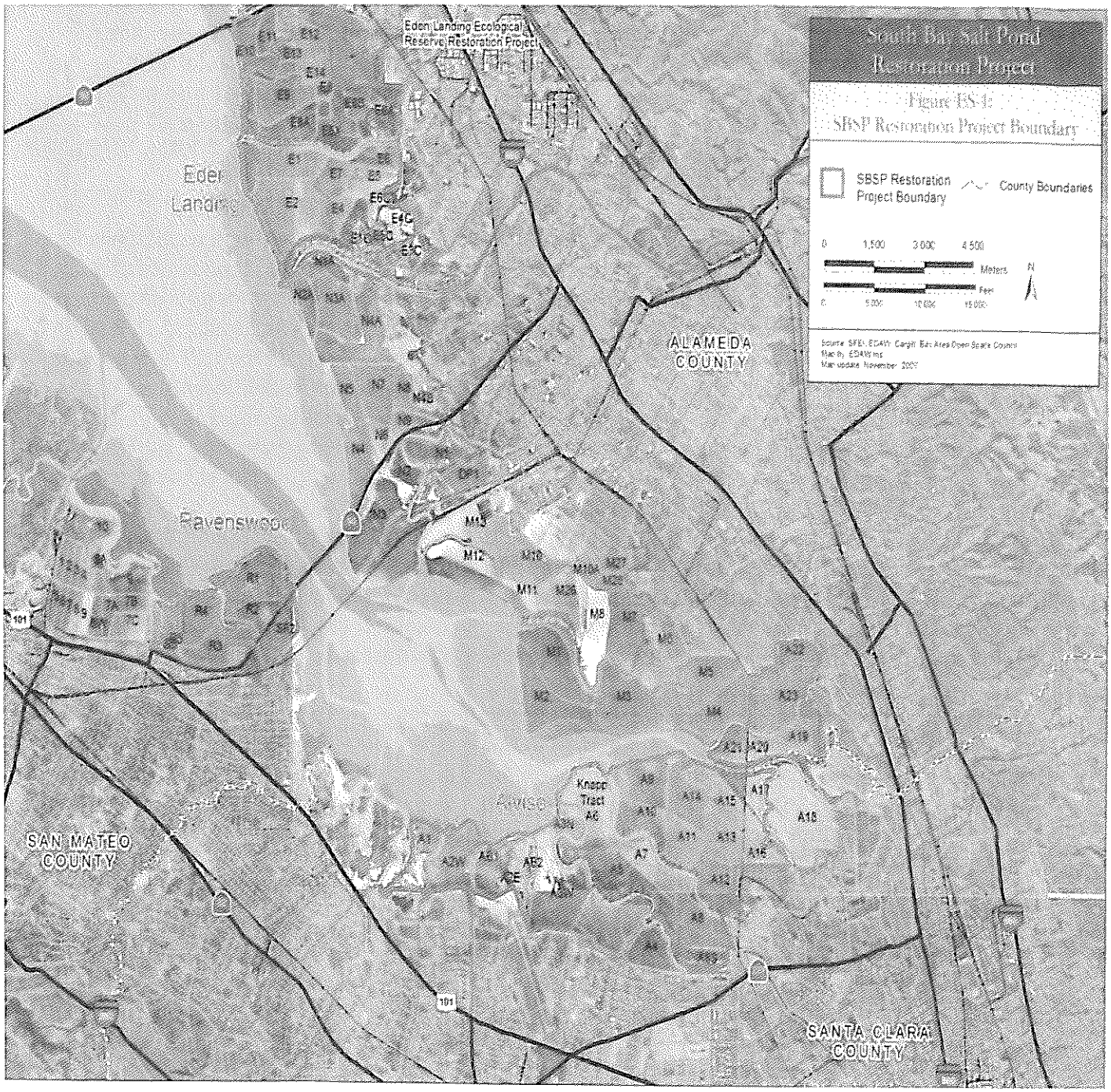
Applied Studies Question #10. Will increased tidal habitats improve survival, growth and reproduction of native species, especially fish and harbor seals? These investigations will likely include monitoring of fish and harbor seal populations. For salmonid smolts, the SBSP Restoration Project is considering the use acoustic tags to assess the spatial and temporal distribution of juvenile salmon and steelhead in the project area.

D. Action Area

The action area of the SBSP Restoration Project encompasses 15,100 acres of former salt ponds located around the edge of South San Francisco Bay within San Mateo, Santa Clara, and Alameda counties. The action area is divided into three geographic portions (Figure 1). The Ravenswood pond complex is located at the western end of the Dumbarton Bridge. The Alviso pond complex extends along the bay from Mountain View to Fremont. The Eden Landing pond complex is located at the eastern end of the San Mateo Bridge. FWS has acquired and will manage 9,600 acres within the Ravenswood and Alviso pond complexes, while CDFG has acquired and will manage 5,500 acres at the Eden Landing pond complex.

Within each pond complex, the action area includes both open waters and subtidal habitats to the upper reaches of tidal action, tidal and nontidal wetlands, and former salt evaporation ponds adjacent to South San Francisco Bay. The action area also includes upland areas immediately adjacent to these features. The action area is bordered by the Bay on one side and is surrounded by urban development on all other sides (Figure 1).

Figure 1. South Bay Salt Pond Restoration Project Action Area (Source: SBSP Restoration Program EIS/EIR, December 2007)



III. STATUS OF THE SPECIES AND CRITICAL HABITAT

This biological opinion analyzes the effects of Phase 1 actions and on-going O&M associated with the SBSP Restoration Project on the Central California Coast (CCC) steelhead Distinct Population Segment (DPS) (*Oncorhynchus mykiss*) and the southern DPS of North American green sturgeon (*Acipenser medirostris*). The effects on designated critical habitat for CCC steelhead and proposed critical habitat for the southern DPS of green sturgeon are also presented below.

A. Species and Critical Habitat Listing Status

CCC steelhead were listed as threatened on August 18, 1997 (62 FR 43937), with populations in coastal California streams from the Russian River to Aptos Creek, and several tributaries of San Francisco, San Pablo and Suisun bays. Subsequent to the listing in 1997, NMFS re-evaluated the listing status of CCC steelhead through an updated review of ten West Coast steelhead DPSs and on June 14, 2004, proposed maintaining the threatened listing determination for CCC steelhead (69 FR 33102). On January 5, 2006, NMFS made a final listing determination reconfirming the threatened status of CCC steelhead (71 FR 834). As part of the new listing determination, NMFS included CCC steelhead produced at the Don Clausen Hatchery and Kingfisher Flat Hatchery/ Scott Creek (Monterey Bay Salmon and Trout Project) as part of the DPS. Critical habitat has recently been designated for CCC steelhead, including approximately 1,676 miles of stream habitat in central coastal California and an additional 386 square miles of estuarine habitat in San Francisco and San Pablo bays (70 FR 52488). The SBSP Restoration Project action area is located within designated critical habitat for CCC steelhead. Primary constituent elements (PCE) of designated critical habitat for CCC steelhead in the action area include the estuarine water column, foraging habitat, and natural cover including large substrate and aquatic vegetation.

The southern population of North American green sturgeon was listed as threatened on June 6, 2006 (71 FR 17757). Promulgation of the rules defining take prohibitions for this species (ESA section 4(d)) has not been completed as of the signing of this biological opinion. An ESA 4(d) rule for this species is expected to be proposed in 2009. The majority of spawning adults from the southern population is concentrated in the Sacramento River. Juvenile green sturgeon likely utilize San Francisco Bay, including the action area, year-round as rearing habitat. Critical habitat was proposed for the southern DPS of green sturgeon on September 8, 2008 (73 FR 52084) and the proposed designation includes the SBSP Restoration Project action area. The PCEs for proposed critical habitat for the southern DPS of green sturgeon in estuarine areas include: food resources, water flow, water quality, migratory corridor, water depth, and sediment quality.

B. Species Life History and Population Dynamics

1. CCC Steelhead

Steelhead are anadromous fish, spending some time in both fresh- and saltwater. The older juvenile and adult life stages occur in the ocean, until the adults ascend freshwater streams to

spawn. Eggs (laid in gravel nests called redds), alevins (gravel dwelling hatchlings), fry (juveniles newly emerged from stream gravels), and young juveniles all rear in freshwater until they become large enough to migrate to the ocean to finish rearing and maturing to adults. General reviews for steelhead in California document much variation in life history (Shapovalov and Taft 1954, Barnhart 1986, Busby *et al.* 1996, McEwan 2001). Although variation occurs in coastal California, steelhead usually live in freshwater for 1 to 2 years in central California, then spend 2 or 3 years in the ocean before returning to their natal stream to spawn. Steelhead may spawn 1 to 4 times over their life. Adult CCC steelhead typically immigrate from the ocean to freshwater between December and April, peaking in January and February, and juveniles migrate as smolts to the ocean from January through June, with peak emigration occurring in April and May (Fukushima and Lesh 1998).

Steelhead fry rear in edgewater habitats and move gradually into pools and riffles as they grow larger. Cover is an important habitat component for juvenile steelhead, both as a velocity refuge and as a means of avoiding predation (Shirvell 1990, Meehan and Bjornn 1991). Steelhead, however, tend to use riffles and other habitats not strongly associated with cover during summer rearing more than other salmonids. Young steelhead feed on a wide variety of aquatic and terrestrial insects, and emerging fry are sometimes preyed upon by older juveniles. Rearing steelhead juveniles prefer water temperatures of 7.2-14.4 degrees Celsius (°C) and have an upper lethal limit of 23.9°C (Barnhart 1986, Bjornn and Reiser 1991). They can survive in water up to 27°C with saturated dissolved oxygen conditions and a plentiful food supply. Fluctuating diurnal water temperatures also aid in survivability of salmonids (Busby *et al.* 1996).

While there are no specific estimates of abundance at the population scale, CCC steelhead numbers are substantially reduced from historical levels. A total of 94,000 adult steelhead were estimated to spawn in the rivers of this DPS in the mid-1960s, including 50,000 fish in the Russian River - the largest population within the DPS (Busby *et al.* 1996). Recent estimates for the Russian River are on the order of 4,000 fish (NMFS 1997). Abundance estimates for smaller coastal streams in the DPS indicate low but stable levels with recent estimates for several streams (Lagunitas Creek, Waddell Creek, Scott Creek, San Vincente Creek, Soquel Creek, and Aptos Creek) of individual run sizes of 500 fish or less (August 18, 1997, 62 FR 43937). For more detailed information on the population trend of CCC steelhead, see Busby *et al.* 1996, NMFS 1997, and Good *et al.* 2005.

While CCC steelhead have experienced significant declines in abundance, and long-term population trends appear to continue downward, they have maintained a wide distribution throughout the DPS. This suggests that, while there are threats to the population's abundance, CCC steelhead possess a resilience that is likely to slow their decline. A recent status review concludes that the CCC steelhead DPS remains likely to become endangered in the foreseeable future (Good *et al.* 2005).

CCC steelhead utilize the estuary as migratory route to and from spawning and rearing habitat in natal streams tributary to San Francisco, San Pablo, and a few streams in Suisun Bay. The easternmost extent of their range are Green Valley and Suisun creeks, which flow into Suisun Bay. In South San Francisco Bay, CCC steelhead currently spawn and rear in San Mateo Creek,

San Francisquito Creek, Stevens Creek, Guadalupe River, and Coyote Creek.

2. Southern DPS of North American Green Sturgeon

The green sturgeon is the most widely distributed and the most marine-oriented of the sturgeon species. Like all sturgeon, they are an anadromous, long-lived, and slow growing species (Adams *et al.* 2002). The largest fish have been aged at 42 years, but this is probably an under estimate and maximum ages of 60-70 years or more are likely (Moyle 2002). Green sturgeon are known to range in nearshore marine waters from Mexico to the Bering Sea, and are commonly observed in bays and estuaries along the western coast of North America. First spawning occurs at 15 years for males, and 17 years for females. Adult green sturgeon return to freshwater to spawn every two to five years, and generally show fidelity to their spawning site. Adults typically migrate into fresh water beginning in late February, spawning occurs from March to July, with peak activity from April to June. Confirmed spawning populations in North America occur in the Rogue, Klamath, and Sacramento rivers. Green sturgeon may migrate long distances upstream to reach spawning habitat. Spawning occurs in deep turbulent areas of large rivers. Eggs are likely broadcast over large cobble substrate where they settle into the spaces between the cobbles. Like salmonids, green sturgeon require cool water temperatures for egg and larvae development, with optimal temperatures ranging from 15 °C to 19 °C. Green sturgeon larvae first feed at 10 days, and grow rapidly, reaching 300 millimeters (mm) in one year. Juvenile and adult green sturgeon are benthic feeders (Moyle 2002). Juvenile green sturgeon in the San Francisco Estuary feed on opossum shrimp (*Neomysis mercedie*) and amphipods (*Corophium spp.*) (Moyle 2002). Adults captured in the Sacramento-San Joaquin Delta feed on invertebrates, including shrimp, mollusks, amphipods, and even small fish (Adams *et al.* 2002). Juvenile green sturgeon spend from one to three years in fresh water before they enter the ocean (Adams *et al.* 2002).

Genetic analysis has identified two subpopulations, or DPS of green sturgeon that qualify as species under the ESA: (1) a northern DPS consisting of populations in coastal watersheds northward of and including the Eel River; and (2) a southern DPS consisting of coastal and Central Valley populations south of the Eel River, with the only known spawning population occurring in the Sacramento River.

The population size of the southern green sturgeon DPS is unknown, but is clearly much smaller than in the northern green sturgeon DPS and is, therefore, more vulnerable to catastrophic events. The lack of population size and trend information contributes to the risk factor of the southern DPS (Adams *et al.* 2002). Recent habitat evaluations conducted in the upper Sacramento, Feather, and possibly the San Joaquin rivers suggest that, as for anadromous salmonids, large amounts of potential spawning habitat were made inaccessible or altered by dams (BRT 2005). Current spawning habitat for green sturgeon has been reduced to a limited area of the upper Sacramento River.

Data on the entrainment of juvenile green sturgeon from the Sacramento-San Joaquin Delta pumping facilities of the Central Valley Project and State Water Project provide an indication of how green sturgeon abundance has changed since 1981. The average number of green sturgeon

salvaged per year at California's John Skinner Fish Facility from 1981 and 2000, was 87 individuals. From 2001 through 2007, about 20 individuals were salvaged per year. At the Federal Tracy Fish Collection Facility, green sturgeon counts averaged 246 individuals per year between 1981 and 2000. From 2001 through 2007, the average was 52 individuals per year (M. Donnellan, unpublished data, 2007). This substantial decrease in numbers is also consistent with decreases in entrainment of white sturgeon within the same time periods.

The most recent status review update concluded that the southern green sturgeon DPS is likely to become endangered in the foreseeable future due to the substantial loss of spawning habitat, the concentration of a single spawning population in one section of the Sacramento River, and multiple other risks to the species (BRT 2005). Based on this information, the southern population of North American green sturgeon was proposed as threatened on April 6, 2005 (70 FR 17386). NMFS published a final rule on April 7, 2006 (71 FR 17757) listing the southern DPS of North American green sturgeon as threatened, which took effect June 6, 2006.

IV. ENVIRONMENTAL BASELINE

The environmental baseline is an analysis of the effects of past and ongoing human and natural factors leading to the current status of the species in the action area. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process (50 CFR §402.02).

For the purposes of this consultation, the action area encompasses 15,100 acres of former salt ponds located around the edge of South San Francisco Bay in three distinct geographic areas: the Eden Landing, Alviso, and Ravenswood pond complexes (Figure 1).

A. Action Area Overview

The San Francisco Bay Estuary is the largest estuary on the west coast of North America, and it is an extremely productive, diverse ecosystem (Trulio *et al.* 2004). During the past two centuries, the estuary has lost more than 90 percent of historic tidal wetlands to diking, draining, and filling (Goals Project 1999; Harvey *et al.* 1988). The South San Francisco Bay (South Bay) is a vital component of the larger Estuary and supports some of the most important habitat remaining in the entire Bay Area.

The term "South Bay" refers to the portion of San Francisco Bay south of Coyote Point on the western shore and San Leandro Marina on the eastern shore (Goals Project 1999). This region differs in several physical and ecological aspects from the Central Bay, North Bay, San Pablo Bay, and Suisun Bay, and the Delta portions of San Francisco Bay Estuary. The habitats included in the South Bay are open waters and subtidal habitats, tidal and non-tidal wetlands, former salt evaporation ponds adjacent to the Bay, and the upland areas immediately adjacent to

these features. Many of these habitats have been dramatically modified by anthropogenic activities including dredging, agriculture, salt production and flood protection. The ecology of South Bay wildlife communities is characterized in the SBSP Restoration Project Final Environmental Impact Statement/Report (2007) by:

(1) High productivity of tidal marshes, with export of organic matter to tidal sloughs, channels, and mudflats, and to the Bay, supporting high abundance of invertebrates, fish, and birds;
(2) High productivity of a portion of the former and current salt ponds, supporting an abundance of invertebrates in higher-salinity ponds and high numbers of fish in lower-salinity ponds, but with virtually no export of organic matter to other habitats aside from variable (and at times, very heavy) use of the salt ponds by birds;
(3) Tidal habitats that support an invertebrate community dominated by non-native species;
(4) High use of South Bay habitats by waterbirds, including significant proportions of breeding and migratory shorebird and waterfowl populations;
(5) Highly dynamic bird and fish communities, with use of different areas varying several times a day with tide height, and with abundance and community composition varying seasonally depending on migration, precipitation, temperature, salinity, and other factors. In particular, large numbers of shorebirds forage on intertidal mudflats at low tide and use salt ponds and other alternative habitats (*e.g.*, water treatment plant ponds) for roosting and/or foraging particularly at high tide;
(6) The presence of rare San Francisco Bay area endemics, including the California clapper rail (*Rallus longirostris obsoletus*), salt marsh harvest mouse (*Reithrodontomys raviventris raviventris*), and salt marsh wandering shrew (*Sorex vagrans halicoetes*), in remnant tidal marsh habitat; other species such as California least terns, western snowy plovers, and steelhead; and
(7) The small, isolated nature of the tidal salt-marsh remnants, with very limited escape cover for salt marsh harvest mice, salt marsh wandering shrews, and California clapper rails.

Open water and subtidal habitats in the South Bay include tidal sloughs and channels, and areas of standing or flowing waters within the salt ponds and tidal marshes. The tidal sloughs and channels carry water through the marshes and between salt ponds and marsh remnants. These areas are detritus-rich and serve as important nurseries and feeding areas for estuarine fish. Fish populations in the action area represent several different trophic levels, including Pacific herring (*Clupea pallasi*), northern anchovy (*Engraulis mordax*), Pacific sardine (*Sardinops sagax caeruleus*), staghorn sculpin (*Leptocottus armatus*), several species of perch, English sole (*Parophrys vetulus*), and California halibut (*Paralichthys californicus*) (Schafer 2004). Many of these fish species in turn support harbor seals and piscivorous birds such as the Forster's tern (*Sterna forsteri*), California least tern (*Sterna antillarum browni*), American white pelican (*Pelecanus erythrorynchos*), brown pelican (*Pelecanus occidentalis*), and double-crested cormorant (*Phalacrocorax auritus*). Waterfowl such as greater scaup (*Aythya marila*), lesser scaup (*Aythya affinis*), canvasbacks (*Aythya valisineria*), and surf scoters (*Melanitta perspicillata*) dive for bivalves, crustaceans, and other invertebrates in shallower subtidal areas. Although these areas support a high diversity of benthic and pelagic macroinvertebrates, most of

the dominant invertebrates are nonnative species. Native oyster populations are present and California bay shrimp (*Crangon franciscorum*) spawn in the open ocean but spend much of their lives feeding in the brackish waters of South Bay sloughs (Baxter *et al.* 1999).

The action area also includes expanses of intertidal mudflats which are minimally vegetated to unvegetated mud lying between Mean Lower Low Water and MTL in the lower marsh zone. Mudflat habitat typically supports less than 10 percent cover of vascular emergent vegetation; this vegetation typically includes areas of colonization by cordgrass and annual pickleweed (*Salicornia europaea*) and is too sparse to map as distinct salt marsh habitat. Most of this habitat occurs just beyond the edge of fully vegetated wetlands, but also occurs between the low-flow channel and edge of wetlands within the tidal reaches of slough and creek channels draining into the Bay. These flats are generally covered by shallow water during high tide, but are uncovered at low tide (Schoellhamer 2005). Narrow mudflats occur along the edges of the tidal sloughs and channels, and on the outboard side of some salt pond levees, while much more extensive flats are present at the mouths of the major sloughs and along the edge of the Bay. Mudflats are dynamic depositional features, changing in extent and location depending on the nature of erosion and deposition of sediments.

The mudflat substrate is composed primarily of fine-grained silts and clays that support an extensive community of diatoms, worms, and shellfish, as well as algal flora. Inundated mudflats provide foraging habitat for many species of fishes, as well as for wading birds. Detritus from tidal marshes, phytoplankton that settles in the water column, and algae and diatoms growing on the intertidal mudflats are responsible for the high abundance of benthic invertebrates on mudflats (Life Science 2003; Warwick and Price 1975). Crustaceans, polychaete worms, gastropod and bivalve mollusks, and other invertebrates live on or just below the surface of the mud. During the daily high tides, fish move over the mudflats to feed on these invertebrates. As the tide recedes and the flats emerge, the fish retreat to subtidal areas while considerable numbers of birds, primarily shorebirds, leave their high-tide roosts and feed on the flats.

The action area includes areas of tidal marsh, brackish marsh and freshwater marsh. Areas of tidal salt marsh in the South Bay are characterized by interstitial soil salinities greater than 27 ppt, on average (H. T. Harvey & Associates 2002). Salt-marsh habitat occurs primarily along the outboard (tidal) side of existing levees separating the salt ponds from the Bay. Salt marsh vegetation consists of a limited number of halophytic (salt tolerant) species adapted to regular immersion by the tides. South Bay salt marshes typically consist of three zones: low marsh dominated by cordgrass, middle marsh dominated by pickleweed, and high marsh with a mixture of pickleweed and other moderately halophytic (salt tolerant) species that can tolerate occasional high tides. These zones are not necessarily linear, but rather are intermingled throughout marshes, especially in wider, older marshes. Current tidal marshes in the South Bay occupy mere remnants of their former extent but they still support high densities, and fairly high diversity, of wildlife species, including several San Francisco Bay endemics. The state and federally endangered salt marsh harvest mouse (*Reithrodontomys raviventris raviventris*) and the salt marsh wandering shrew (*Sorex vagrans halicoetes*) occur particularly where pickleweed is present. The California vole (*Microtus californicus*) occurs here as well, and is often the most

common small mammal in tidal marshes. California clapper rails nest in gumplant on the higher-elevation channel edges and in high pickleweed clumps, and more rarely in thicker stands of cordgrass, in both salt and brackish tidal marshes.

Brackish marsh habitat typically occurs in the low-to-mid intertidal reaches of sloughs and creeks draining into the Bay, where the vegetation is subject to tidal inundation diluted by freshwater flows from upstream, and groundwater emergence along the terrestrial edge of salt marshes. As such, the average interstitial soil salinity of vegetation associated with tidal brackish marsh in the South Bay is lower than in salt marshes, ranging from 15 ppt to 20 ppt (H. T. Harvey & Associates 2002). Marsh plant species richness and diversity increase in brackish marshes compared with salt marsh. The vegetation in brackish marsh habitat is dominated by emergent, vascular plant species adapted to intermediate (brackish) interstitial soil salinities, including short bulrushes such as alkali bulrush (*Scirpus robustus*) and saltmarsh bulrush (*Scirpus maritimus*).

Brackish marshes support many of the wildlife species that use salt marsh and freshwater marsh habitats. Anadromous fish (migrating from saline to fresh water to spawn) and catadromous fish (migrating from fresh to saline water to spawn) and invertebrates such as shrimp use brackish marshes while physiologically acclimating to changing salinity on their migrations between saline and freshwater habitats. Brackish marshes support most of the bird species occurring in both salt and freshwater marshes.

Freshwater marsh occurs in relatively limited areas of the South Bay in the upper reaches of sloughs and creeks draining into the Bay or from groundwater emergence. These areas are subject to some tidal influence, but they are also flushed with fresh water on a daily basis and, therefore, support mostly freshwater emergent vegetation. The water-surface elevation within reaches of freshwater marsh may vary by as much as 10 ft depending on daily tidal activity and seasonal, fresh water flows from upstream. Broad-leaf cattail (*Typha latifolia*), and the taller bulrushes, including California bulrush and hard-stem bulrush, typically dominate the freshwater marsh habitat in the upper reaches of sloughs and creeks draining into the Bay. In areas of freshwater marsh, the Pacific treefrog (*Hyla regilla*), bullfrog (*Rana catesbeiana*), and western toad (*Bufo boreas*) are present. California tiger salamanders (*Ambystoma californiense*) occur in vernal pool habitats in the Warm Springs area, primarily on Refuge lands, adjacent to the SBSP Restoration Project area and the Newark salt ponds managed by Cargill, Inc.

B. Status of Listed Species in SBSP Action Area

The SBSP Restoration Project action area does not provide habitat suitable for spawning by either steelhead or green sturgeon, but some rearing by the juvenile life stages does occur in the action area. The southern DPS of green sturgeon travel to the upper reaches of the Sacramento River to spawn, while CCC steelhead spawn and rear in several South Bay tributary streams.

Three CCC steelhead streams enter the South Bay in the vicinity of the SBSP's Alviso pond complex: Coyote Creek, Guadalupe River, and Steven Creek. Approximately 1.5 miles south of the Ravenswood pond complex, San Francisquito Creek enters the South Bay, and this stream supports a population of CCC steelhead. Alameda Creek enters the South Bay at the Eden

Landing pond complex and this stream historically supported a population of CCC steelhead. The steelhead run in Alameda Creek has been extirpated due to the construction of an impassable barrier in the flood control channel approximately 8 miles above the estuary. This barrier has prevented adult steelhead from accessing all the watershed's suitable spawning and rearing habitat since the mid-1970s. A few adult steelhead enter lower Alameda Creek each winter, but they are unable to successfully complete their migration. Any steelhead spawning which occurs in the Alameda Creek flood channel is assumed to be unsuccessful, because this portion of the stream does not provide adequate substrate for spawning and large portions of the flood control channel is dry during the summer and fall.

Estuaries are important nursery habitat for juvenile salmonids (Healy 1991; Thorpe 1994; Busby and Barnhart 1995); however, specific information regarding steelhead utilization of estuaries is limited (Quinones and Mulligan 2005; Bond *et al.* 2008; Hayes *et al.* 2008). Steelhead juveniles likely use brackish areas of the South Bay during the smoltification process as they move from a freshwater environment to the ocean. Juveniles likely forage in both brackish and tidal marshes, but virtually no information is available to determine the extent of their utilization of these habitats in the South Bay. It is generally believed that steelhead migrate rapidly as smolts through estuaries to complete their growth to adulthood in the ocean (Quinn 2005; McMichael *et al.* 2006). Keegan (2007) reports Central Valley steelhead smolts equipped with ultrasonic tags appear to be focused on emigrating through San Francisco Bay as rapidly as possible. It is unknown if this behavior reported by Keegan (2007) is also representative of CCC steelhead originating from South Bay tributary streams, and it is also unknown if this behavior is a recent adaptation to the urbanization of San Francisco Bay. Alternatively, it is possible that some juvenile steelhead reside in San Francisco Bay for an extended period prior to ocean entry while others may choose to never fully enter the ocean and rear to maturity in the estuary (J. Fuller, NMFS, pers. com. December 17, 2008; Moyle 2002). This type of extended or exclusive estuarine residence has been observed in the Russian River estuary (J. Fuller, NMFS, personal communication, December 17, 2008). However, there is no information from San Francisco Bay which indicates CCC steelhead reside for extended periods in the estuary. Returning adult steelhead likely navigate their way through SBSP action area rapidly as they seek the freshwater upstream spawning grounds of their natal streams.

Green sturgeon are a benthic species which reside year-round in San Francisco Bay. Southern DPS of green sturgeon remain in the estuary as juveniles for a several years and then enter the ocean to forage, returning every few years to spawn in the mainstem Sacramento River. Some returning adults likely enter the South Bay as they forage and stage prior to their Sacramento River upstream migration. There are no reports of adult or juvenile green sturgeon observations within the SBSP action area, but fisheries monitoring in this region has been very limited. Green sturgeon have been captured by CDFG sampling with mid-water and otter trawls in the South Bay near the San Leandro Channel (Jahn 2006). Within the SBSP action area, habitat conditions are suitable for green sturgeon and they likely occur there.

C. Status of Critical Habitat in the Action Area

The action area is within the designated critical habitat for CCC steelhead and within proposed critical habitat for the southern DPS of green sturgeon. Essential features of critical habitat in the action area for listed species include the estuarine water column, foraging habitat, and food resources.

The PCEs of CCC steelhead critical habitat in the action area include water quality and quantity, foraging habitat, natural cover including large substrate and aquatic vegetation, and migratory corridors free of obstructions. Sloughs and shoreline areas within the action area include highly vegetated areas, thus providing a supply of insects upon which juvenile steelhead may forage. Although there is no direct evidence that steelhead enter the tidal sloughs and marshes of the action area during their migrations, conditions in tidal and sub-tidal habitat areas of the SBSP action area are generally sufficient to support juvenile steelhead foraging and rearing.

The PCEs for proposed critical habitat for the southern DPS of green sturgeon in estuarine areas include: food resources, water flow, water quality, migratory corridor, water depth, and sediment quality. Although fish populations have not been regularly sampled in the South Bay, sampling in San Pablo Bay, to the north of the action area, occurred regularly between 1980 and 1995. Stations in San Pablo Bay were sampled each month using mid-water and bottom trawls (Baxter *et al.* 1999). The data show that green sturgeon collected by trawls in San Pablo Bay ranged from 328 to 733 mm in length. Given that the trawls are not designed to adequately sample sturgeon, the data cannot be used to accurately estimate green sturgeon abundance. Juvenile green sturgeon are year-round residents in San Francisco Bay and likely forage in the South Bay, as their relative, the white sturgeon, are caught there and they feed on similar prey. The extent to which green sturgeon inhabit the SBSP action area is unknown.

D. Factors Effecting the Species' Environment in the Action Area

Solar salt production in the action area began in the mid-1850s and resulted in the conversion of large wetland areas in the South Bay to salt evaporation ponds (Siegel and Bachand 2002). Levees constructed around broad expanses of tidal mudflats and marsh isolated these areas from San Francisco Bay and allowed for conversion to salt evaporation ponds. Early salt production efforts were small operations scattered throughout the Bay, but by 1936, the Leslie Salt Company consolidated several smaller companies into one large operation (EDAW 2005). Cargill acquired the Leslie Salt Company in 1978 and continued producing approximately one million tons of salt annually from ponds around San Francisco Bay.

Solar salt production takes several years to complete the process, with the time period depending on seasonal variations in temperature, rainfall and evaporation rates (Siegel and Bachand 2002). The process begins with the intake of Bay water into an "intake" pond, either through pumps or through a gate that opens at high tide. Once in the system, the Bay water is referred to as brine. The brine flows slowly through a series of ponds called "evaporator" or "concentrator" ponds, with salinity increasing from one pond to the next through evaporation. When the brine becomes fully saturated with salt, the brine is pumped into "pickle" ponds for storage and then into crystallizer ponds for eventual harvesting (Life Science 2004). Within a crystallizer pond, evaporation continues and a layer of salt accumulates on the bed. This raw salt is mechanically

harvested and sent to Cargill's processing plant in Newark for further processing before it is ready for consumers. The remaining solution, an extremely saline liquid by-product known as bittern, is pumped into bittern ponds near the processing plants for long-term storage. Because of its high salinity, bittern is toxic to aquatic plants and wildlife and cannot be discharged back to the Bay.

In October 2000, Cargill proposed to consolidate salt pond operations and sell the land and salt production rights on 61 percent of its South Bay operation area. Negotiations headed by Senator Dianne Feinstein led to the public acquisition of the South Bay salt ponds. The State of California approved the purchase of the salt ponds from Cargill in 2003. FWS and CDFG are now the landowners and land managers of the SBSP action area. The Ravenswood Pond Complex and Alviso Pond Complex are now part of the Don Edwards San Francisco Bay National Wildlife Refuge which is managed by the FWS. This refuge was the first urban National Wildlife Refuge established in the United States dedicated to preserving and enhancing wildlife habitat, protecting migratory birds, protecting threatened and endangered species, and providing opportunities for wildlife-oriented recreation and nature study for the surrounding communities (SBSP EIS/EIR 2007). The Eden Landing Pond Complex has become part of the Eden Landing Ecological Preserve which is managed by CDFG. This ecological reserve is managed by the CDFG to provide protection for rare, threatened or endangered native plants, wildlife, aquatic organisms and specialized terrestrial or aquatic habitat types (SBSP EIS/EIR 2007).

E. Previous Section 7 Consultations in the Action Area

NMFS completed consultation pursuant to section 7 of the ESA with the Corps, USGS, and FWS on the ISP in 2004. The ISP was an interim plan to maintain and enhance the biological and physical conditions within the salt ponds acquired from Cargill during the period between the cessation of salt production and the implementation of the long-term restoration plan – the SBSP Restoration Project. Section 7 consultation on the ISP was concluded informally by letter from NMFS dated May 10, 2004, with a determination that the proposed interim management actions in the SBSP action area were not likely to adversely affect listed fish species. ISP actions that will be ongoing under the long-term SBSP were re-evaluated in this consultation and are addressed in this biological opinion.

V. EFFECTS OF THE ACTION

Implementation of Phase 1 actions are expected to provide an overall benefit to threatened CCC steelhead and threatened green sturgeon by increasing the amount of tidal and sub-tidal estuarine habitat in the action area. However, some operation and maintenance activities during the 10-year Corps permit may have adverse effects on individual fish. Both steelhead and green sturgeon use the tidal and brackish channels in the action area for foraging and some fish may be entrained into managed ponds, captured by fish monitoring gear, or subjected to degraded water quality during construction activities. Sloughs and channels in the SBSP action area connect San Francisco Bay with several South Bay steelhead spawning streams. As a result, adult and

juvenile steelhead seasonally migrate through the action area to access Stevens Creek, Guadalupe River, Coyote Creek, and Alameda Creek. Juvenile steelhead may also utilize portions of the action area to ease the transition from fresh- to saltwater during the process of smoltification (*i.e.*, physiological adaptation to the saltwater environment). Juvenile green sturgeon utilize the tidal channels and sloughs for foraging throughout the year.

A. Tidal Marsh Restoration.

Tidal marshes are important components of the San Francisco Bay aquatic ecosystem for fish and invertebrates. Detritus originating from the breakdown of plant material and photoplankton in tidal marshes forms much of the foundation for the food web that ultimately provides sustenance for the estuary's aquatic flora and fauna (SBSP EIR/S 2007). Flood tides receding from tidal marshes bordering the South Bay convey nutrients and carbon from the marshes to fish and invertebrates in sub-tidal channels and to the bay itself. As a result of the twice-daily tidal cycles, the tidal sloughs and channels of the action area are important rearing and nursery areas for fish.

The Project's proposed restoration of tidal marsh habitat at Alviso Pond Complex A6 and Eden Landing Pond Complex E8A/E8X/E9 is expected to benefit steelhead and green sturgeon by increasing productivity in the marsh itself and in adjacent tidal sloughs and channels. Detrital input from restored marshes is expected to increase productivity in the benthic invertebrate food chain, potentially increasing the density of the invertebrate prey base available to various fish species in the action area. Tidal channel networks will develop within the restored marshes and provide foraging opportunities during high tide. The channel network is also expected to provide fish the opportunity to adequately exit the marsh and avoid stranding during low tide.

Marsh restoration is also expected to benefit productivity on adjacent South Bay mudflats. Crustaceans, polychaete worms, gastropod and bivalve mollusks, and other invertebrates live on or just below the surface of the mud (Harvey *et al.* 1977). Detrital input from restored marshes is expected to increase invertebrate productivity on adjacent mudflats. Fish that move over the mudflats to feed on these invertebrates will benefit from the increased productivity. As the tide recedes and the mudflats emerge, the fish will retreat to subtidal areas in adjacent channels.

It is widely believed that estuaries are important habitat for young salmonids (Quinn 2005). Estuaries commonly provide excellent growing conditions for foraging juvenile salmonids and growth rates typically exceed rates observed in freshwater (Shapovalov and Taft 1954; Kjelson *et al.* 1981, Bond 2006). Young salmonids have the ability to feed of a variety of different organisms (Macdonald *et al.* 1987) and the rich productivity of tidal sloughs and channels in the South Bay offer many foraging opportunities. Salmonid smolts which are larger at the time of ocean entry have shown higher survival rates to adulthood. Additional growth which occurs in the estuary by a juvenile salmonid prior to ocean entry may be small, but could make a significant difference in overall survival at sea (Quinn 2005).

For juvenile CCC steelhead, the South Bay action area provides functional significance for feeding and transition to seawater. CCC steelhead juveniles may utilize the tidal and brackish

marshes and sloughs in the action area to feed on the rich production of copepods, larval fish, and zooplankton. The proposed project is expected to increase the productivity of these areas. In addition to increase feeding and growth opportunities, estuaries provide a gradual transition from fresh- to saltwater. By easing this stressful period for salmonids, estuaries can assist in the smoltification process of juvenile steelhead. Restoration of tidal marsh areas by the SBSP Restoration Project will expand this habitat type and the availability of this habitat type for CCC steelhead pre-smolts and smolts.

For green sturgeon, juveniles are thought to move downstream from the upper Sacramento River to the Delta and San Francisco Bay early in their first year, where they remain for approximately 3 years. Once in San Francisco Bay, green sturgeon are believed to be primarily opportunistic benthic foragers due to the sub-terminal placement of their mouth and the diets of other species in the genus *Acipenser* (Kelly *et al.* 2007). Stomach content analysis by Radtke (1966) and Ganssle (1966) suggests they feed in San Francisco Bay on benthic crustaceans, particularly amphipods, shrimps, clams, annelid worms, crabs, and fishes. SBSP Restoration Project's proposal to restore tidal conditions at pond complexes Alviso A6 and Eden Landing E8A/E8X/E9 is expected to increase aquatic productivity in adjacent tidal sloughs and channels and enhance foraging opportunities for green sturgeon.

B. Entrainment at Managed Pond Water Control Structures.

FWS and CDFG propose to continue to operate several water control structures at existing managed ponds and a pumping plant on the Alameda Creek Flood Control Channel for Pond E1C. In addition, FWS and CDFG propose to build or replace water control structures at the following new managed pond complexes: Ravenswood SF2, Alviso A5/A7A8, Alviso A16/17, and Eden E12/E13 (Table 1). Conditions within most managed ponds will not be suitable for the long-term survival of steelhead or green sturgeon, and in some cases, conditions may not be suitable for the short-term survival of these species. Most managed ponds will be operated to maintain shallow water conditions for foraging by shorebirds. Proposed water depths in managed ponds typically range from 2 to 12 inches. Salinity levels are expected to be higher than adjacent tidal channels due to remnants of the former salt evaporation ponds. DO conditions may be very low due high amounts of detritus. DO levels may be particularly low during the warm summer months, and fish kills have been observed and attributed to low DO conditions. USGS (2008) reported DO levels as low as one milligram per liter in Alviso Pond A3W during August 2007.

Most water control structures have the ability to be operated as intakes and/or outlets between the tidal channels and sloughs of the South Bay and the interior of managed pond complexes. As intakes, water will be withdrawn from the South Bay or adjacent tidal sloughs and conveyed into the managed pond complex. With the exception of the pumping plant at water control structure #B2C-16 on the Alameda Creek Flood Control Channel, all intakes are operated tidally – that is water flows through the intake during the incoming flood tide. Eden Landing structure #B2C-16 is a pumping plant that is periodically operated by CDFG. Structures that are operated as intakes only, allow the flood tide to enter the managed pond, but a flap-gate (or similar structure) prevents water from flowing back out of the managed ponds as the tide recedes. Structures that

are operated for "two-way flow" are open at both ends and allow water to flow in and out of the managed ponds with the tidal cycle. Outlet only structures prevent the inflow of water from the South Bay and serve to drain the managed ponds.

Juvenile steelhead and green sturgeon foraging in the South Bay may be entrained by new or existing water control structures operating as intakes. As water flows into a managed pond during flood tide conditions, small fish may be overtaken by the inflow, entrained through the culvert, and enter managed ponds. If the structure is operated as an "intake only", fish entrained into a managed pond will likely become trapped. Outlets at some managed ponds are located hundreds or thousands of feet distance from the intake structure and, therefore, the chance of an individual fish successfully finding its way out of the managed pond is remote. If such fish are able to tolerate the conditions within the ponds and eventually return to tidal sloughs via pond outlets, the impact on an individual would likely not be substantial. However, managed ponds are typically shallow water, higher salinity, lower DO, and have increased predation pressure (due to high bird populations) than tidal habitats. As a result, entrainment in managed ponds at water control structures which are operated as "intakes only" is expected to result in the mortality of steelhead and green sturgeon.

To minimize the risk of entrainment and entrapment at managed ponds, CDFG and FWS have proposed operational measures at the intakes which pose the greatest risk to steelhead and green sturgeon. The measures include: (1) placement of fish screens at the intake to prevent entrainment; (2) seasonal closure of the intake during the steelhead migration season; and (3) seasonal operation of the structure for "two-way flow" which allows for water to both enter and exit the culvert with the tidal cycle during the steelhead migration season. Seasonal closures and fish screens will be employed at intakes to managed ponds located directly on steelhead streams while "two-way flow" operations will be employed at intakes located directly on the shoreline of San Francisco Bay.

At eight water control structures located adjacent to Stevens Creek, Guadalupe River, Coyote Creek, and Alameda Creek (#B2C-14, B2C-16[4], A7-7, A14-1, A14-10, A14-13, A16-1b, A16-1), FWS and CDFG proposed to install fish screens that meet NMFS and CDFG criteria no later than October 2015. Draft fish screen designs will be provided to NMFS for review and approval prior to construction. Fish screens at these intakes will eliminate the risk of fish entrainment and allow for the year-round use of the structure as an intake or outlet. With NMFS input on the fish screen design, it is anticipated that the operation of these structures with fish screens will have no adverse effect of threatened steelhead or green sturgeon.

Prior to the October 2015 installation of fish screens, operational measures are proposed at the above eight intakes located directly on steelhead streams. Juvenile steelhead typically range in size from 150 to 300 mm during their outmigration, and they may be susceptible to entrainment due to their small size. Intake velocities may overwhelm a small fish and draw them with the waters of the flood tide into a managed pond. To minimize this risk prior to the installation of fish screens, these water control structures will be used as outlets only or completely closed from

[4] This water control structure includes a 7,660 gpm pumping plant.

February 1 to May 31. This period encompasses the majority of outmigration season of juvenile steelhead South Bay streams, and NMFS believes this will allow for their safe passage from their freshwater rearing streams through the South Bay to the ocean. A small number of steelhead smolts may outmigrate in early June, but this is expected to be less than one percent. Downstream migrant trapping performed by the Santa Clara Valley Water District in Stevens Creek, Coyote Creek, and the Guadalupe River during 1997, 1998, and 1999 captured 256 steelhead smolts, and only one of these captures occurred after June 1st (SCVWD unpublished data). These seasonal operational measures will be initiated in 2009 with the exception of two structures on Alameda Creek. Since Alameda Creek does not currently have a run of steelhead, the operational measures for the two intakes on the Alameda Flood Control Channel (#B2C-14, B2C-16) will not be implemented until 2012. Actions to restore steelhead passage to the upper Alameda Watershed are scheduled for implementation by 2012. By this time, the SBSP Restoration Project's operational measures will be in place in advance of the first outmigrating year class of juvenile steelhead from Alameda Creek.

The armored notch at Pond A8 on Alviso Slough is a much larger intake and poses an additional risk to adult steelhead migrating upstream in the Guadalupe River. To address the potential for both adult and juvenile steelhead entrainment at the Pond A8 armored notch, the intake will be fully closed beginning December 1 and remained closed until May 31. This period will encompass the adult upstream migration period as well as the downstream migration season. The armored notch is too large to be effectively equipped with a fish screen. Therefore, FWS proposes to continue to seasonally operate this structure to avoid entrainment of adult and juvenile steelhead migrants.

For water control structures located directly on the shoreline of the San Francisco Bay, FWS, and CDFG have proposed seasonal operational measures for the 10-year duration of the O&M permit (Table 1). Water intakes located directly on the shoreline of San Francisco Bay (Structures #B2-11, A2W-4, A3W-1, A3W-2, and two new intakes at Pond SF2) will be operated for two-way flow during the period between February 1 and May 31. Due to their proximately to San Francisco Bay, Structures #WB-1 and WB-1A will also be operated for two-way flow during this same period. This operation mode will allow for steelhead and green sturgeon to easily enter and exit managed ponds through the same water control structure during the same tidal cycle. Fish are expected to encounter less than suitable conditions within the managed pond complex due to low DO concentrations, high salinities, and avian predation. If fish do not exit with the receding tide, they will be exposed to conditions in managed ponds that may result in physical injury or mortality. Fish that successfully escape the managed ponds will return to the tidal sloughs and channels of the South Bay, and it is expected that their foraging, rearing, and/or migration will continue unimpaired.

Seasonal operational restrictions at all water control structures will not apply during the period between June 1 and January 31, and there are several additional project intakes that contain no measures to address the potential entrainment of fish (Table 1). At locations where pond intakes receive water directly from tidal sloughs and channels, juvenile steelhead and green sturgeon may be entrained. Entrainment may result in the temporary "stranding" in a managed pond, or it could result in the mortality of the individual. Fish that enter managed ponds during high tides

could potentially be subject to increased predation or they could perish due to poor water quality or lack of food before another high tide enables them to return to tidal channels outside the managed ponds. However, NMFS believes the risk of entrainment at these other locations is generally low and few fish are likely to be lost in these managed ponds. Green sturgeon are relatively large fish during their residence in San Francisco Bay. Green sturgeon sampled by CDFG in the South Bay between 1980 and 2004 were all in excess of 600 mm in length. Data from trawls by CDFG in San Pablo Bay shows green sturgeon juveniles ranged from 328 to 733 mm in length. The excellent swimming ability of larger fish will allow them to avoid entrainment through an unscreened intake culvert. Hydraulic conditions, dark lighting and the presence of trash racks are known to discourage fish movement (FWS 1995). These conditions will be present at the project's water intakes and are expected to impede and prevent the passage of larger fish, including green sturgeon, into managed ponds. Juvenile steelhead which remain in the South Bay for year-round rearing and foraging are expected to rapidly grow and their larger size and swimming ability also reduce the risk of entrainment at managed ponds intake structures. Overall, the intakes which pose the greatest risk of entrainment to steelhead and green sturgeon will have fish screens or seasonal operational measures. At intakes that pose low risk of entrainment, a small number of steelhead and green sturgeon may be entrained into managed ponds and some of these fish would likely be lost to poor water quality or avian predation.

C. Monitoring and Fish Sampling

Proposed monitoring activities would include surveys of managed ponds, restored marshes, and other locations as described in the project's Adaptive Management Plan. Additional sampling and monitoring will occur in association with applied studies. Monitoring locations would include managed ponds, restored marshes, and adjacent areas in the South Bay. Surveys for shorebirds and harbors seals by boat and airplane may disturb fish including steelhead and green sturgeon, but these activities are not expected to adversely affect listed fish. Monitoring of harvest mouse populations by trapping within restored marshes and vegetation mapping from aerial photos and ground-truthing is expected to have no effect on steelhead and green sturgeon. Water quality and sediment monitoring are also expected to have no effect of steelhead and green sturgeon. Only monitoring of fish through sampling with nets, traps and other gear is expected to directly encounter steelhead or green sturgeon.

The SBSP Restoration Project's fish monitoring plan framework proposes sampling of pelagic and demersal fishes. This sampling may be performed with a variety of gear types including pursue seines, fyke nets, beach seines, gill nets, and throw nets. Sampling performed within managed ponds is not expected to encounter listed steelhead or green sturgeon because monitoring will be performed quarterly and is very unlikely to detect rare-occurring individual fish. However, sampling performed in tidal marshes and channels adjacent to managed ponds may encounter steelhead and green sturgeon. Sampling will be performed quarterly, but the specific monitoring locations and gear types have not been identified. Pilot evaluations may be conducted to determine specific sites and gear types. Monitoring plans will be developed by CDFG and FWS.

Some of the proposed fish monitoring activities are expected to include the capture and handling of steelhead and green sturgeon. Capturing and handling fish causes them stress, though they typically recover fairly rapidly from the process and, therefore, the overall effects of the handling are generally short-lived. The primary contributing factors to stress and death from handling are excessive doses of anesthetic, differences in water temperatures (between the original habitat and the container in which the fish are held), dissolved oxygen conditions, the amount of time that fish are held out of the water, and physical trauma (Kelsch and Shields 1996). Stress on salmonids increases rapidly from handling if the water temperature exceeds 64 degrees Fahrenheit (°F) or dissolved oxygen is below saturation. Fish that are transferred to holding tanks can experience trauma if care is not taken in the transfer process. In addition, when fish are handled by samplers to obtain measurements and other data, it is not uncommon for fish to be dropped on the ground by the handlers because the fish are not sedated enough or properly restrained. This can result in internal injuries, especially in females with developing ovaries (Stickney 1983). An injured fish is more susceptible to developing diseases, which can lead to delayed mortality. Some of the injuries which can lead to disease are the loss of mucus, loss of scales, damage to integument and internal damage (Stickney 1983, Kelsch and Shields 1996). The potential risks associated with capture and handling are dependant of the specific method of capture gear type.

Seine nets will likely be used in the monitoring program. These nets trap fish by encircling them with a long wall of webbing. Typically, the top edge of a seine has floats and the bottom edge is weighted. As the net is closed, the fish become concentrated in the net. Seines are usually large enough that they are fished by two or more people, though can be small enough to be fished by one person. Generally, seines are set in an arc around the targeted fish and then dragged to shore. Seines are effective for sampling littoral areas of lentic habitats. In lotic habitats, seines are most easily used in areas of low velocity, but can be used in high velocity areas if ends of the net are held in place while someone approaches the net from upstream, herding fish into the net. To be most effective, a seine needs to be deployed quickly enough that the target species cannot escape the encircling net. Small fish can be gilled in the mesh of a seine. Scales and dermal mucus can be abraded by contacting the net. Fish can be suffocated if they are not quickly removed from the net after the net is removed from the water to process the fish. Also, the fish can be crushed by the handler when removing the net from the water.

Trawls have been used sample fish in the South Bay. Trawls are cone-shaped, mesh nets that are towed, typically, along benthic habitat (Hayes 1983, Hayes *et al.* 1996). Rectangular doors, attached to the towing cables, keep the mouth of the trawl open. Most trawls are towed behind a boat, but small trawls can be operated by hand. As fish enter the trawl, they tire and fall to the codend of the trawl. Mortality and injury rates associated with trawls can be high, particularly for small or fragile fish. Fish can be crushed by debris or other fish caught in the net. Depending on mesh size, some small fish are able to escape the trawl through the netting. However, not all fish that escape the trawl are uninjured, as fish may be damaged while passing through the netting. Short duration trawl hauls (5 to 10 minutes maximum) may reduce injuries (Hayes 1983, Stickney 1983, Hayes *et al.* 1996).

Gill nets are walls of netting suspended vertically in the water by a float line on the top and lead line on the bottom. The mesh of gill nets is relatively large; fish attempt to pass through the mesh and are captured. Fish are caught in the net in one of three ways: (1) gilled – held by mesh slipping behind the opercula, (2) wedged – held by the mesh around the body, or (3) tangled – held by teeth, spines, maxillaries or other protrusions without penetration of the mesh (Nielsen and Johnson 1983). Fish are primarily caught in the net by being gilled. When a fish is gilled the opercula do not open and close efficiently and disrupt respiratory gas exchange, leading to suffocation. Sometimes fish are injured while being removed from a gill net, including damage to internal organs from being squeezed, damage to scales and mucus, and damage to jaws and other protruding segments of the body. Soak time proportionally affects the lethal nature of gill nets (Hubert 1983, Hubert 1996); therefore, use of short-length gill nets that are checked frequently should reduce injury. Since gill nets are highly lethal and stress fish more than other forms of passive gears (Hubert 1996), gill nets should not be the preferred gear for capturing live fish for release. Mortality associated with gill nets can be reduced to as little as 6 percent with the of short net soak times, careful handling of fish on removal from the net, and a recovery box (Fraser *et al.* 2002).

Fish sampling methods for the SBSP Restoration Project will be designed to avoid and minimize lethal collections, but some adverse effects to listed fish are expected with the above gear types. However, the amount of unintentional injury and mortality attributable to fish capture is expected to vary widely depending on the method used, the ambient conditions, and the expertise and experience of the field crew. The extent and nature of effects on listed fish associated with the SBSP monitoring program will be highly dependant on sampling locations and gear types. Pursue seines, fyke nets, beach seines, and throw nets may capture both steelhead and green sturgeon, but most fish will likely be released and returned to the South Bay unharmed. Gill nets, however, are likely to result in the mortality of captured individuals. Based on the results of previous fish sampling effects in the South Bay, few listed fish are likely to be encountered during monitoring effects. Based on a review of similar sampling efforts with gill nets and other similar gear types around San Francisco Bay, it is anticipated that the project's quarterly fish sampling program will encountered five or less individual green sturgeon, ten or less juvenile steelhead and five or less adult steelhead each year. These collections by qualified fisheries biologists are expected to avoid and minimize the potential injury. Less than ten percent of captured individuals are anticipated to be killed during sampling. NMFS' participation on the project's Adaptive Management Team will provide an opportunity to review the draft fisheries sampling plans and develop techniques that will avoid and minimize lethal collections.

D. Construction of Phase 1 Facilities

The largest construction projects proposed for Phase 1 will occur within perimeter levees. These Phase 1 actions within the interior berms of the ponds will not affect threatened fish species or adjacent tidal channels, because work will be isolated from San Francisco Bay. On the outboard side of perimeter levees, construction of the Pond A8 pilot channel, construction of fish screens at eight water control structures, and levee breaching at Ponds A6 and E8A/E8X/E9 will effect the tidal waters of the South Bay and affect listed fish species.

Levee breaching for tidal restoration at Pond A6 and Ponds E8A/E8X/E9 will occur at perimeter levees, but the extent of work outside the perimeter levee is relatively small and construction is expected to be completed within a few days or few weeks at each site. During the actual breaching event, listed fish may be affected through the discharge of salinity-laden waters. However, water quality monitoring has been performed at similar levee breach sites around San Francisco Bay associated with restoration of former salt ponds and results generally show that high salinity levels do not reach levels that would adversely affect listed fish species and salinities return to baseline levels within a few days. Green sturgeon are euryhaline, that is they are tolerant of variation in ambient salinity levels. Breaching events will be scheduled by FWS and CDFG to occur between June 1 and January 31 which will avoid the outmigration season of steelhead smolts. Adult steelhead could be present during the winter months, but they are also tolerant of the expected levels of variation in salinity levels associated with a levee breach event. Overall, NMFS anticipates that any short-term impact associated with increased salinity in the channels following breaching will be insignificant and discountable.

At Pond A8 during Phase 1, FWS proposes to construct an approximately 475 ft-long pilot channel by excavating through fringe marsh habitat adjacent to upper Alviso Slough. Construction of the notch and pilot channel is expected to take 30 to 36 weeks and will primarily occur during the period between April and October. If the connection between the pilot channel and upper Alviso Slough is excavated early in the construction of the pilot channel, fish in upper Alviso Slough may be exposed to poor water quality due to turbidity and suspended sediment released by excavation activities. Under this construction scenario, steelhead and green sturgeon would be exposed to poor water quality for several weeks during construction of the pilot channel. High levels of turbidity and suspended sediment can affect listed fish species by disrupting normal feeding behavior, reducing growth rates, increasing stress levels, and reducing respiratory functions. Measures to control the discharge of excessive levels of sediment and degraded water quality may be implemented, but their effectiveness is uncertain. Alternatively, the connection between the pilot channel and upper Alviso Slough could be excavated after the entire pilot channel has been completed. This would avoid impacts to fish and water quality in Alviso Slough during several weeks of excavation activities. Increased levels of turbidity and suspended sediment would be limited to the final excavation of the connection between the channel and Alviso Slough. Under this scenario, impacts to water quality would be short-term and considerably less than the thresholds commonly cited as the cause of behavioral and physical impacts.

Prior to October 2015, the project proposes to construct fish screens at eight existing water control structures. Placement of the new fish screens will be performed during the period between June 1 and November 30. Although green sturgeon may be present in the project area year-round, this period will avoid the migration season of adult and juvenile steelhead. Construction disturbance during the placement of fish screens is expected to be minimal because the majority of work will be performed on a perimeter levee during low tide and above the water surface. Construction avoidance measures are proposed that will avoid and minimize the discharge of sediment and other materials into the adjacent water column. Fish screen placement may result in degradation of water quality by increasing levels of turbidity and suspended sediment. As discussed above, high levels of turbidity and suspended sediment can affect listed

fish species by disrupting normal feeding behavior, reducing growth rates, increasing stress levels, and reducing respiratory functions. For the construction of fish screens, disturbance will be limited to a small area immediately on and adjacent to an existing levee. Potential impacts to water quality would be localized, short-term, and considerably less than the thresholds commonly cited as the cause of behavioral and physical impacts. Overall, impacts associated with fish screen construction is expected to be minor and the long-term benefits of the fish screens on managed pond water intakes will occur over the 50-year life of the SBSP Restoration Program.

F. Maintenance Activities

On-going O&M activities include levee maintenance, repair and replacement of water control structures, periodic dredging of channels, boat ramp and dock maintenance, and the cleaning of trash racks and fish screens. The majority of proposed maintenance work involves existing structures on the inboard side of the perimeter levees. Work within perimeter levees will be isolated from the tidal sloughs, channels and waterways of San Francisco Bay and, therefore, adverse affects to threatened steelhead or green sturgeon would not occur. Only work proposed to occur outside of perimeter levees has the potential to affect listed steelhead and green sturgeon. Work outside of perimeter levees typically includes levee repairs, channel maintenance dredging, repair/replacement of water control structures, and maintenance of boat ramps and docks.

For levee maintenance, repairs typically involve the placement of material dredged from the inside of pond or imported material on levee tops or levee sides. Riprap may also be placed on levees to address localized erosion from high energy waves. A dragline, barge-mounted dredge, aquatic excavator, or amphibious construction equipment may be used for levee repair. Dredging on the outside of perimeter levees may be performed to periodically to move equipment between ponds or maintenance of inlet/outlet channels for enhancing water flow. In addition to levee maintenance, repairs at water control structures, boat ramps, and docks will also disturb soil and vegetation. These periodic maintenance activities are expected to result in localized and temporary degradation of water quality. Temporary increases in turbidity and suspended sediment in the adjacent water column will occur during actual construction. However, the area of affected water quality is expected to be small and quickly disperse with tidal circulation. Most maintenance activities will be completed within a few days.

The project's proposed conservation measures include several actions to avoid and minimize impacts to water quality during maintenance construction. Specifically, construction on the outboard side of perimeter levees will be performed at low tide under de-watered conditions, to the extent practicable. Green sturgeon are adapted to living in estuaries with fine sediment bottoms and, thus, are tolerant of high suspended sediment concentrations. Green sturgeon and steelhead in San Francisco Bay commonly encounter areas of high suspended sediment concentrations due to storm flow runoff events, wind and wave action, and benthic foraging activities of other aquatic organisms. Therefore, the minor and localized areas of turbidity associated with maintenance work on the outboard side of perimeter levees are not expected to impair or harm listed fish species and will not result in short-term or long-term impacts to aquatic habitat. Disturbance and noise associated with dredging, levee repair, and other

maintenance activities may startle fish and result in dispersion from the action area, but no adverse affects are anticipated by this disturbance.

For the repair of existing facilities and the construction of new facilities, the project proposes to use materials other than treated wood for all structures that come in contact with water. Chemically-treated wood is frequently used for the piles and framing members of the docks and other water-related structures. Contaminants released from treated wood into the aquatic environment can be toxic to aquatic organisms. FWS and CDFG propose to avoid this potential adverse effect on the aquatic environment by not using any treated wood products in structures that come in contact with water. During the repair and replacement of existing in-water facilities, steelhead and green sturgeon are expected to benefit from the removal of existing treated wood structures.

G. Impacts to Designated Critical Habitat

The anticipated effects of the SBSP Restoration Project's Phase 1 actions are on designated critical habitat for CCC steelhead and proposed critical habitat for green sturgeon are primarily beneficial. Phase 1 of the project will breach existing levees adjacent to the South Bay to restore 330 acres of tidal salt marsh at Pond A6 and 630 acres of tidal salt marsh at Ponds E8A, E8X, and E9. This significant expansion of tidal marsh and tidal channels within the South Bay will benefit steelhead and green sturgeon rearing and foraging. Flood tides receding from tidal marshes will convey important nutrients and food resources to fish and invertebrates in sub-tidal channels and the South Bay itself. As a result, restored tidal sloughs and channels in the action area are expected to increase the productivity of invertebrates and fish in the action area. The project's restoration of tidal marsh habitat will increase the quantity of tidal marsh and tidal channel habitat and improve the PCE's of critical habitat in the action area for both steelhead and green sturgeon.

Operational measures at water intakes and the placement of fish screens on existing and new water control structures will benefit listed fish and critical habitat by improving fish passage in rearing habitat and migratory corridors. These intakes divert flow from tidal channels in the South Bay to circulate water through managed ponds. Water quality and habitat conditions within managed ponds are generally unsuitable for steelhead and green sturgeon. Proposed operational measures and fish screens significantly reduce the risk of fish entrainment into these areas.

Levee breaching, pilot channel construction, and O&M activities on the outboard side of perimeter levees are expected to result in short-term disturbance to fringe marsh and the adjacent South Bay shoreline. Localized impacts to water quality may occur in the form of increased levels of turbidity and suspended sediment. However, these construction activities are generally small in area and construction activities are typically a few days in duration. Thus, impacts due to construction of Phase 1 facilities and on-going O&M are expected to be minor, localized, and short-term. Construction-related impacts associated with Phase 1 actions and O&M activities have been presented above.

Overall, the project is expected to improve PCE's of designated critical habitat for CCC steelhead and proposed critical habitat for green sturgeon by expanding tidal habitat, increasing productivity in the South Bay, and improving fish passage conditions near water intake structures.

H. Interrelated and Interdependent Actions

Interrelated actions are defined as actions that are part of a larger action and depend on that larger action for their justification (50 CFR §402.02). Interdependent actions are defined as those that have no significant independent utility apart from the proposed action (50 CFR §402.02). NMFS does not anticipate any interrelated or interdependent actions associated with the proposed action.

I. Cumulative Effects

Cumulative effects include the effects of future State, Tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

To identify potential future non-federal projects in the action area, NMFS reviewed the cumulative effects information provided in the SBSP Restoration Project EIS/EIR, the project's biological assessment, and the Santa Clara Valley Water District's website (http://www.valleywater.org). Other than the ongoing impacts related to restoration of former salt evaporation ponds to wetlands identified in the Environmental Baseline, NMFS did not identify any future non-Federal actions that are reasonably certain to occur within the action area.

J. Integration and Synthesis of Effects

Estuaries are important rearing and foraging habitat for steelhead and green sturgeon. Tidal marshes and channels in the South Bay provide important habitat for rearing of juvenile steelhead and juvenile sturgeon, acclimation of steelhead smolts to seawater, and serve as migration corridors to several South Bay steelhead streams. The proposed implementation of Phase 1 of the SBSP Restoration Project is anticipated to benefit threatened CCC steelhead, the southern DPS of green sturgeon, and critical habitat. The restoration of 330 acres of tidal habitat at Pond A6 and 630 acres of tidal habitat at Ponds E8A, E8X, and E9 will expand the quantity of estuarine habitat in the South Bay and enhance the quality of existing habitat. Detritus originating from the breakdown of plant material and photoplankton in restored tidal marshes will become important nutrients and food resources to fish and invertebrates in sub-tidal channels and the South Bay itself. Tidal channel networks will develop within the restored marshes and provide foraging opportunities during high tide. Increases in productivity will likely increase the invertebrate prey base available to various fish species in the action area. Overall, expansions of the tidal marshes of the South Bay aquatic ecosystem are expected to improve PCE's of designated critical habitat for steelhead and proposed critical habitat for green sturgeon in the action area.

At four locations during Phase 1, CDFG and FWS will be creating new managed ponds for various species of birds and mammals (Ponds SF2, A5/7/8, A16/17, and E12/13). On-going operations and maintenance will be preformed at existing managed ponds in the action area. Water control structures on perimeter levees surrounding managed ponds draw water from the South Bay to circulate through the managed ponds. Water quality and habitat conditions within managed ponds are generally unsuitable for steelhead and green sturgeon while the risk of avian predation is also great. To avoid or minimize the risk of entraining listed steelhead and green sturgeon into managed ponds, CDFG and FWS have proposed operational measures for water intakes located in critical areas. Intakes that draw water directly on the shoreline of the South Bay will be operated for two-way flow during the period between February 1 and May 31. This will allow fish entering an intake to freely exit the managed pond at the same location, and this could be accomplished during the same tidal cycle. At six intakes located on or near steelhead spawning streams (*i.e.,* Stevens Creek, Guadalupe River, Coyote Creek, and Alameda Creek), CDFG and FWS will either close the structure or only operate the structure as an outlet from February 1 through May 31. This period encompasses the majority of the steelhead outmigration season and will protect this smaller life stage of the species as they migrate to the ocean as smolts. By October 2015, FWS and CDFG will install fish screens on these six water control structures and year-round protection from entrainment will be provided for steelhead, green sturgeon, and other fish species.

Levee breaching, pilot channel construction, and O&M activities on the outboard side of perimeter levees are expected to result in short-term disturbance to fringe marsh and degrade water quality in adjacent tidal channels. Localized impacts to water quality may occur in the form of increased levels of turbidity and suspended sediment. However, these construction activities outside of perimeter levees are generally small in area and construction is typically a few days in duration. Thus, impacts due to construction of Phase 1 facilities and on-going O&M are expected to be minor, localized, and short-term.

Fisheries monitoring by the project is expected to annually collect a small number of steelhead and green sturgeon. Based on previous sampling in the South Bay with similar sampling gear types, NMFS anticipates that less than ten juvenile steelhead, less than five adult steelhead, and less than five green sturgeon will be collected annually for the next 10 years, and these fish will be subject to low injury and mortality rates during fish collections.

Overall, the project is expected to benefit CCC steelhead and green sturgeon by expanding tidal habitat, increasing productivity in the South Bay, and improving fish passage conditions near water intake structures. A small number of juvenile steelhead and green sturgeon may be entrained by water intakes at managed ponds during the next 10 years. Many of these entrained fish are expected to successfully exit the managed pond, but some fish may become lost and perish due to poor water quality or avian predation. Due to the size and intake velocities at these water control structures, entrainment will likely to be limited to juvenile life stages of steelhead and green sturgeon. The larger size and excellent swimming ability of adult fish will allow them to successfully avoid entrainment.

Steelhead are currently well distributed throughout the South Bay tributaries of Stevens Creek,

Guadalupe River, and Coyote Creek. Green sturgeon distribution and abundance are not well known in the South Bay. Due to the relatively large number of juvenile steelhead produced by each spawning pair, steelhead spawning in these watersheds in future years are likely to produce enough juveniles to replace the few that may be lost due to entrainment and fish sampling impacts. Loss of green sturgeon is expected to be very low during proposed project activities and the restoration of 960 acres of tidal habitat in the South Bay will significantly expand the habitat of this species in the action area. Juvenile green sturgeon are opportunistic benthic foragers, and they are expected to benefit from the project's restored tidal areas. Restored tidal marshes and channels will provide renewed opportunities for feeding on crustaceans, clams, annelid worms, crabs, and small fishes in the action area. Thus, the proposed project is expected to have a benefit on current and future juvenile green sturgeon feeding in the action area. The risk of a small loss of juvenile green sturgeon during the next ten years is likely insignificant to the species because nearly all juveniles are expected to avoid managed pond intakes, and these juveniles are likely to have increased survival chances due to improved habitat conditions. In addition, the expansion of habitat will likely increase the number of juvenile green sturgeon that benefit from the restoration actions, and may assist in increasing future adult sturgeon returns.

Regarding critical habitat, the project's expanded tidal marsh and channel habitats are anticipated to provide an increase in the value of estuarine PCE's for both CCC steelhead and green sturgeon. The overall long-term effects of the project are beneficial to CCC steelhead, green sturgeon, and critical habitat by enhancing the quality and expanding the quantity of tidal habitat in the South Bay. The proposed action is not expected to appreciably reduce the likelihood of the survival and recovery of CCC steelhead, southern DPS of green sturgeon, or appreciably reduce the value of critical habitat.

VI. CONCLUSION

After reviewing the current status of CCC steelhead, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is NMFS' biological opinion that implementation of Phase 1 of the SBSP Restoration Project and issuance of a 10-year permit for on-going O&M by FWS and CDFG in the project area are not likely to jeopardize the continued existence of threatened CCC steelhead.

After reviewing the current status of critical habitat, the environmental baseline for the action area, the effects of the proposed actions, and the cumulative effects, it is NMFS' biological opinion that the proposed Phase 1 actions and on-going O&M by the SBSP Restoration Project are not likely to result in the destruction or adverse modification of designated critical habitat for CCC steelhead or proposed critical habitat for the southern DPS of green sturgeon.

VII. INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined

as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by NMFS as an act which actually kills or injures fish or wildlife. Such an act may include significant habitat modification or degradation which actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are nondiscretionary, and must be undertaken by the Corps for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps (1) fails to assume and implement the terms and conditions, or (2) fails to require its designees to adhere to the terms and conditions of the incidental take statement, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Corps must report the progress of the actions and its impact on the species to NMFS as specified in the incidental take statement (50 CFR §402.14(I)(3)).

A. Amount or Extent of Take

The number of threatened steelhead and green sturgeon that may be incidentally taken during project activities is expected to be small. Incidental take may occur as entrainment at water control structures at managed ponds, and during fisheries monitoring programs. The precise number of fish taken by entrainment at managed pond intake structures cannot be accurately quantified due to: (1) the precise number of fish that may be present is unknown; and (2) the precise number of fish that may be entrained is unknown. Based on the configuration of the intakes and their associated seasonal operations, the number of fish entrained into managed ponds is expected to be limited to a small number of juvenile steelhead and juvenile green sturgeon during the next 10 years. Most of these entrained fish are expected to successfully escape the managed ponds and return to the tidal sloughs and channels of the South Bay. For the fisheries monitoring program, the number of steelhead and green sturgeon collected can be estimated from similar fisheries sampling efforts in the South Bay. NMFS anticipates that less than ten juvenile steelhead, less than five adult steelhead, and less than five green sturgeon will be collected annually during the next 10 years in the fisheries monitoring program, and these fish will be subject to low injury and mortality rates during fish collections.

B. Effect of the Take

In the accompanying biological opinion, NMFS has determined that the anticipated take is not likely to result in jeopardy to CCC steelhead or the southern DPS of green sturgeon.

C. Reasonable and Prudent Measures

NMFS believes the following reasonable and prudent measures are necessary and appropriate to minimize take of CCC steelhead and the southern DPS of green sturgeon:

1. Ensure the fish monitoring program and applied studies assist in the evaluation of project effects on native fish and minimize harm and mortality of steelhead and green sturgeon.

2. Ensure the project's fish screen and water control structures eliminate or minimize the risk of fish entrainment.

3. Undertake measures to minimize harm to steelhead from construction and degradation of aquatic habitat.

4. Prepare and submit reports regarding the project's construction of Phase 1 facilities, on-going operations at managed ponds, and the results of the fish monitoring program and applied studies.

D. Terms and Conditions

The Corps and its permittees must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and define the reporting and monitoring requirements.

In order to be exempt from the prohibitions of section 9 of the ESA, the Corps, its permittees, and their designees must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and present reporting/monitoring requirements. These terms and conditions are nondiscretionary.

1. The following terms and conditions implement reasonable and prudent measure 1:

    a. The permittees shall prepare and submit to NMFS for review and approval the Phase 1 fish monitoring plans for pelagic and demersal fishes by June 15, 2009. Monitoring shall be designed to assess the fish assemblage in restored tidal areas and existing South Bay tidal sloughs and channels. Non-lethal sampling gear and techniques shall be used at all locations that are likely to encounter steelhead or green sturgeon.

    b. The permittees shall prepare and submit to NMFS for review and approval all Phase 1 applied study proposals that involve fisheries sampling. Applied study proposals shall be submitted to NMFS for review and approval at least 90 days in advance of the initiation of the study. Non-lethal sampling techniques shall be used at all locations that are likely to encounter steelhead of green sturgeon.

    c. Steelhead and green sturgeon collected in the monitoring program shall be handled with extreme care and kept in water to the maximum extent possible. All captured fish shall be kept in cool, shaded, aerated water protected from excessive

noise, jostling, or overcrowding any time they are not in the stream or bay waters, and fish shall not be removed from this water except when released.

d. If any salmonids or sturgeon are found dead or injured during sampling or during observations of a fish kill, the biologist shall contact NMFS biologist Gary Stern by phone immediately at (707) 575-6060 or the NMFS Santa Rosa Area Office at (707) 575-6050. All salmonid and sturgeon mortalities shall be retained, placed in an appropriately-sized sealable plastic bag, labeled with the date and location of collection, fork length, and be frozen as soon as possible. Frozen samples shall be retained by the biologist until specific instructions are provided by NMFS. The biologist may not transfer biological samples to anyone other than the NMFS Santa Rosa Area Office without obtaining prior written approval from the NMFS Santa Rosa Area Office, Supervisor of the Protected Resources Division. Any such transfer will be subject to such conditions as NMFS deems appropriate.

2. The following terms and conditions implement reasonable and prudent measure 2:

a. The permittee shall submit draft design plans for all new and replacement water control structures on perimeter levees in the project area to NMFS for review and approval at least 120 days prior to construction.

b. The permittee shall submit draft design plans for all fish screens to NMFS for review and approval at least 120 days prior to construction.

3. The following terms and conditions implement reasonable and prudent measure 3:

a. Treated wood may not be used in any structure that comes in contact with water.

b. The permittees shall allow any NMFS employee(s) or any other person(s) designated by NMFS, to accompany field personnel to visit the project sites during construction activities described in this opinion.

c. Once construction is completed, all project-introduced material (pipe, gravel, cofferdam, *etc.*) must be removed, leaving the area as it was before construction. Excess materials will be disposed of at an appropriate disposal site.

d. Construction equipment used on the outside of perimeter levees will be checked each day prior to work and, if necessary, action will be taken to prevent fluid leaks. If leaks occur during work, the Corps, the permit holders, or their contractor will contain the spill and remove the affected soils.

4. The following term and condition implements reasonable and prudent measure 4:

a. The Corps and permittees shall provide written reports to NMFS by January 15 of each year regarding the project's construction of Phase 1 facilities at pond

complexes SF2, A5/7/8, A6, A16/17, E8A/E8X/E9, and E12/13, during the prior calendar year. Report shall include description of (1) levee work, including breaches; (2) construction of water control structures; (3) excavation of pilot channels and other areas outside or perimeter levees; (4) construction of recreational facilities outside of perimeter levees; and (5) other facilities and structures on or outside of perimeter levees. The reports shall include the dates construction began and was completed; a discussion of any unanticipated effects or unanticipated levels of effects on salmonids or sturgeon, a description of any and all measures taken to minimize those unanticipated effects and a statement as to whether or not the unanticipated effects had any affect on ESA-listed fish; the number of salmonids or sturgeon killed or injured during the project action; and photographs taken before, during, and after the activity from photo reference points.

b. The Corps and permittees shall provide written reports to NMFS by January 15 of each year regarding the project's construction of water control facilities and fish screens on perimeter levees throughout the entire project area. The reports shall include the dates construction began and was completed; a discussion of any unanticipated effects or unanticipated levels of effects on salmonids or sturgeon, a description of any and all measures taken to minimize those unanticipated effects and a statement as to whether or not the unanticipated effects had any affect on ESA-listed fish; the number of salmonids or sturgeon killed or injured during the project action; and photographs taken before, during, and after the activity from photo reference points.

c. The Corps and permittees shall provide written reports to NMFS by January 15 of each year regarding operation of the following water control facilities on perimeter levees: B2C-14, B2C-16, B2-11, A2W-4, A3W-1, A3W-2, A7-7, A14-1, A14-10, A14-13, A16-5b, A16-5, A16-1b, A16-1. WB-1, WB-1A, WB-4, WB-2, SF2-1, and SF2-2. The reports shall indicate the dates in which the structure began and ceased operation as one-way flow, two-way flow, inlet only, or outlet only. Report shall also indicate if and when a fish screen was installed on the structure.

d. The Corps and permittees shall provide written reports to NMFS by January 15 of each year regarding the results of the project's fisheries monitoring program and applied studies. If the full report for the prior year is not available by January 15th, a summary of fish captures and results shall be provided and the full report provided by September 15th of the year.

e. The Corps and permittees shall provide written reports to NMFS by January 15 of each year regarding observations and data collected at fish kills within the project area. If a full report for the prior year is not available by January 15th, a summary of fish kill observations shall be provided and the full report provided by September 15th of the year.

f. All the above reports shall be submitted to NMFS Santa Rosa Area Office, Attention: Supervisor of Protected Resources Division, 777 Sonoma Avenue, Room 325, Santa Rosa, California 95404-6528.

VIII. REINITIATION NOTICE

This concludes formal consultation on the issuance of a permit to FWS and CDFG for Phase 1 of the SBSP Restoration Project and the issuance of a 10-year permit to FWS and CDFG for on-going maintenance activities within the SBSP project area in San Mateo, Santa Clara, and Alameda counties, California. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) the identified action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered in the biological opinion; or (4) a new species is listed or critical habitat designated that may be affected by the identified action. In instances where the amount or extent of incidental take is exceeded, formal consultation shall be reinitiated immediately.

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B. Personal Communications

Josh Fuller. National Marine Fisheries Service, SWR-Santa Rosa Area Office. December 2008.