South Bay Salt Pond Restoration Project
South Bay Fish and their Habitats Workshop Synopsis

Date: Friday, May 20, 2005, 9:00am to 3:00pm
Location: San Francisco Bay Conservation and Development Commission, 26th Floor, 50 California Street, SF
Purposes: To increase our knowledge of the South Bay fish community, in general, and salmonids, in particular, to understand their habitat needs, and to recommend effective actions the Restoration Project can take to benefit fish and their habitats.

Expected Outcomes:

- Suggestions on how to improve the Fish Science Synthesis;
- Suggestions on what the Project can do help Bay fish;
- List of prioritized ideas for short-term and long-term studies to increase our understanding of fish populations, especially surfperch and salmonids, in the context of the Restoration Project;
- Ideas on good monitoring methods for current conditions and ISP management.

Presentation #1: Kate Schafer, Aquamarine Research
Summary of the Fish Synthesis and Surfperches in the South Bay

Kate discussed the information in the15-page draft synthesis she wrote for the South Bay Salt Pond Restoration Project. Her results focused primarily on data compiled from the Marine Science Institute (MSI), which used otter and surface trawls to collect fish in deep water conditions from the 1970s until about 2000. This data set lists 70 species of fish collected in the South Bay. The California Department of Fish and Game also monitored fish populations in the South Bay since the 1980s, also using trawls, but these data are not currently included in the synthesis. The synthesis focus is narrow now, but would benefit from including other data sets and information on invertebrate prey.

In looking at MSI data on nine species of surfperch, marked declines have been observed over the last ten years. Surfperch will benefit from the increased nearshore vegetated habitat that marsh restoration will provide. MSI data also show declines in English sole have over the last 30 years. Juvenile California halibut prefer the warmer waters of the South Bay and then migrate to deeper waters at year-one. Populations of Pacific sardine have been seasonal and highly variable. Ocean conditions have major impacts on Bay fish, showing the importance of understanding offshore conditions.

Key concerns for fish in the Project Area are salinity changes, dissolved oxygen (DO), public access and pollutants. A number of fish species can benefit from restoration of complex tidal marsh habitat mosaics. Water quality and fish diversity needs to be adequately monitored during the ISP and restoration, as fish are very sensitive to DO and salinity variations. Additional research is needed to determine the needs of the most abundant species, predict 50-year impacts of sea level rise on fish, assess fish response to changing habitat conditions, and perhaps, develop a predictive fish model.

Outcome 1: Suggestions for the Science Synthesis

- Discuss the limitations of the data sets; use information from the San Francisco Airport reports summarizing fish capture methods and their limitations. Kathy Hieb asks whether

report is available. She does not recall seeing a discussion of fish sampling in tidal marshes when NOAA and CDFG reviewed their sampling plan. They did sample in shallow subtidal mudflats, but not sloughs or vegetated habitats.

- Include descriptions of current sampling programs, including gear and maps of sampling locations.
- Be as explicit as possible about habitat requirements of different species.
- Identify key target species and species complexes, and focus the literature review on those.
- Move steelhead information into the fish synthesis and use the data sets from CEMAR, SCVWD (survey data still needs to be compiled), and NOAA fisheries.
- Focus specifically on Project Objectives and Project habitat requirements.
- Include the USGS data from the ponds, including the North Bay ponds.
- Include invertebrates, in so far as they are prey items, especially bay shrimp, epibenthic and benthic invertebrates.
- Include the CDFG open water data set, the three additional tidal marsh surveys, and anecdotal data (for example from NCCFFF).
- Add historic data (if it exists) on eelgrass and oyster bed distribution in the South Bay and discuss turbidity effects on eelgrass distribution.

Presentation #2: Kathy Hieb, CDFG, Central Valley Bay Delta Branch

Use of the San Francisco Estuary's tidal marshes by fishes-focus on South Bay

Kathy gave an overview of tidal marsh habitats and how they are used by resident, transient, migratory and opportunistic fish. Her data show that in San Pablo Bay marshes, resident species comprise 78% of fish species in marsh plain channels, 50% in larger channels, 11% in open water and 99% in tidally-muted open water; a similar pattern would be expected for South Bay tidal marshes. She noted that tidal marshes are important as nursery habitat because higher temperatures, shelter (vegetation, shallow water), higher turbidity, and increased food promote growth and survivorship of young fish. The nursery role of a habitat can vary with the tide; for example, tidal channels provide foraging habitat at high tide and refuge from predators at low tide. Restored tidal marshes should be connected to open water, not tidally muted with the water level managed by a tide gate.

Transient species, such as Pacific herring, staghorn sculpin, and shiner perch use a range of habitats in the Bay at different times of the year. Pacific herring juveniles are found in tidal mashes and other shallow-water habitats in March and April, after which they migrate to deeper water. In contrast, staghorn sculpin rears in tidal marshes for a much longer period, February through June, before emigration to deeper water. Shiner perch are most common in tidal marshes from May through August, but probably emigrate to deeper water earlier in South Bay due to higher water temperatures. Because many fish species migrate or are transient, they export nutrients and energy from marsh habitats to the deeper Bay and ocean.

Kathy noted that most of the data from over 25 years of CDFG trawls in open water comes from north of the Dumbarton Bridge and there are few data sets about fish diversity and habitat use in the far South Bay. One of the problems sampling in open water south of the Dumbarton Bridge is an introduced tube amphipod (*Ampelisca abdita*) that clogs towed nets, such as the otter trawl.

In summary, a complex of tidal marsh habitats will benefit many species at varying stages in their life histories, and restoration of a mosaic of habitats should be a goal of the

Project. Evaluating the value of marshes should not focus solely on special status species, but the fish community as a whole. Little is known about the nursery function of marshes vs. open water for most fish species, and this could be an area of research. We do know enough about the South Bay fish communities to predict which species will be found in restored marshes and to select indicator species.

Presentation #3: Gordon Becker, CEMAR
Salmonids of the South Bay

Gordon summarized his work with Rob Leidy on salmonids in the South Bay. Much of the information on presence/absence in streams was produced by Leidy who, while with USEPA, identified and walked 270 streams in the Bay area and including 100 in the South Bay. Coho did occur historically, but are now gone (extirpated) from the South Bay. While Chinook probably did not occur historically in the South Bay, fish of hatchery origin are now found in the Guadalupe River and Coyote Creek.

With respect to steelhead, data indicate that 69 of approximately 100 streams in the South Bay definitely had this species, historically. Data from the past 10 years indicate a 30% decline, to 49, in the number of streams that support *Oncorhynchus mykiss* populations. Only 18 streams can support this fish's anadromous life cycle. The four best steelhead streams in the South Bay are Alameda Creek, Coyote Creek, Guadalupe River, and San Francisquito Creek.

Much is unknown about steelhead use of estuarine habitat in the South Bay. Gordon suggested that the project could help steelhead by providing refuge for young fish from predation, a suitable environment for young fish to respond to salinity change, and an area with abundant food that could produce high growth and increased ocean survivorship. Of these three features, evidence for the benefit of high productivity is most reliable. Gordon also suggested the restoration Project maximize shallow brackish marshes near stream mouths. For a number of reasons, Gordon does not believe that steelhead abundance will be a good measure of the success of the Project.

There is controversy about the USFWS plans to establish new Caspian tern colonies to compensate for colonies removed in Washington state. During the discussion, Clyde Morris, USFWS, stated clearly that no Caspian terns will be physically moved. The intent is to reduce the amount of habitat on the Columbia River and add more habitat here and the other locations, with the hope that the birds will move on their own. Gordon noted that Caspian terns have been shown to selectively feed on steelhead. He felt that the plan was not a good idea in light of the small numbers of steelhead using the South Bay.

Outcome 2: Recommendations for the Restoration Plan

- Pull levees back from sloughs to create wider fringe marshes along the sloughs; don't be bound by existing levees.
- Locate tidal areas adjacent to sloughs, as fish productivity is linked to tidal action; the more tidal area the better.
- Increase tidal marsh patch size and connectivity between tidal marsh, tidal flat and subtidal habitat, whenever possible; large tidal marshes increase food productivity, provide important filtering functions, lead to increased abundance of fish; connections to other aquatic habitat allow movement of non-resident fish.
- Manage ponds for to ensure good dissolved oxygen conditions for fish.
- Establish oyster and eelgrass beds.

- Mercury is a huge concern and there are still questions in terms of effects of Hg on fish; conduct studies and look at USACE data for Hamilton on meHg.
- Some workshop members believe it is important to limit *Spartina alterniflora* and hybrids as cover by these invaders may decrease marsh plain and possibly decrease fish productivity. Other members indicated that little is known about the potential impacts of *S. alterniflora* and its hybrids on native fish.

Presentation #4: John Krause, California Department of Fish and Game and Clyde Morris, US Fish and Wildlife Service
ISP Changes and Monitoring

John provided a summary of Initial Stewardship Plan (ISP) activities and monitoring. In the Eden Landing Complex, DFG opened pond B10 to tidal circulation on July 8, 2004. However, on August 24 the gate broke and that pond system has been operated as a muted tidal pond system with continuous intake and discharge since then. The deteriorating structure will be replaced as part of the final phase of construction for the 835-acre Eden Landing restoration project and will thereafter perform according to the ISP. They also opened pond B2 on August 11, 2004, after the installation of new water control structures. Monitoring requirements, for salinity, dissolved oxygen (DO), pH, and temperature, were set by the Regional Water Quality Control Board. Monitoring for both pond systems showed conditions were in compliance for salinity, pH and temperature, but some excursions from the DO standard were observed.

Based on daily averages for continuous monitoring of dissolved oxygen, discharges were below the 5.0 mg/L standard set in the Basin Plan as follows: Pond System 2--90 total recorded days with 27 days below 5.0 mg/L and 0 below 3.4 mg/L; Pond System B10--132 total recorded days, with 67 days below 5.0 mg/L, 3 below 3.0 mg/L and 0 below 1.0 mg/L. It should be noted that Pond 10 was managed as a muted tidal pond after the gate broke on August 24, 2004. The pond continued to discharge at DO below 5 mg/L. The 48" intake/discharge culvert may not have had sufficient capacity to establish a fully muted tidal regime in this pond. Monitoring efforts showed that dissolved oxygen levels in Ponds B2 and B10 exhibited a strong diurnal pattern (low dissolved oxygen near dawn and higher levels at mid-day). The Pond 6A system is expected to begin ISP operations in fall 2005 after construction of the culvert in Pond 6A.

In the Alviso Complex, operated by the US Fish and Wildlife (FWS), Don Edwards National Wildlife Refuge, Ponds A2W and A3W were opened to the Bay on July 19 and A7 on July 26, 2004. Monitoring showed that A2W and A3W met the salinity discharge requirements. A7 was initially above 44ppt but within 2 weeks was below the 44ppt requirement. On all but two occasions, pH in receiving waters was within the standards. With respect to DO, receiving waters for all ponds (as measured in the ponds at the discharge point), but especially pond A3W, were below the 5.0 mg/l requirement on a significant number of days. For Ponds A2W and A7, receiving water monitoring in the Bay and Alviso Slough did not detect reductions in DO levels from these discharges. Monitoring of Guadalupe Slough indicated that Pond A3W may have caused DO depressions in certain areas. Due to DO problems, the FWS instituted a rapid reporting system to the RWQCB, collected data to understand the sources of low DO in the ponds, met with Save the Bay and other stakeholders concerned about water quality conditions, and implemented actions to improve DO levels coming out of the ponds. After reviewing data of ambient DO levels from a South Bay Slough occurring before the pond discharges as well as reports from other aquatic systems outside the Bay Area, the RWQCB lowered the DO level trigger for the 2005 season from 5.0 mg/l to 10% percentile of 3.3 mg/l.

Presentation #5: Francine Mejia USGS, WFRC.

Preliminary Data on Fish from USGS Monitoring of the Project Ponds

Francine presented fish data collected by her USGS team in the selected Project ponds and sloughs from March 2004-March 2005. Fish were sampled with gill nets, minnow traps and bag seines. Nets were typically set for two hours in sloughs and minnow traps in the ponds for 1-2 hours. Sloughs and some ponds were not seined. Data were collected in March, June, September, and November, 2004 and March 2005. Limitations to data collection were that sampling occurred on about the top two hours of the tide so they would not get stranded, they were not allowed to use gill nets in Coyote Creek, Alviso Slough and Stevens Creek from December 15 to April 30 (therefore no steelhead samples) and they could not get out on the soft levees during the rain. They sampled in Stevens Creek, Alviso Slough, Coyote Creek, Coyote Hills Slough, the Old Alameda Flood Control Channel, Eden Landing ponds 1,2, 4,5, 6C and 7, and Alviso ponds A2W, A2E, and A 9-12.

Francine and her team collected 12,392 fish in 20 species representing 16 families. Of the 20 species, 13 were native species. The non-native species were American and threadfin shad, chameleon and yellowfin goby, rainwater killifish, striped bass, and common carp. Surprises were finding two American shad and, in one of the ponds (A9), a striped bass that was about 1 meter long and very heavy. Alviso Slough had the most fish. Coyote Hills slough had a large number of striped bass in March. Dominant species in the sloughs were topsmelt, northern anchovy, and leopard shark. American shad could also be abundant. In the ponds, topsmelt, yellowfin goby, rainwater killifish and longjaw mudsuckers were the most abundant species.

Water quality data showed Alviso and Eden Landing sloughs were above 5.0 mg/l while the ponds in the two areas were above this standard for about 75% of samples. The sloughs had lower pH (~8.0) than the ponds (~8.5). Salinity has declined since ISP implementation. Additional samples will be collected in June and September, 2005.

Outcome 3: List of uncertainties requiring study

- Sedimentation and sea level rise impacts on fish habitat
- Public access impacts on fish
- Potential impacts of legacy contaminants and endocrine disruptors
- Water quality effects on species, especially salinity and DO changes
- How South Bay freshwater inflows have changed and affected fish species
- Whether marshes provide refuge for steelhead and nursery habitat for other species

Outcome 4: Recommendations for Monitoring

Species monitored should be good indicators of conditions in three habitat types: tidal marsh, intertidal mudflats, and subtidal channels. They should also reflect essential habitat functions for fish including nursery support, food chain support, resident survival, and migrant survival. Three overall goals for monitoring should be:

- Determine fish use of evolving habitats (both problems, such as fish trapped in ponds and not enough channels, and benefits, such as expanded use of habitats by species);
- Assess pollutant effects;
- Track population changes and growth in non-native species.

Four good indicator species/groups are:

1. Longjaw mudsucker a resident species that can be used to monitor use of various higher-elevation marsh habitat types and the level of MeHg.
2. Surfperch species, especially shiner perch—they are transient species that used all three major habitats and can be used to monitor fish use of evolving habitats in the Restoration Project.
3. Leopard sharks—this species is a top predator in the South Bay food chain, using tidal marshes opportunistically, not residents. They can be used to assess MeHg bioaccumulation in the food chain.
4. Starry flounder and California halibut—these 2 transient species could be indicators of restoration success, but are not common all years as ocean conditions effect recruitment. Note: California halibut are more common when we have a warm-water regime, starry flounder when there is a cold-water regime.

Sampling suggestions include:

- Collect data on overall fish diversity and relative abundance.
- Use different sampling methods at different locations to sample a wider range of habitats and species groups.
- Focus on presence/absence versus numbers.
- Conduct validation sampling at permanent stations that could be established at Eden Landing and the Island Ponds to assess fish response to changing conditions.
- Sample larger sloughs and in Bay occasionally.
- Sample during low DO periods, especially Sept/October
- Assess fish use, invasives and pollutant problems at the landscape and Phase 1 design scale.
- Coordinate sampling between ISP ponds and restoration actions.
- Coordinate sampling with the contaminants group and others, as fish sampling can be expensive.

Next steps:

- Revise the Fish and their Habitats Science Synthesis
- Hold a follow-up workshop on Trophic Levels in the South Bay

Summarized by L. Trulio
Finalized on July 12, 2005

Name	Organization
Marty Seldon	Northern California Council Federation of Fly Fishers
Mike Brinkley	Northern California Council Federation of Fly Fishers and Flycasters, Inc.
Francine Mejia	USGS
Toni Russell	USGS
Steve Ritchie	South Bay Salt Pond Restoration Project
Brenda Buxton	State Coastal Conservancy
John Bougeois	H. T. Harvey
Kate Schafer	Aquamarine Research
Peter LaCivita	US Army Corps of Engineers
Steve Moore	Regional Water Quality Control Board
Kathy Hieb	California Department of Fish and Game
John Krause	California Department of Fish and Game
Carl Wilcox	California Department of Fish and Game
Korie Schaeffer	National Marine Fisheries Service
Natalie Cosentino-Manning	NOAA
Marilyn Latta	Save the Bay
Emmanuel da Costa	Alameda County Flood Control District
Laura Kidd	Alameda County Flood Control District
Francesca Demgen	URS
Bill DeJager	US Army Corps of Engineers
Gordon Becker	CEMAR
Jason Bielski	San Francisco PUC Water Quality
Jane Lavelle	San Francisco PUC Water Quality
Lisa Porcella	Santa Clara Valley Water District