



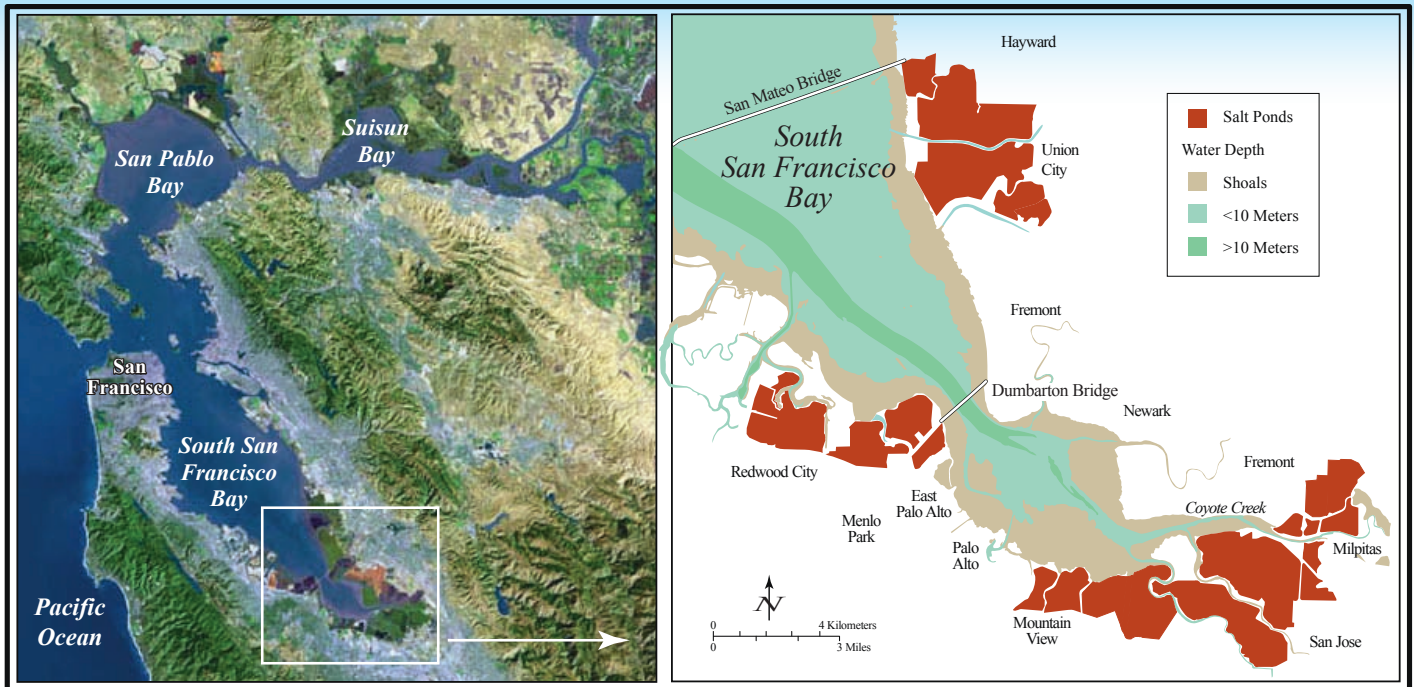
Science Support for Salt Pond Restoration and Management in South San Francisco Bay

One of the largest wetland restoration efforts in the United States is underway on 16,500 acres of salt evaporation ponds in San Francisco Bay. More than 85 percent of historic tidal marsh acreage has been lost from diking and filling in the San Francisco Bay Estuary. The South Bay Salt Pond Restoration Project will restore thousands of acres of marshlands that will enhance ecosystem functions by improving water quality and adding habitat for endangered species. It will also create a system of managed ponds to provide habitat and food (e.g., brine shrimp and brine flies) for migrating and wintering waterbirds. The salt ponds were purchased by state and federal agencies in March of 2003. The restoration process is being managed collaboratively by the U.S. Fish and

Wildlife Service, California State Coastal Conservancy and the California Department of Fish and Game. The primary goals of the restoration are to: 1) restore and enhance a mix of wetland habitats, 2) provide for flood management and 3) provide public access and recreation opportunities (www.southbayrestoration.org). However, physical and biological data are needed by resource agencies to adequately design a comprehensive restoration plan that considers the complexity of the system and maximizes ecological benefits of these habitats. The U.S. Geological Survey is collecting and analyzing data to answer key questions for the restoration. The purpose of this fact sheet is to inform the public of the science support the USGS is providing for the restoration effort.



A tidal marsh habitat in Fremont – this habitat type is one goal of salt pond restoration.



Satellite image of San Francisco Bay and inset map showing the location of salt ponds that are the focus of the restoration.



Specialized equipment is used to map shallow water bathymetry, an important factor in bird use of the ponds.

Composition and abundance of fish and invertebrates are monitored in ponds and adjacent sloughs.



What is the current ecology of the salt ponds?

Assessing existing and evolving habitat structure and ecosystem function to aid in development and management of restored marshlands, USGS scientists are routinely measuring:

- Water quality, nutrients and chlorophyll
- Invertebrate and fish diversity
- Sediment composition
- Levels of mercury and other contaminants

How much water and sediment are supplied to South Bay?

New data collection efforts will allow USGS scientists to better understand physical processes within South Bay:

- Sediment station on Coyote Creek
- Seasonal monitoring in South Bay

Which habitats and salt ponds do birds prefer?

Monthly surveys will determine optimal management strategies for diving birds and estimate the availability and importance of shallow habitat for shorebirds.

Monthly data collected in the ponds include:

- Bird species assemblages
- Habitat characterization
- Foraging activity



USGS scientists and cooperators from PRBO Conservation Science and Prince William Sound Science Center use micro-transmitters to track abundant migratory birds like the western sandpiper (right) and American avocet (left) that rely on South Bay habitats.



How are salt ponds managed for bird habitat?

USGS has developed a simulation model for the inter-connected ponds that will be used to maintain habitat goals, explore long-term restoration alternatives and minimize pumping cost. This model tracks the following critical habitat variables:

- Salinity
- Temperature
- Water level



USGS scientists servicing a salinity and temperature probe in a pond. Installed sensors continually measure water quality parameters in select ponds.



A USGS scientist collects a water sample from a pond for water quality analysis.



Charles C. Benton, 2002©

Levees that divide salt ponds from neighboring sloughs also help control flood waters.

What will happen to existing tidal flats and the birds that use them?

Tidal flats around the periphery of South Bay provide habitat for shorebirds and waterfowl. Restoring ponds to tidal action may erode some tidal flats. Thus, the USGS is gathering information on:

- Bathymetric changes
- Sediment supply and transport
- Bird use of and food resources on tidal flats

How tall are the levees, and will they help to control flooding?

An aerial survey using LIDAR, an aircraft-mounted laser surveying device, will provide data to create a very detailed surface elevation map of South Bay, including shallow areas of the bay, ponds and sloughs. The map will be used for:

- Flood management planning
- Identifying land use
- Hydrologic modeling
- Completing a bathymetric map for South Bay

Is there enough sediment?

To restore a pond to tidal marsh, levees are breached and tidal action provides sediment to build the new marsh. The USGS is determining the amount of sediment available for restoration of some ponds to tidal marsh based on:

- Monitoring data
- Numerical modeling
- Bathymetric changes



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