

Appendix D- Monitoring

Fish Monitoring

The California Department of Fish and Wildlife operates the Summer Towntnet Survey (STN) (<https://www.wildlife.ca.gov/Conservation/Delta/Towntnet-Survey>), which collects zooplankton and juvenile fish samples at all stations shown in Figure 1 below, on a biweekly basis in June, July, and August. The tow net consists of a fixed D-frame sled on runners with an 18-foot net. The main net body is 11 ft. long with 1/2" stretch, knotted, nylon, mesh tapering down to a 7 ft. cod-end with a section of woven mesh with approximately 8 holes per inch. A zooplankton net (modified Clarke-Bumpas net, 160 micron mesh) is attached to the top of the net frame to sample mesozooplankton prey availability during one of the fish tows at each station. Two 10 minute stepped oblique tows are performed at each station. A third tow is conducted if any fish are captured during the first two tows. All fishes and several invertebrate species are counted and measured.

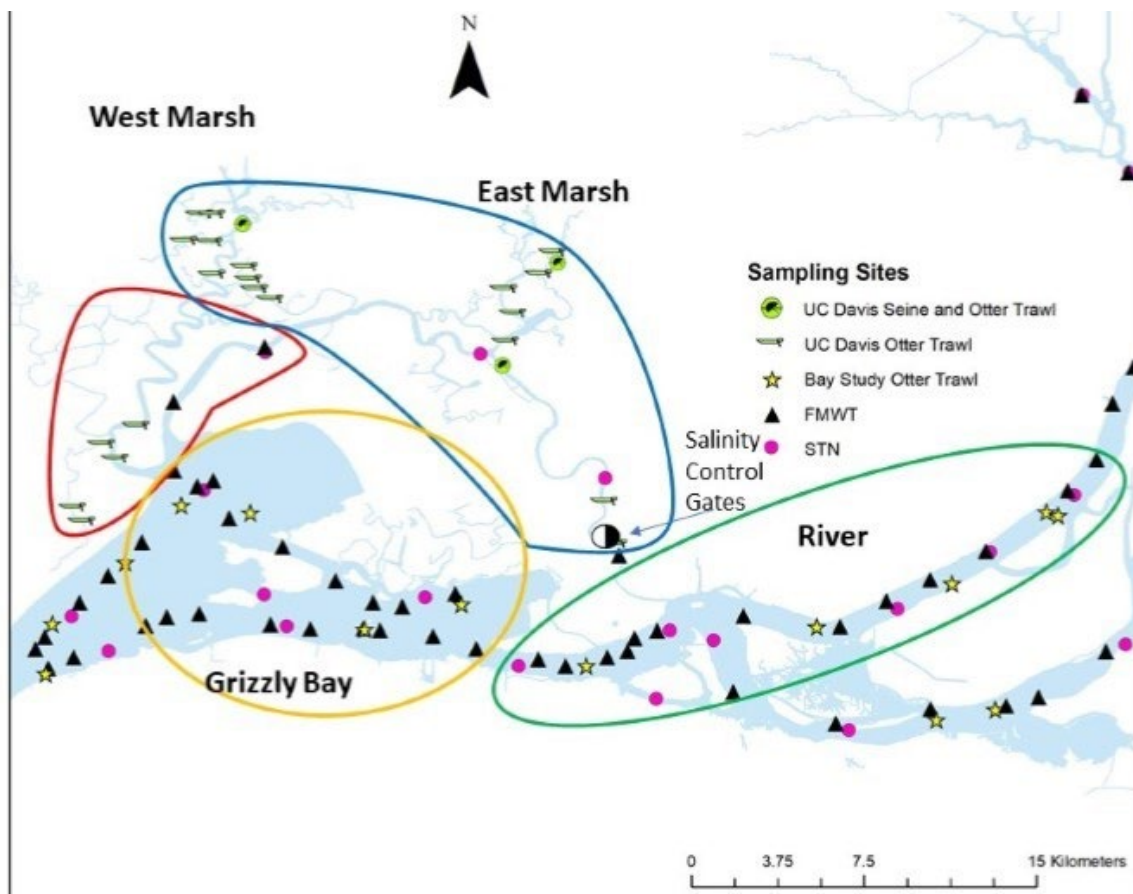


Figure 1. Sampling sites for IEP's long-term fish monitoring surveys. FMWT = Fall Midwater Trawl. STN = Summer Towner Survey.

In September, the Towner Survey is replaced by the Fall Midwater Trawl (FMWT), (<https://www.wildlife.ca.gov/Conservation/Delta/Fall-Midwater-Trawl>), which operates on a monthly basis and also collects zooplankton samples in addition to fish sampling at a subset of its fish sampling stations (Figure 1, above). The midwater trawl net has mouth dimensions of 12 ft x 12 ft. Net mesh sizes graduate in nine sections from 8-inch stretch-mesh at the mouth to 0.5-inch stretch-mesh at the cod-end. All four corners of the net mouth are connected to planing doors that hold the net mouth open when being towed through the water. At each station a 12-minute stepped-oblique tow is conducted. All fishes and several invertebrate species are counted and measured. At stations where zooplankton is collected, a mesozooplankton net (modified Clarke-Bumpas net, 160 micron mesh) and a macrozooplankton (mysid) net attached to a steel frame is sampled by a stepwise-oblique tow immediately before or after fish sampling.

The Enhanced Delta Smelt Monitoring Program (EDSM) was initiated by the U.S. Fish and Wildlife Service in 2016 to provide estimates of Delta Smelt distribution and abundance (https://www.fws.gov/lodi/juvenile_fish_monitoring_program/jfmp_index.htm). EDSM conducts stratified random sampling via Kodiak trawls (July-March) and larval gear (May-June). Over the course of a week, field crews sample between 18 and 37 random sites, with at least two samples in Suisun Marsh (sites are randomly selected, so not shown on sampling figure). A minimum of two tows are conducted at each site. All fish collected are identified (in the field when possible, in the lab for early life stages), measured, enumerated, and recorded. In addition to fish information, environmental data are collected for each sampling event. Full details on methods and data are available on their Environmental Data Initiative data package (United States Fish and Wildlife Service et al. 2019).

In future years reports may include fish surveys conducted by UC Davis. UC Davis conducts the Suisun Marsh Fish Sampling Program, a year-round monthly survey of the Suisun Marsh Region (<https://watershed.ucdavis.edu/project/suisun-marsh-fish-study>). This survey conducts beach seines and otter trawls at 21 sites in nine sloughs throughout the Marsh (Figure 1). Trawling is conducted using a 5.3 m long otter trawl with a 1.5 m X 4.3 m opening, with 35 mm stretch mesh in the body and 6 mm stretch mesh in the cod end. The trawl is towed at 4 km/hr for 5 minutes in small sloughs and 10 minutes in large sloughs. Beach seines are only conducted in upper Suisun and Denverton sloughs using a 10 m beach seine with 6 mm stretch mesh.

Water Quality Monitoring

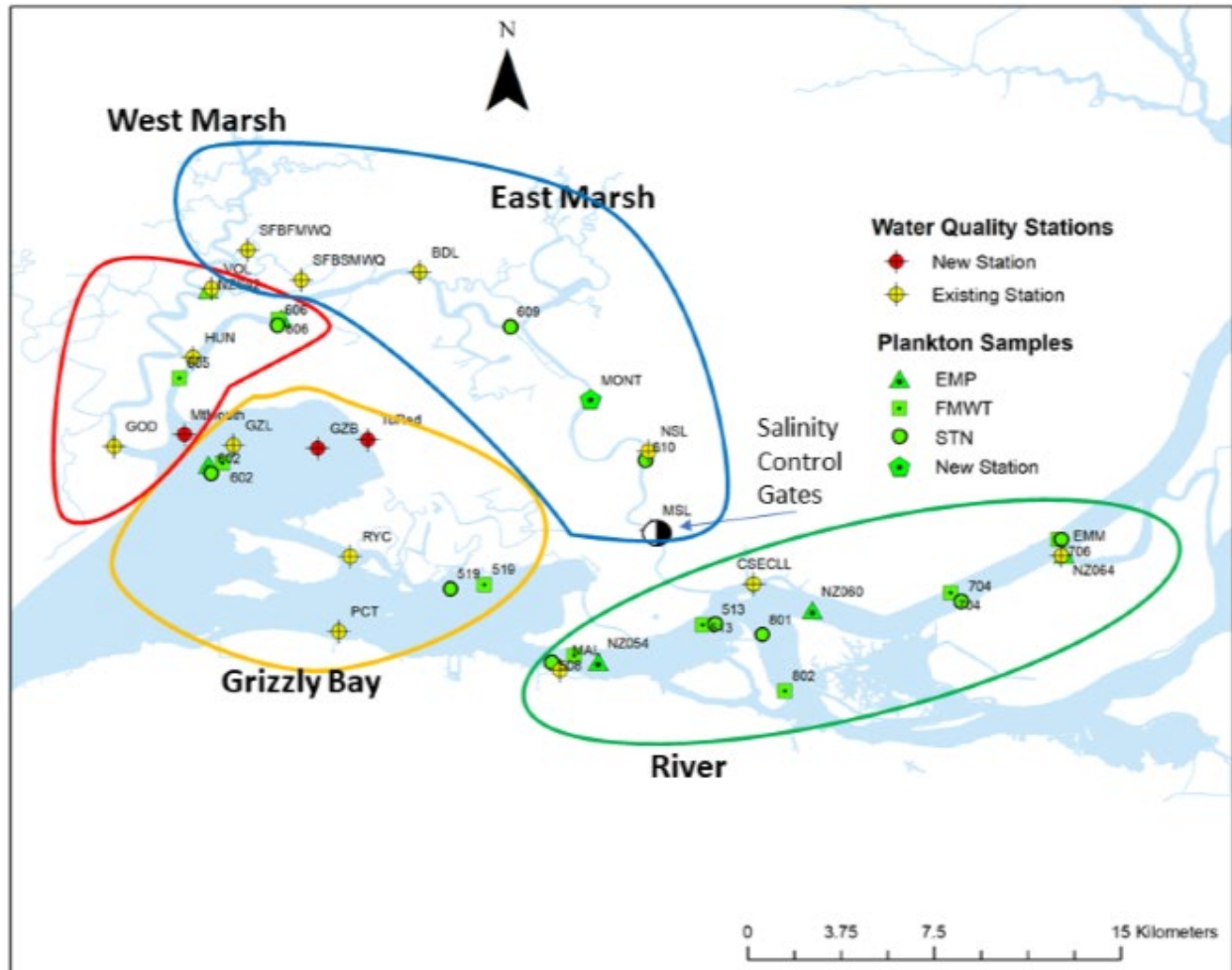


Figure 2. Suisun Bay region existing and proposed monitoring and sampling locations. The three regions used for major comparisons are outlined. Additional data collected in Grizzly Bay will help better understand the spatial extent of the SMSCG influence.

In addition to the stations used in the report, three new sondes will be placed in Grizzly Bay, as per the requirements in the 2020 ITP (section 9.1.3.3), one at the mouth of Montezuma Slough, one in the eastern region of Grizzly Bay, and one at the mouth of the Tule Red restoration site. The Tule Red sonde was deployed in June of 2020, and the two new Grizzly Bay Sondes were deployed in November of 2020. Data from these stations will be presented in future seasonal reports.

Phytoplankton and Zooplankton

Phytoplankton and Zooplankton are monitored primarily using four existing IEP surveys, including the CDFW STN and FMWT (described above), as well as the DWR/CDFW Environmental Monitoring Program (EMP) and USBR Directed Outflow Project (DOP).

Some additional samples were collected specifically for this management action to increase the spatial and temporal resolution of data in the area of interest.

To monitor phytoplankton, several types of data are used. Water quality stations distributed throughout the area collect algal pigment fluorescence data every 15 minutes. Water samples are collected from these stations every two weeks or monthly for laboratory analysis of chlorophyll-*a* and used to calibrate the continuous fluorescence data. This chlorophyll-*a* concentration data serves as a proxy for phytoplankton abundance. Phytoplankton community composition is sampled at a sub-set of nine zooplankton sampling sites, three in each of the key regions (Eastern Marsh, Western Marsh, River), as well as the existing “floating” stations at 2 PSU and 6 PSU. Samples are collected as 60-mL water samples preserved with Lugol’s iodine solution. Taxonomic analysis is conducted by BSA Environmental Services, Inc. (Beachwood, OH), following the same methods and procedures as the EMP phytoplankton samples. These samples augment existing IEP phytoplankton community composition data collected monthly by EMP at all their fixed stations and weekly from April to November by DOP (see descriptions of EMP and DOP surveys above). Phytoplankton community composition data will not be available until February of 2021, so only chlorophyll data is presented in this report.

Zooplankton sampling by STN and FMWT are described in the previous section. EMP conducts water quality, phytoplankton, and zooplankton sampling on a monthly basis throughout the upper estuary at 17 stations (Figure 14). At each station, they collect a 10-minute stepped oblique trawl using the same zooplankton sled used by FMWT (see above). (<https://wildlife.ca.gov/Conservation/Delta/Zooplankton-Study>). Two of these stations are not fixed, but instead follow the salinity field and sample where the bottom salinity reaches 2 PSU and 6 PSU, respectively.

Additional sampling was completed in 2020 to increase the number of stations in key regions and/or increase the frequency of sampling during the time period of interest. The goal is to achieve biweekly sampling during July to October across the area impacted by the Delta Smelt Summer Fall Habitat Action. The new station “Mont” was established for to monitor the effects of additional SMSCG operation. Sampling at STN stations 609 and 610 was extended into September and October. The frequency of sampling of EMP NZS42 and FMWT 606, 508, 519, 602, 513, 704, 706, 802 was increased from monthly to biweekly. Also, FMWT 605, which typically only samples fish, was added as a biweekly zooplankton station.

This evaluation focused on mesozooplankton collected by the 160-micron mesh nets only. Analysis of 2018 data found that the data collected with a 500-micron mesh (Mysid) net were too highly variable to reach any conclusions about the effects of the action. Therefore, we discontinued the collection of extra mysid samples in 2020.

Clam Density and Biomass

DWR staff conducted bivalve surveys in July and September of 2019 and 2020, matching the survey months of earlier years. We used a Ponar dredge to take benthic community samples

at each of 28 sites distributed throughout Suisun Marsh. Sites were chosen in 2018 by first identifying all sites in the region that DWR's Environmental Monitoring Program had sampled before, either as regular monitoring sites or as part of a benthic special study, then adding in additional sites that provided geographical coverage, channel size diversity, and estuary gradient, from Grizzly Bay and the Sacramento River up to the limits of where a small motorboat can access the smallest channels at high tide. The 2018 survey sampled 45 sites; this was reduced after power analysis to 28 sites for the 2019 and 2020 surveys by removing sites that were very close together or were interstitial between sites with similar communities.

The Ponar dredge sample at each site (bottom area 0.052 m²) was rinsed over a standard size 30 mesh (595 microns) and preserved in formalin for later processing. All *Potamocorbula* and *Corbicula* individuals were counted and their maximum shell dimension was measured to the nearest millimeter. The counts and size distributions were used to calculate bivalve density and ash-free dry biomass per square meter, using length-biomass regressions created for each species in both July and September as part of the Environmental Monitoring Program's regular monitoring. Water quality data at each site was also collected with a YSI sonde during sampling, along with data on sediment type.

Experiments to examine whether the two clam species experience differential growth and mortality in Suisun Marsh, especially when comparing large and small Marsh channels, were conducted by Dr. Ted Grosholz of UC Davis. These experiments consisted of both species being marked, measured, placed in common gardens (either in a cage/open/partial cage array, or on tethers) in different locations of the Marsh, recovered after various time intervals, and recounted and measured.