

Rick Wilder. Long term monitoring of juvenile fishes in the Sacramento-San Joaquin River Delta.

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The Delta Juvenile Fish Monitoring Program (DJFMP) is one of three programs at the Stockton Fish and Wildlife Office (STFWO). Our program has monitored juvenile fish populations in the Sacramento-San Joaquin River Delta region since the mid-1970s. The program is funded primarily by the U.S. Bureau of Reclamation (USBR) and the California Department of Water Resources (DWR) as mitigation for impacts of water export facilities, the Central Valley Project (CVP) and the State Water Project (SWP) respectively, in the southern Delta. The CVP supplies water to agricultural land throughout the Central Valley of California while the SWP provides municipal and agricultural water to southern California. In 2004, the two facilities provided water to over one million acres of agricultural fields in the Central Valley and 22 million people in southern California.

The DJFMP and its goals have evolved over the past 30 years to better address water management actions and endangered species listings. The original goal of the program was to determine how reduced river flows caused by water export operations affected the survival and migration of juvenile Chinook salmon, *Oncorhynchus tshawytscha*. As a result of federal and state listings of multiple races of Chinook salmon and other species of Delta fish, we expanded monitoring to all fish species throughout the year and across the entire Delta and nearby areas. This expansion has provided an opportunity to evaluate the impacts of water export operations on other species.

Currently, the two main goals of the program are to: (1) monitor the distribution, abundance, migration, and survival of juvenile Chinook salmon that are rearing in and migrating through the Delta towards the Pacific Ocean, and (2) document spatial and temporal distribution patterns of all juvenile fishes in the Delta, the lower Sacramento and San Joaquin Rivers, and parts of San Francisco, San Pablo, and Suisun Bays.

We work in collaboration with other member agencies of the Interagency Ecological Program (IEP), which is a consortium of federal and state agencies and one nongovernmental organization. The IEP was formed to provide information on the factors that affect the ecological resources in the Sacramento-San Joaquin River Estuary to allow for more efficient management of the estuary.

The DJFMP currently samples 59 sites, the large majority of which are sampled on a weekly basis. We use three types of sampling gears to conduct monitoring: beach seines, Kodiak trawls, and midwater trawls. Beach seining is conducted at 58 sites, where a seine net is dragged through the water across a site adjacent to shore. At three sites, we conduct trawling with nets pulled behind one (midwater trawl) or two (Kodiak trawl) boats for a standard period of time. The gear type used depends on time of year, environmental conditions, and the targeted fish species, or race in the case of Chinook salmon.

All data are entered into a Microsoft Access database, checked for accuracy at least three times, and then transferred to the "Bay-Delta and Tributaries" (BDAT) public web

site <bdat.ca.gov>, which is maintained by DWR. We currently have 122 species of fish and major invertebrates and over 1.4 million records in our database. From April-June, we post our data within 24 hours of collection on the California Department of Fish & Game (CDFG) data server to aid water managers in making decisions regarding the real-time management of spring water operations. We actively encourage and promote the acquisition and use of our data by other agencies and the public.

Our program participates in many "mark and recapture" experiments to better understand juvenile Chinook salmon survival while outmigrating through the Delta towards the ocean. To implement these experiments, fish from a given hatchery release are marked with a small (0.5-1.0 mm) coded wire tag inserted into the snout of the fish. When a fish is recaptured up to five years later, the tag is extracted and the code is read under magnification, revealing information regarding the origin of the fish. This information is useful in estimating migration rates and survival of fish. We conduct the "Delta Action 8" experiment to (1) compare survival of outmigrating winter-run salmon in the interior Delta (areas physically in between the Sacramento and San Joaquin Rivers) relative to the mainstem Sacramento River, and (2) determine the relationship between survival of juvenile winter-run salmon in the interior Delta and water exports out of the Delta. We conduct the "Sacramento River fall-run survival" experiment to estimate survival of fall-run juvenile Chinook salmon as they migrate through the Delta to help evaluate Delta restoration and water operations. The "Vernalis Adaptive Management Plan" (VAMP) experiment is conducted to evaluate the impacts of San Joaquin River flows and exports by SWP and CVP on juvenile Chinook salmon survival through the Delta.

Multiple members of our staff are actively involved in a variety of other collaborative fisheries projects around the Delta region. We coordinate releases of experimentally marked Chinook salmon with state hatcheries (Feather River Hatchery, Merced River Hatchery, and Mokelumne River Hatchery) and Coleman National Fish Hatchery (CNFH) to estimate their survival, movement, and timing of entry into the Delta. We participate in various working groups that evaluate fishery related issues in the Delta. We are involved with multiple outreach events targeting the general public and elementary school children, including the California State Fair, the American River and CNFH Salmon Festivals, and visits to classrooms. We have developed and implemented a fish monitoring program on Liberty Island, a flooded agricultural island in the Delta, with funding provided by Stone Lakes National Wildlife Refuge (NWR). We have provided technical expertise to the San Joaquin River NWR by conducting fish monitoring of the fishery resources in the Refuge. We provide our expertise in sampling design to other agencies, including the National Oceanic and Atmospheric Administration (NOAA), CDFG, and DWR. We collect fish tissue samples for DNA analysis conducted by DWR in an effort to refine race determination of salmon. We work with the California/Nevada Fish Health Center on various projects to evaluate fish health issues, including VAMP survival studies and post-trawl capture survival studies. We are involved in the "Environmental Water Account," which is a CALFED-funded program designed to provide water for fisheries protection and recovery and to provide assurances for more consistent water supplies.

We report our results through a variety of avenues, including an annual report, regular contributions to a quarterly IEP newsletter, publications in peer-reviewed journals, and presentations at scientific conferences and workshops.

To maintain relevance in a rapidly changing environment, the STFWO has developed a vision statement that will shape the progress of our future endeavors. In our vision we continue to strive to be recognized for our scientific leadership in monitoring, research, restoration, and management of aquatic resources. To assist in meeting this goal, the DJFMP will initiate a programmatic science review of our program this fall to evaluate whether we are using the highest quality scientific methods to address program goals. Our vision commits to fostering strong, productive collaborations and teamwork with our peers, cooperators, stakeholders, and the public. The DJFMP is currently collaborating with both academic and agency partners on a comprehensive project that will continue our monitoring program at Liberty Island. This project will provide stakeholders, managers, and the public with knowledge about the impacts of a flooded island on flood control, water conveyance, and species of special concern. The STFWO remains committed to providing expertise and leadership to the conservation and restoration of our fisheries resources through the generation of essential information in collaboration with others.

