Interagency Ecological Program for the Sacramento-San Joaquin Estuary

Newsletter

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For information on the Interagency Ecological Program, visit our home page on the World Wide Web (*www.iep.water.ca.gov*).

Readers are encouraged to submit brief articles or ideas for articles. Correspondence, including requests for changes in the mailing list, should be addressed to Randy Brown, California Department of Water Resources, 3251 S Street, Sacramento, CA 95816-7017.

Interagency Program Quarterly Highlights

These quarterly highlights summarize significant activities and findings of the Interagency Program during the past 3 months.

Delta Flow Measurement

Rick Oltmann

The floods of January disabled three UVM sites: Sacramento River at Rio Vista, Threemile Slough, and San Joaquin River at Stockton. A destroyed transducer pile has been replaced at the Threemile Slough site, and the site is again operational. The Rio Vista UVM recorded a velocity of just under 7 feet per second right before it failed — probably due to damage to the across-channel transducer cable. We are awaiting the arrival of a more robust transducer cable. A transducer pile was destroyed at Stockton also and has not been repairable because of the high San Joaquin River flows. The site was operational again by early April.

The USGS obtained an indirect measurement of delta outflow by combining daily flow data for four UVM sites: Sacramento River at Rio Vista, Threemile Slough, San Joaquin River

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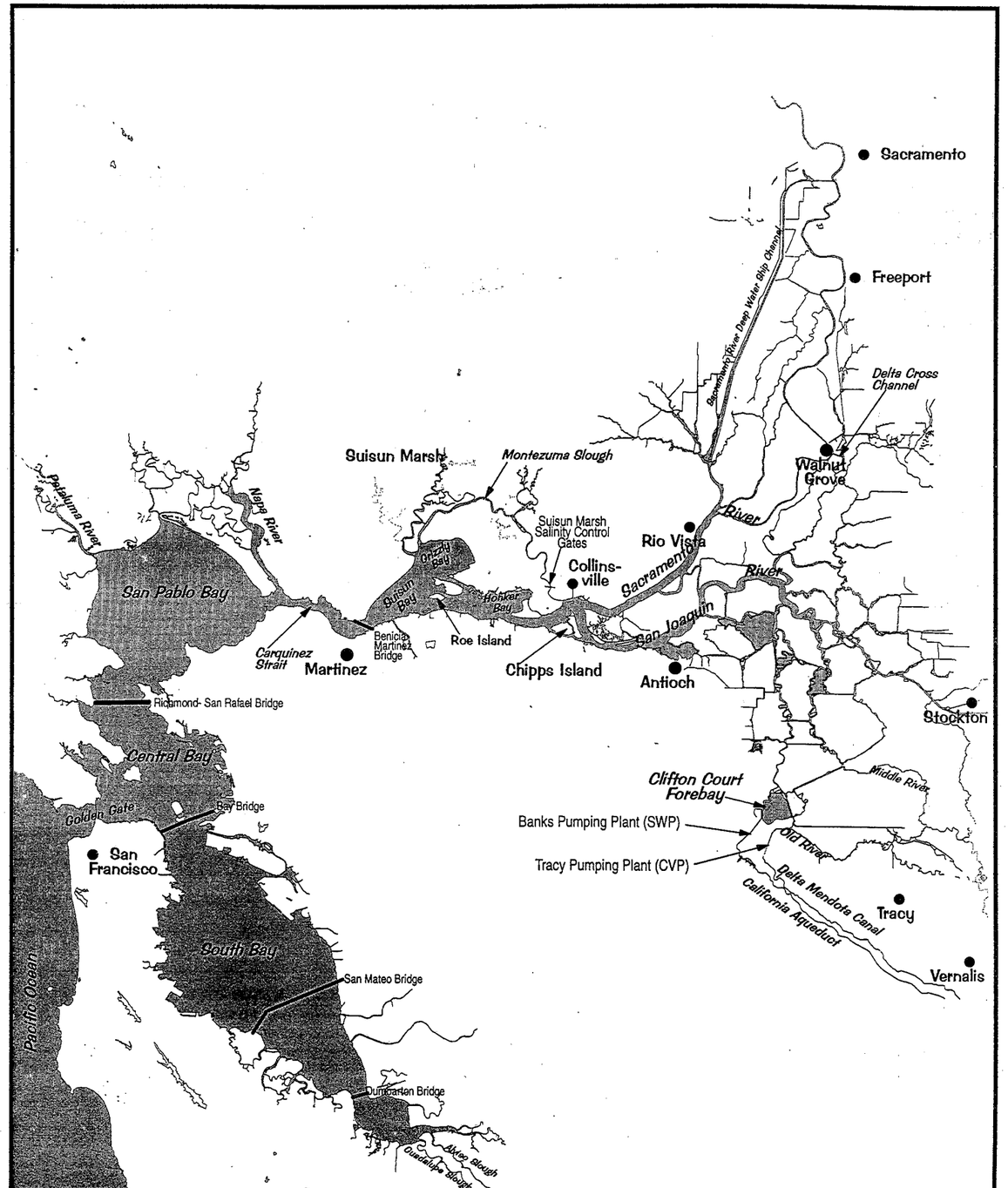
SACRAMENTO-SAN JOAQUIN DELTA AND SAN FRANCISCO BAY ESTUARY



at Jersey Point, and Dutch Slough. A daily time-series of delta outflow has been computed beginning with February 12, 1996, and continuing until the 1997 floods disabled two of the UVM sites. The data were first shown at the 1997 annual IEP workshop at Asilomar and were compared with delta outflow estimates calculated using the conventional mass-balance approach. The two data plots match well for medium to high outflow, but not as well for low outflow. The lack of agreement between the data during low-flow conditions is not surprising considering that the mass-balance approach does not account for the effects of the spring/neap tidal cycle (filling and draining of the delta) and atmospheric pressure changes and uses an imprecise estimate of delta consumptive use.

The USGS is planning to monitor tidal flow at seven new sites in the southern delta using acoustic Doppler current profilers for April-June 1997 as part of a cooperative juvenile salmon migration study with FWS and DFG. Rhodamine-WT dye will be released at about the same time and place as salmon smolts are released near Mossdale on the San Joaquin River. The dye will be traced using automatic samplers to determine where the fish may go, assuming they go with the flow. The flow data will be needed to analyze the dye-concentration data and, of course, will be valuable for flow model calibration. The dye-concentration data will also be useful for calibrating transport models.

Delta Model

Since November, the Delta Model Project Work Team has divided its efforts on: calibrating and verifying the hydrodynamics and salinity transport modules of DSM2; recalibrating the hydrodynamics and salinity transport modules of DSM1 for the CALFED Bay/Delta Program; and preparing a model validation comparison report for 1-dimensional flow models in support of CALFED studies.

Delta Simulation Model 2

Ralph Finch

DWR's Delta Modeling Section added some new features to DSM2:

- Reservoir-to-reservoir pumping capability needed to simulate CALFED alternatives was added to the "Hydro" and "Qual" modules.
- The Qual module was given multiple conservative constituent tracking capability. This will enable tracking throughout the delta of water originating from, for example, Martinez (downstream boundary), the Sacramento and San Joaquin rivers, and agricultural drainage.
- The Qual module was given the capability to simulate nonconservative constituents such as temperature, dissolved oxygen, and BOD. However, reaction coefficients will have to be calibrated before the constituents are used.

A PC version of DSM2 is now available on DWR's Delta Modeling web site. It is compiled with Microsoft Powerstation Fortran 4.

The Delta Modeling Section is calibrating the DSM2 hydrodynamic and salinity transport modules. Model results are sensitive to channel bathymetry in some channels (for instance, Threemile Slough). Until better cross-sectional data are available, the goal is to calibrate DSM2 at least as good as DSM1 (and probably better). A second calibration is planned after resurveying some of the delta channels. At present, DSM2 appears roughly as good as DSM1. However, we are experimenting with cross sections for Threemile Slough and a few other locations to examine the sensitivity of model response to bathymetry. A final document will be prepared showing the performance of DSM2 in the first phase of calibration.

The Delta Modeling Section is starting to replace DSM1 with DSM2 for application studies. We have begun parallel studies with both models, partly to see how they compare and partly to streamline production use of DSM2. We have identified these tasks necessary before DSM2 is ready for production studies by the public: finalize first phase calibration/verification; improve Hydro module initial stage input to avoid numerical problems on startup; verify the DSM2 Particle Tracking Model (PTM) against its DSM1 counterpart to confirm their general agreement.

Delta Simulation Model 1 Recalibration

Chris Enright

In November 1996, the CALFED Bay/Delta Program asked DWR's Suisun Marsh Branch to recalibrate DSM1 in response to concerns that the model is not adequately calibrated with flow data. The objective is to update model channel geometry descriptions based on the bathymetry database used for developing DSM2 and to improve DSM1 flow calibration based on recent flow data collected by USGS.

We have reviewed and updated bathymetry and configuration of all channels and have completed QA/QC of cross-sectional plots and channel data spreadsheets. The updated DSM1 Geometry file for rectangular channel sections is assembled with the updated grid network, channel descriptions, and Suisun Marsh managed wetlands input data. The model grid map is updated to reflect the modified grid network. The updated DSM1 Geometry file was tested for general stability with both 19-year

mean and nonrepeating Golden Gate tides and a range of delta and marsh hydrologies. Geometry file statistics have been prepared for comparison with the earlier version of the DSM1 geometry file.

The hydrodynamic module calibration is complete. Three hydrologic periods were simulated to calibrate model flow and stage: May 15-21, 1988; January 12-20, 1993; and May 20-June 1, 1994. Calibration results are presented on the IEP Home Page under "CALFED DSM1 Recalibration". You can post your comments and questions about the results on the email reflector dsm1cal.water.ca.gov. The hydrodynamic module will be verified using data from June 1994, October 1994, and April 1996.

Salinity module calibration is underway using water years 1991-1993 to provide a wide range of hydrologic conditions. The verification period is expected to include 1987-1995.

Validation Comparison of Delta Models

Rick Oltmann

As part of the CALFED Bay/Delta Program, USBR is preparing a model validation comparison report for one-dimensional flow models of the delta. USBR has invited others to provide model output for May 10 to June 30, 1994, for comparison with measured flow and water-elevation data: DWR's DSM1 and DSM2; Contra Costa Water District's FDM; and UC-Davis' RMA model. Delta conditions for this period include: relatively low inflow and export rates; Delta Cross Channel gates opened and closed several times; and several south delta barriers in place part of the time.

For further information contact Liz Howard at USBR (916/979-2976).

Entrapment Zone Studies

Wim Kimmerer

In the last quarter we have been putting the finishing touches on the final report of the 1994 entrapment zone studies. The report will be an IEP technical report comprising an executive summary that should be readable by most people familiar with the estuary, an introductory chapter, and five technical chapters. Each of these chapters has been written as a more-or-less separate paper, and several of them will be submitted to scientific journals after suitable modification.

We have done much of the analysis of the 1995 data and some of the 1996 data. Hydrodynamic conditions in 1995, a wet year, were very different from those in 1994, a dry year: for one thing, the entrapment zone was centered at about Chipps Island in 1994 and at Carquinez Strait in 1995. However, the behavior of the organisms collected did not vary that much between years: all of the EZ-resident species we examined migrated vertically in synchrony with the tides.

In 1996 we took much larger samples using large nets, resulting in high numbers (and therefore good sample statistics) but also dirty samples requiring a lot of work to examine. Processing of these samples continues.

These results were presented by Jon Burau, Tim Hollibaugh, and Bill Bennett in a session on estuarine turbidity maxima at the recent meeting of the American Society of Limnology and Oceanography in Santa Fe. That session brought together scientists working on these phenomena in several estuaries, including the Chesapeake, St. Lawrence, and Columbia. There was enough common ground at that meeting to prompt several of us to organize a dedicated workshop on the topic, to be held in autumn 1998.

Estuarine Ecology Team

Wim Kimmerer

The Estuarine Ecology Team has published IEP Technical Report 52, an assessment of the likely mechanisms underlying the "Fish-X2" relationships. This document is not a review article but an essay outlining the collective opinion of the team on how these relationships come about. In general, issues of habitat appeared to be most important to the largest number of species. Although lower trophic levels appeared to be affected by food supply, trophic linkages do not seem to be the cause of these relationships. In other words, species like longfin smelt and striped bass appear to respond to flow conditions through some direct physical link (*eg*, habitat or circulation patterns) rather than through stimulation of food supply. This interesting conclusion will be the topic of my talk at a theme session on effects of freshwater flows at the Estuarine Research Federation's biennial meeting in Providence, RI.

At the request of the Interagency Coordinators, the EET has held several discussions on Interagency Program research needs with regard to introduced species. Results of these deliberations are being assembled by Bruce Herbold and will be presented to the Coordinators about the end of April.

Long-Term Ecological Research

Wim Kimmerer

Several scientists from Romberg Tiburon Center, Bodega Marine Laboratory, and Stanford University are preparing a proposal to the National Science Foundation for work in the San Francisco estuary. The proposal is in response to an announcement of funds available under the Long-Term Ecological Research (LTER) program specifically for "land-margin" sites. The proposal will probably be focused on unraveling some aspects of the "Fish-X_2" relationships.

If funded, the LTER program for the San Francisco estuary would be an excellent complement to Interagency Program and other scientific activities in the bay for several reasons:

- The LTER program emphasizes monitoring and data management, but this is to be secondary to research. This is the opposite emphasis to that in the Interagency Program, so the two activities could be made complementary by data exchange, participation by certain individuals in both programs, and joint planning of research activities.
- Existing IEP monitoring focuses on the upper estuary, and USGS efforts have concentrated on South Bay. This may suggest an emphasis on Central and San Pablo bays in the LTER program.
- To the extent that IEP monitoring and data management can be used in the LTER program (with appropriate agreement as to ownership of data and authorship of papers), the LTER proposal can be greatly strengthened by a partnership with the Interagency Program.

I will keep the Estuarine Ecology Team and others in the Interagency Program informed about progress of the LTER. I would appreciate any feedback on any aspect of this program.

Neomysis/Zooplankton Study

Jim Orsi

The high flows of January and February pushed most copepods out of the delta and Suisun Bay into Carquinez Strait and out of our sampling area, but freshwater cladocerans were found throughout Suisun Bay and the delta. The most abundant copepod in January-March was *Cyclops*. *Eurytemora* was second. In February, rotifers of the genus *Synchaeta* were abundant in the delta. Samples from Carquinez Strait and San Pablo Bay in March contained moderate numbers of *Acartia* but few *Eurytemora*.

Both *Neomysis* and *Acanthomysis* were rare, but *Neomysis* was more abundant and was most numerous in Suisun Marsh. *Acanthomysis* was most abundant at Martinez.

Delta Smelt

Dale Sweetnam

Monthly midwater trawls to monitor delta smelt distribution were completed in March. With January's high outflows, delta smelt had widespread distribution — from the Napa River to above Hood on the Sacramento River and near Turner Cut on the San Joaquin River. Delta smelt were also collected on the North and South Forks Mokelumne River; Old River near Franks Tract; Grizzly, Honker and Suisun bays; and Miner and Montezuma sloughs.

North Bay Aqueduct larval sampling started February 23, and the information is being posted on the DFG home page (http://www.delta.dfg.ca.gov). No delta smelt larvae have been observed yet, but quite a few longfin smelt larvae have been observed. As of March 27, 14,285 fish larvae had been identified.

Shallow water sampling for delta smelt started in March at five sites: Napa River, Honker Bay, Montezuma Slough at Nurse Slough, Sherman Island, and Cache Slough. The purpose is to determine the use of shallow water by larval delta smelt. A new sampling net and protocols have been designed exclusively for this study. A "push net" boat has been fitted with four egg and larval nets that can be sampled at the same time. Two of the nets are at the surface and two sample about 8 feet deep. The push-net allows samples to be taken in front of the boat so there is no disturbance from the boat as there is with a towed net. Extremely large numbers of larvae have been collected, so laboratory processing will take some time. Also, North Bay Aqueduct and 20mm samples have priority.

The 20mm survey started March 31 and will continue every 2 weeks through July.

Delta smelt in the laboratory culture project have begun to spawn. It appears that their spawning begins when water temperature approaches 14°C.

Juvenile Salmon

Mark Pierce

We suspended trawling at Sacramento for the first three weeks of January due to flooding and high water, then resumed 4 days/week with a midwater trawl substituted for the kodiak trawl until February 14. We collected 33 winter-run-sized and 4 late-fall-run-sized fish. During beach seining along the Sacramento River (below Hamilton City), we collected 83 winter-run-sized fish so far this season, but only 24 of them since December. The Delta Cross Channel gates remained closed for the entire first quarter of 1997.

Trawling at Chipps Island was not as severely affected by the flooding, and delta smelt catches have diminished dramatically since last fall. The floods did delay the second of two releases of CWT late-fall smolts by about 2 weeks. The first release at Miller Park on December 2 was intended to evaluate survival under a low outflow/high export set of conditions; the January release was to evaluate higher outflow/lower export conditions. Survival indices are pending, but raw recovery numbers were unexpectedly

low. A total of 116 winter-run-sized chinook were collected during the quarter at Chipps Island, 72 of which were caught in March.

The early January flooding on the San Joaquin River forced suspension of the kodiak trawl program at Mossdale. High water and unstable levees kept the trawl off the water until March 21, and beach seine access was limited as well. The limited sampling indicates some fairly large smolts are coming out of the San Joaquin basin. Some of these are within or near the winter-run size range based on the size criteria now in use.

Coordination and tagging is ongoing as we near the initiation of delta CWT studies in April. Releases are scheduled at Sacramento as part of the Anadromous Fish Restoration Program and in the southern delta under various export and flow conditions for evaluation of the temporary barrier at the head of Old River.

Delta Resident Fishes

Ken Miller

In 1995, we began biennial monitoring to sample during February, April, June, and August. February 1997 electrofishing at the 20 fixed 1-kilometer-long sites throughout the delta was completed in early March. High flows reduced launching access in several areas and silted in portions of our sampling sites in both forks of the Mokelumne River. Water quality reflected the high flow: Secchi depth averaged 39 cm and specific conductance averaged 219 micromhos — about 41% and 36% lower, respectively, than our February 1995 survey.

We caught 3,173 fish, 82% of which were introduced centrarchids — mostly bluegill, redear sunfish, and largemouth bass. Highest densities of centrarchids were in low-flow channels of one oxbow in the central delta and several dead-end sloughs in eastern delta. We tagged 114 largemouth bass of 200mm fork length to estimate mortality rates.

We captured 42 white catfish at 9 of the 20 sites, compared to a single fish in February 1995. During 1995, white catfish moved into shallow water and became vulnerable to electrofishing as surface temperature increased to 19-23°C in June and August. Water temperature averaged only 13°C in February 1997, so the higher catch of white catfish is not explained by water temperature.

Native fishes made up only 6.6% of the deltawide catch, but represented 80% of the catch from three high-flow riverine sites in the Sacramento River and Steamboat Slough. The most numerous native species there were: lamprey ammocoetes (unknown species) (89), chinook salmon (39), and tule perch (17). Splittail, absent from our February 1995 survey, were captured at both Sacramento River sites, and 9 of 10 fish caught were in the 184-218mm range. These fish are likely from the 1995 year class that was widely distributed in the delta as young-of-the-year in our June 1995 sample.

Salvage Monitoring Program

Scott Barrow

Due to high rainfall in January, outflow was high and water exports were low. Tracy Fish Collection Facility repairs also contributed to low exports. From January 19 to March 24, the primary bypass valves and primary louver panel supports were being repaired, and the CVP pumped on only 2 days.

SWP/CVP fish salvage was down 50-60% compared to last year. Also, delta smelt and winter-run-sized chinook salmon appeared later than in recent years. Delta smelt were first observed on February 20 at the CVP and February 27 at the SWP. The first winter-run-sized chinook salmon were observed on March 8 at the CVP and March 9 at the SWP. No CWT chinook salmon have been observed at either facility since December 16, 1996.

North Bay Aqueduct

Dale Sweetnam

The 1997 larval entrainment monitoring began February 23. Four stations in Barker and Lindsey sloughs are sampled every other day with a sled-mounted plankton net. Another four stations in Cache and Miner sloughs are sampled every fourth day. Sampling is scheduled to continue through mid-July. Results from the three stations closest to the North Bay Aqueduct pumping station are posted on the IEP home page, and larval delta smelt density in Barker Slough and surrounding areas are scheduled to be posted on the web on a recent-time basis (within 72 hours of sampling).

Through March 11, a total of 9,149 larvae had been collected and identified, of which 96.9% were prickly sculpin and 2.6% were longfin smelt. No delta smelt larvae had been collected at any of the stations. One wakasagi was collected at station 718 (Lindsey Slough) on February 23. One juvenile salmon and one sturgeon prolarvae were collected at station 726 (Miner Slough) on February 23.

Contra Costa Canal Intake Entrainment

Jerry Morinaka

Every fourth day during January, we used a sieve-net to sample fish entrainment at the Contra Costa Canal (discharge side of Pumping Plant 1). The predominant fish species captured was threadfin shad (mean fork length = 60mm). No chinook salmon, delta smelt, longfin smelt, or splittail were captured.

In February, we increased the frequency of sieve-net sampling to every other day. However, on February 6, the Contra Costa Monitoring Group decided to discontinue sampling at Pumping Plant 1 and shift the sampling program to the headworks area of the Contra Costa Canal (future site of the fish screens), where delta water is first diverted from Rock Slough. A study plan being developed for the new location will include biological monitoring to evaluate performance of the fish screens.

Mallard Slough Monitoring

Jerry Morinaka

Fishery monitoring in the intake channel of the Mallard Slough pumping plant and outside the channel in the Sacramento River (Suisun Bay) was conducted once on January 30 and once on March 5, using tows with an egg/larval net and a modified tow-net. Due to boat availability and adverse weather, we did not sample in February. Prickly sculpin was the predominant species captured at both sites on January 30. One chinook salmon (38mm) was captured in the egg/larval net and one delta smelt (59mm) was captured in the tow-net; both were captured in the intake channel. The only two species captured in the egg/larval net on March 5 were longfin smelt and prickly sculpin; both species were captured at both sites but were more abundant in Suisun Bay. Only one longfin smelt was captured in the tow-net in Suisun Bay. We have discontinued monitoring near the Mallard Slough diversion because the pumping plant was shut down in early March.

A new study plan being developed will sample actual entrainment at the Mallard Slough pumping plant. The current sampling program monitors only the relative abundance of fish species near the diversion. Future sampling will use a bypass valve and an overflow structure downstream of the pumping plant. A sampling net positioned at the overflow structure will filter up to 30% of the water being diverted through the pumping plant. Monitoring will focus on entrainment of winter-run chinook salmon and delta smelt.

Suisun Ecological Work Group

Eliza Sater

In February the Suisun Ecological Work Group began meeting monthly. The focus of recent meetings has been on work being done by the five subcommittees, which is still in the data-gathering and review stage. The Brackish Emergent Marsh Vegetation subcommittee is completing field studies to determine the distribution and abundance of sensitive plant species. The Waterfowl subcommittee is estimating waterfowl abundance and nesting densities; determining salinity tolerance ranges for waterfowl food plants; and examining the relationship between channel, pond, and soil water salinity. The Wildlife subcommittee is evaluating habitat needs of certain wildlife species and has identified a number of areas for research. The Aquatic Habitat subcommittee is reviewing the literature to determine salinity tolerance ranges for certain fish species and is also reviewing the findings of the UC-Davis Fisheries Monitoring Program. This subcommittee will begin working with the UC-Davis database to examine the relationship between water year type, salinity, and fish abundance in Suisun Marsh. The Water Quality and Hydrology subcommittee is completing modeling studies for the Suisun Marsh Preservation Agreement. Modeling results are being made available to the other SEW subcommittees.

For more information, contact Eliza Sater (916/227-0179 or esater@water.ca.gov).

STAFF CHANGES AT ESO

People have been coming and going recently at DWR's Environmental Services Office. In January, Leo Winternitz moved from his position as head of the Interagency Program Section to accept a promotion to Chief of the Monitoring and Analysis Branch. Zach Hymanson returned to ESO from the California Coastal Commission in March to fill the vacancy in the Interagency Program Section created by Leo's move. Also in March, Bellory Fong, Chief of the Environmental Compliance and Review Branch, accepted a limited-term assignment in the CALFED Program. Dale Hoffman-Floerke has been named Bellory's successor. And finally, Earle Cummings from DWR's Division of Local Assistance began work at ESO in April as DWR's wetland coordinator.