

CALFED Bay-Delta Program

Science Program Program Plan Year 8 (State FY 2007-2008; Federal FY 2008)

Implementing Agencies:

Science Program: Resources Agency/CALFED Bay-Delta Program

IEP: California Department of Fish and Game, California Department of Water Resources, California State Water Resources Control Board, U.S. Bureau of Reclamation, U.S. Fish and Wildlife Service, U.S. Geological Survey, National Marine Fisheries Service, U.S. Army Corps of Engineers, U.S. Environmental Protection Agency

April 20, 2007

Introduction

This Science Program Program Plan identifies the CALFED Program activities that are scheduled to be completed during State Fiscal Year (FY) 2007-2008 and Federal FY 2008 (July 1, 2007 and September 30, 2008). The Plan also describes the accomplishments made during the previous year.

Priorities

As described in the Record of Decision (ROD), it is expected that the Science Program will develop and provide the best scientific information possible to guide decisions regarding CALFED actions and to evaluate the results of the implemented actions in an open and transparent process. Under the leadership of the Lead Scientist, the Science Program designs an organizational strategy for implementing the broad program objectives that includes suites of actions and program-specific activities that both inform current priority management needs and sustain science integration over the long-term.

In Year 8 (FY 07/08), the Science Program's focus will be on priorities identified in the CALFED Bay-Delta Program 10 Year Action Plan and actions that will inform critical activities including the End of Stage 1 decisions, Delta Vision, Delta Risk Management Strategy (DRMS), and Bay-Delta Conservation Plan (BDCP). The priority activities for Year 8 are:

- Developing a *State of Science for the Bay-Delta System* report that will compile, synthesize and communicate the current scientific understanding of Bay-Delta system. The first edition will focus on the science most relevant to the upcoming CALFED Program End of Stage 1 decisions and the Delta Visioning process.
- Increasing efforts on information synthesis and communication of scientific understanding to the CALFED community through specific targeted products such as the San Francisco Estuary and Watershed Science, an open access, peer-reviewed journal that publishes research about the science and resource management of San Francisco Bay, the Sacramento-San Joaquin Delta, and the upstream watersheds.
- Communicating science to the spectrum of CALFED audiences with specific targeted products.
- Providing staff and resource support for the CALFED Independent Science Board.
- Providing support for End of Stage 1 decisions through programmatic reviews such as Environmental Water Account (EWA) Review, Delta Risk Management Strategy (DRMS) Reviews, and supporting End of Stage 1 assessments of Drinking Water Quality and Ecosystem Restoration Programs.
- Continuing performance measures and indicators development in collaboration with implementing agency representatives.
- Continuing to invest in priority scientific information needs through program's Proposal Solicitation Package and providing support to increase data analyses of existing monitoring data sets through the CALFED Science Fellows program.
- Supporting ongoing scientific research, projects, and programs across the CALFED Bay-Delta Program by identifying and providing technical expert advisors.

Accomplishments

The Science Program has continued to support and participate in an intensive effort to improve understanding of the Bay-Delta system, as well as improve the application of science throughout the CALFED Program. The activities identified in the Accomplishments section below are part of a long-term strategy to meet the program's objectives while maintaining the ability to respond to unforeseen critical issues facing the CALFED Program. For example, continued investment to increase our understanding of the Bay-Delta system through competitive research grants and CALFED Science Fellows not only yields information to inform pressing questions on Delta ecosystem sustainability with current water operations practices, but also provides the foundation that will support sound resource management decisions over the long-term.

TASK: Communication of Scientific Understanding

- ***State of Science for the Bay-Delta System.*** The Science Program began the development of the *State of Science for the Bay-Delta System*, an effort to compile, synthesize and communicate the current scientific understanding of Bay-Delta ecosystem. Under direction of the Lead Scientist, an Editorial Board has been named and chapter authors are being contacted. Progress on the report will be presented to the ISB for comment in June 2007 and a final draft for review will be presented for comment to the ISB in November 2007. A first edition of the report will be completed by December 2007.
- ***Science News.*** Monthly editions of Science News were developed and emailed to a wide audience beginning in February 2007. *Science News* highlights happenings of the CALFED Science Program and related activities.
- ***Online journal.*** Four issues of the online, peer-reviewed journal, San Francisco Estuary and Watershed Science, were published in Year 7 of the Program. The journal is publicly accessible (<http://repositories.cdlib.org/jmie/sfews/>) and covers topics relevant to resource management questions. A companion service to the peer-reviewed electronic journal is San Francisco Estuary and Watershed Archive (<http://www.estuaryarchive.org/archive/>). The Archive is intended to provide electronic access to legacy documents, including: historical accounts and surveys; project, planning and strategic reports; and non-peer-reviewed environmental information resources. An initial focus of the Archive is to digitize, index, and post historically important collections of papers and books that are now out of print.
- ***Website.*** The Science Program uses its website as the primary tool to inform the public on all program products and activities. The website has a wide range of resources including links to the technical panel and workshops, Independent Science Board, and PSP information (<http://science.calwater.ca.gov/index.shtml>).
- ***Bay-Delta Science Seminar series.*** The Science Program has supported speakers for individual seminars on topics relevant to the CALFED Program. In the fall of 2005, the program created a formal quarterly seminar series program in collaboration with

University of California, Davis, Center for Aquatic Biology and Aquaculture. The series provides the most current topical information or new perspectives on resource management and water operations to agency scientists and resource managers.

- ***CALFED Science Conference 2006.*** The 4th Biennial CALFED Science Conference was held October 23-25, 2006 at the Sacramento Convention Center. The conference, centered around the theme “Making Sense of Complexity: Science in a Changing Environment”, was a great success with 1200 attendees involved, three days of oral presentations and over 180 poster presentations. High priority issues addressed were Pelagic Organism Decline, Mercury, Invasive Species, Climate Change, and Wetland Restoration. Brief 3-5 bullet summaries of the main issues and lessons learned from each presentation, “Presentations at a Glance,” will be posted on the Science Conference website in spring 2007.
- ***National Conference on Ecosystem Restoration.*** Several Science Program staff members are presenting talks or posters or facilitating sessions for the second National Conference on Ecosystem Restoration (NCER) to be held in Kansas City, Missouri April 23-27, 2007. The NCER is a forum for physical, biological, and social scientists, engineers, resource managers, planners and policy-makers to share their knowledge and research results concerning ecosystem restoration throughout the United States. Several multi-scale ecosystem restoration programs (e.g., Missouri River, Great Lakes, Everglades, CALFED Bay-Delta, Chesapeake Bay Columbia River, Louisiana Coastal Area, Puget Sound, Mississippi River) will be highlighting what has contributed to success, as well as lessons learned from these programs. The roles of policy, planning and science in establishing goals and performance expectations for achieving successful and sustainable ecosystem restoration will be explored. Deputy Director Ron Ott served on the conference planning committee.

TASK: Investment in Priority Scientific Information Needs

- ***Proposal Solicitation Package (PSP) Process***
 - **2006 Focused PSP.** The PSP, released June 2006, received approximately 35 proposals in 4 tightly focused research topics:
 - Environmental water
 - Aquatic invasive (exotic) species
 - Trends and patterns of population and system response to a changing environment
 - Habitat availability and response to change.

The Technical Synthesis Panel recommendations for \$6 million in funding were presented to the California Bay-Delta Authority at their December 14, 2006 meeting. The Authority recommended funding these projects to the Secretary of Resources, who recently approved those recommendations. Principal investigators have been notified and work has begun on grant agreements. For more information on the PSP process, priority topics, and

proposal information, please visit:

http://science.calwater.ca.gov/psp/psp_package_2006.shtml

- ***CALFED Science Fellows***

- **2006 CALFED Science Fellows solicitation.** The program selected 2 pre-doctoral and 8 post-doctoral fellow projects from the 2006 solicitation. The solicitation requested applications for projects addressing the priority topics identified in the 2006 Science Program PSP as well as agency-identified targeted questions for EWA, drinking water quality, and pelagic organism decline (POD). For additional information on the CALFED Science Fellows Program visit:
<http://www.csgc.ucsd.edu/EDUCATION/CALFED/CALFEDIndx.html>

- ***California Sea Grant State Fellows Program***

- The CALFED Science Program is hosting a California Sea Grant State Fellow, Dorian Fougères, who is examining how science is being applied and integrated into decision making processes such as Delta Vision. This program provides a unique educational opportunity for graduate students who are interested both in environmental resources and in the policy decisions affecting those resources. The program matches highly motivated and qualified graduate students with "hosts" in the California State agencies for a 9-month paid fellowship in Sacramento.

- ***Delta Regional Ecosystem Restoration Implementation Plan***

The Delta Regional Ecosystem Restoration Implementation Plan (DRERIP), being developed by the CALFED Ecosystem Restoration Program (ERP) implementing agencies, is one of four regional plans intended to guide the implementation of the ERP. The DRERIP process is fulfilling a component of the adaptive management approach by including the latest scientific information on how the system works, including developing species life history and ecosystem conceptual models that articulate our knowledge of the system and scientifically evaluating restoration actions. These conceptual models and scientific evaluation process are useful tools for other current Delta planning activities such as the Bay-Delta Conservation Plan and Delta Vision. The Science Program is supporting the scientific input element of this ERP effort through membership of the Science Program Manager on the Adaptive Management Planning Team which oversees the effort, assigning a staff person to coordinate scientific input components with California Department of Fish and Game and other ERP agency staff, and contributions from several Science Program staff members to conceptual model development.

TASK: Performance Evaluation of CALFED Programs

- ***Technical review panels and peer review***

Outside scientific advice and review play critical roles in evaluation of CALFED program elements and are crucial components of making science open and accountable. The Science Program has applied peer review at several levels: proposal review, priority topics, and programs. Over the past year, the program has focused most of its peer review efforts in support of independent technical panels in response to emerging priority issues.

- **Environmental Water Account (EWA):** A review of the EWA was held in the CALFED Bay Delta Program offices in Sacramento, November 28-30, 2006. Previous reviews addressed primarily program implementation—how was acquired water used for target species. The 2006 Review also addressed the key question of biological effectiveness. Specific elements of the review included the contribution of the EWA and other environmental water programs to protecting and restoring Delta smelt, Chinook salmon, and steelhead in the San Francisco estuary and watershed, developing plans for science needs and water allocation priorities for EWA Year 7, and identifying science components and water allocation strategies for a possible future environmental water program. The Review Panel also reviewed the Resources Agency Action Matrix: a proposed set of actions for modified water project operations intended to improve conditions for pelagic organisms, including delta smelt. The Panel report was distributed in January 2007 and a Science Program/EWA Implementing Agency response is anticipated by April 2007. The Independent Science Board will review the report and response in June 2007. For more information on EWA and the review, see the EWA Workshops webpage: <http://science.calwater.ca.gov/workshop/ewa.shtml>.
- **Delta Risk Management Strategy (DRMS).** The Science Program is coordinating an Independent Review Panel (IRP) for the Phase 1 and Phase 2 DRMS products. An informational meeting was held for the IRP in March 2007. The Phase 1 and Phase 2 reports are targeted for review in June and September 2007, respectively. The Independent Science Board will review the IRP reports and DRMS responses.

- ***Indicators and performance measures development***

The Science Program is collaborating with implementing agency and CALFED Program Performance and Tracking staff on several inter-related efforts to develop performance measures. Working with implementing agency staff, the Science Program developed a framework in FY05/06 that will provide guidance for consistent indicator and performance measure development for the CALFED Bay-Delta Program. In response to the 10-Year Action Plan, the CALFED agencies formed a subcommittee to direct the development of indicators and performance measures related to the Program objectives and actions. The subcommittee formed four subgroups, one for each of the four CALFED objectives: water supply reliability, water quality, ecosystem restoration, and levee system integrity. The subgroups are

using a phased approach to develop prospective indicators and performance measures starting in Phase 1 with a detailed plan and schedule to complete performance measure development for an initial set of indicators. The subgroups released a draft Phase 1 Report in fall 2006 and will present a final draft to the ISB, BDPAC and the Authority in June 2007. The ISB is receiving regular performance measure updates since a specific charge to the ISB is to approve performance measures from a scientific perspective. In fall 2006, ISB liaisons were assigned to each of the four subgroups to help them with performance measure development.

A retrospective performance assessment of Stage 1 implementation of the CALFED Bay-Delta Program has been prepared by the BDPAC Performance and Financing Subcommittee working with the CALFED Program Performance and Tracking Program staff. It is expected that this report will become part of the CALFED End of Stage 1 report.

TASK: Application of Scientific Practices

- ***Independent Science Board (ISB).*** The Authority passed a resolution on June 15, 2006 to establish a new, reconstituted ISB as nominated by the Lead Scientist. The Board of twelve distinguished scientists and engineers had its first meeting August 14-15, 2006 in Sacramento and is meeting on a quarterly basis. Meeting materials and outcomes can be found at http://science.calwater.ca.gov/sci_tools/isb.shtml

TASK: Program Planning/Reporting/Administration

- ***Lead Scientist recruitment.*** Michael Healey was recommended as Lead Scientist by the Authority and approved by Secretary Chrisman as of January 2007. He will serve a one-year term. His focus for the Science Program is setting priorities and developing a vision and strategic plan.
- ***Program planning and reporting.*** The Science Program has developed annual plans as part of the over all CALFED planning process. The FY06/07 plans were approved by the Authority in December 2006. The program also produced a Science section for the 2007 CALFED Annual Report. In addition to the program plans and annual reports, the Lead Scientist and staff have provided regular updates on program activities and relevant issues through staff reports and presentations to the ISB, Authority and BDPAC.
- ***Tracking database.***
The Science Program is developing a project tracking database to help track deliverables and progress on research grants, and to support evaluations of progress toward program goals and objectives. The first objective in this effort was to populate the databases with current research information so that Science Program staff can query the database to update and track different aspects of the research they oversee. This activity is about 90% complete.

TASK: Coordination with the Interagency Ecological Program (IEP)

The Science Program has made marked progress in improving communication and coordination with the IEP Directors, Coordinators, and staff. Science has identified a

dedicated staff person to act as liaison between the two programs and to facilitate and coordinate recent efforts to address the Pelagic Organism Decline (POD). This effort resulted in a revised 2007 IEP POD workplan with the intent to produce an updated IEP POD synthesis report in fall 2007. The IEP coordinators and directors are now assessing a proposal by the Science Program that there be an IEP lead scientist housed in the Science Program to guide the scientific direction of IEP.

Activities

The following section describes the major projects and activities planned by the Science Program for the next fiscal year (07/08) to address program goals and to meet ROD objectives along with priorities identified in the CALFED Bay-Delta Program 10-Year Action Plan. The Science Program's strategy will be to focus intensively on specific areas to inform critical activities including the End of Stage 1 decisions, Delta Vision, Delta Risk Management Strategy (DRMS), and Bay-Delta Conservation Plan (BDCP), while designing and implementing practices that will support science integration over the long-term.

TASK: Communication of Scientific Understanding

Communication of current scientific understanding and new technical information is a top priority of the Science Program and a key component of science-based adaptive management.

- ***State of Science for the Bay-Delta System.*** The Science Program is undertaking an extensive effort to compile, synthesize and communicate the current scientific understanding of Bay-Delta ecosystem. The first product of this effort, *State of Science for the Bay Delta System (SOSBDS)*, is slated to be completed in December 2007. The SOSBDS is expected to become an ongoing, iterative synthesis, with periodic updates and content that evolves with the evolving issues in the Delta. The first edition will focus on the science most relevant to the upcoming CALFED Program End of Stage 1 decisions and the Delta Visioning process. The report will incorporate the most current understanding of system structure and function, of Bay-Delta system services, of drivers or demands on these services, and of how management actions have influenced both services and the system as a whole. The goal is to have the report be recognized as the most authoritative assessment of Bay-Delta science.
- ***Website.*** In addition to continued updates of key Science Program information, staff will begin implementing a new strategy to increase effectiveness of information transfer through the website (<http://science.calwater.ca.gov/index.shtml>). [Should we add something about the updated CALFED interface here?]
- ***Online journal.*** The Science Program is currently working to transfer management of the online, peer-reviewed journal, San Francisco Estuary and Watershed Science and the companion online Archive to the University of California, Davis' John Muir Institute. The Program determined that it would improve journal production efficiency and perception of independence to move management of SFEWS to a single academic entity.
- ***Bay-Delta seminar series.*** The Science Program is sponsoring a formal quarterly seminar series in collaboration with the University of California, Davis, Center for Aquatic Biology and Aquaculture. The series provides the most current topical information or new perspectives on resource management and water operations to agency scientists, resource managers and university researchers.

- ***State of Estuary Conference.*** With the San Francisco Estuary Program and others, the Science Program is co-sponsoring the Biennial State of the Estuary Conference to be held in at the Scottish Rite Center, Oakland, CA, on October 16–18, 2007. The State of the Estuary Conference provides a biennial assessment of the ecological health of the San Francisco Bay-Delta Estuary. This conference brings the latest information about the estuary’s changing watersheds, impacts from major stressors, recovery programs for species and habitats, and emerging issues to scientists, resource managers, stakeholders, and decision makers.
- ***Other communication products.*** The Communications Team is evaluating a communications strategy developed for the Science Program that identifies target audiences and communications products used by the Science Program. It recommends strategies for improving communication of scientific information. The team is now identifying next steps and products for the Program. One of the first products that has been re-started is a monthly electronic newsletter *Science News*.

TASK: Investment in Priority Scientific Information Needs

- ***Proposal Solicitation Process***
 - The Science Program has requested approximately \$10 million in the FY07/08 budget for a focused proposal solicitation to be released in late summer or fall 2007, pending budget approval. Under the guidance of the Lead Scientist and ISB, staff will work to identify priority topics and develop the 2007 solicitation package using the focused process used in 2006. Dedicated program staff will oversee and coordinate solicitation process, including peer review of proposals, convening a technical panel for proposal selection and grant making. It is expected that the projects selected in this solicitation will be able to commence work by mid 2008.
- ***CALFED Science Fellows Program***
 - The Science Program is conducting a new round of granting funds to postdoctoral and graduate researchers to target agency research priorities and data analyses gaps. Approximately \$2M will be awarded to about eight Fellow projects by November 2007.
 - The Science Fellows Program is requesting research proposals addressing either (1) the four priority topics outlined in last year’s CALFED Science Program Proposal Solicitation Package (environmental water, aquatic invasive (exotic) species, trends and patterns of populations and system response to a changing environment, habitat availability and response to change) or (2) specific CALFED implementing agency science needs (Environmental Water Account, pelagic organism decline, systems modeling, indicators and performance measures).

TASK: Performance Evaluation of CALFED Programs

- ***Technical Review Panels and Workshops.*** The Science Program will continue to convene Technical Review Panels and issue workshops as specific needs are

identified by the Lead Scientist, the CALFED Program managers or implementing agencies. The Program's focus will be reviews and program evaluations that will inform End of Stage 1 decisions at the end of 2007. Proposed activities for the upcoming year include:

- Review of Delta Risk Management Strategy (DRMS) (Spring 2007-Fall 2007)
 - Workshops in response to the November 2006 Review of the Environmental Water Account (FY07/08)
 - Review of Performance Measures Framework (Fall/Winter 2007)
 - Review of Delta Conveyance modeling and research activities (Summer 2007)
 - Supporting assessments of water quality and ecosystem restoration programs.
- ***Coordinate indicators and performance measures development*** The Science Program will continue to work with the CALFED Program Performance and Tracking staff to coordinate the development of prospective performance measures for the CALFED Program in collaboration with the implementing agency Performance Measures subcommittee and subgroups. The subgroups report to the Performance Measure subcommittee, and are performing the bulk of the indicator and performance measure development effort. Science Program staff will work with subgroup members to foster integration and linkages across Program objectives in the larger Performance Measure subcommittee. The subgroups will begin Phase 2, implementation of the Phase 1 plan, upon review and approval of the Phase 1 Report, expected in June 2007. Science Program staff will work with CALFED Program Performance and Tracking staff to help the implementing agencies identify aggregate performance measures similar to those used in the retrospective program assessment to better inform policymakers and the public of CALFED Program performance.
 - ***Coordinate performance measure, monitoring and assessment activities.*** There are numerous performance measure, monitoring, assessment and research activities in the Bay-Delta, some under the auspices of the CALFED Program and others that are part of local, regional or other programs. The Science Program is currently working with several Bay-Delta system experts to develop a strategic plan for CALFED Program monitoring and assessment that will be fully integrated with the performance measure effort. The approach will evaluate existing efforts, identify gaps in monitoring and assessment and recommend priority items for implementation. The Science Program will coordinate the plan development with the CALFED implementing agencies.
 - ***Science integration.*** Coordination of activities is one of the main tools for increasing science integration throughout the CALFED Program. The Science Program will continue to dedicate staff resources to help coordinate science efforts in other programs. Examples of these programs include IEP, EWA, Conveyance, Water Quality, and DRMS. In Year 8, Science Program also plans on expanding its use of Science Advisors. The advisors will be subject matter experts who will work with Science Program staff to support the Delta Vision advisors (the CALFED Lead Scientist and ISB chair) and to provide advice and technical support to implementing agencies in dealing with complex resource and system management problems.

TASK: Application of Scientific Practices

- ***Independent Science Board (ISB)***. The ISB is a key component in ensuring continuous advancement of credible scientific information for guiding management decisions in the CALFED Program. ISB activities include addressing priority issues such as evaluation of programs and projects to aid in End of Stage 1 decisions, providing technical oversight and review for the State of Science of the Bay-Delta System report, performance measures, assuring science is used in all programs, and helping to select a new Lead Scientist. The ISB meets quarterly or more often as needed. The ISB Chair provides updates on Board activities to the Authority and BDPAC. ISB liaisons have been identified for many of the high priority activities listed above. For more information on ISB activities, charge, and products, please visit: http://science.calwater.ca.gov/sci_tools/isb.shtml

TASK: Program Planning/Reporting/Administration

- ***Lead Scientist recruitment***. The current Lead Scientist, Dr. Michael Healey, will be leaving in January 2007. A Lead Scientist search process is currently underway, starting with recruitment of interested, qualified candidates by the ISB. The goal is to have a new Lead Scientist in place by the time Dr. Healey's term expires, including review of candidates by a Selection Committee, recommendations by the Committee to the ISB and CALFED Director, recommendations to the Authority and Resources Agency, and appointment by the Resources Secretary. Discussions are occurring on how to make the position more attractive in hopes of attracting more of qualified, high stature candidates.
- ***Tracking database***. The Science Program is developing a database to help track deliverables, progress on research project, and support evaluations of progress toward stated goals and objectives. The long-term vision is to link the Science Program database with GIS applications, and integrate with CALFED-wide program tracking database.

TASK: Coordination with the Interagency Ecological Program (IEP)

The Science Program and IEP staff will continue to work to more clearly define their relationship and coordinate their activities. The IEP Directors are currently evaluating a proposal to have both an IEP Program Manager and IEP Lead Scientist. The IEP Lead Scientist would report to the CALFED Lead Scientist and work closely with the IEP Program Manager. If approved by the IEP Directors, the IEP Lead Scientist would be hired in Year 8, helping to improve coordination between the CALFED Science Program and IEP. Until a decision is made, the CALFED Science Program will continue to participate with IEP through representation on the IEP Coordinators and POD Management Team. Coordination between the Science Program and IEP will include developing plans for comprehensive monitoring, proposal solicitations, data analysis and synthesis; including addressing POD related issues. The IEP and Science Program will also coordinate other ongoing multidisciplinary studies, monitoring program review and transformation of monitoring program information into knowledge. The Science Program will support IEP programmatic reviews via Technical Panels, new investments in research and analysis via proposal solicitation, and focused technical expertise via

recruitment of Science Advisors and Science Fellows. A biennial work plan synthesis report is planned for IEP POD activities in fall 2007.

Funding

CALFED Science Program (\$ in millions)	Yr 7	Total
CALFED Science Program	\$	\$
Investment in Priority Scientific Information Needs	6.00	6.00
Communication of Scientific Understanding	2.41	2.41
Performance Evaluation of CALFED Programs	3.05	3.05
Applications of Scientific Practices	0.85	0.85
Program Planning/ Reporting/ Administration	2.07	2.07
Total Available Funding	\$14.38	\$14.38

CALFED Science Program (\$ in millions)	Yr 7	Total
State	13.68	13.68
Federal	.70	.70
Available Funding Total	\$14.38	\$14.38

Attachment I: Interagency Ecological Program Plan

Goals and Objectives

The mission of the Interagency Ecological Program (IEP) is, in collaboration with others, to provide ecological information and scientific leadership for use in management of the San Francisco Estuary.

The long-term goals and objectives of IEP are to fulfill its mission by:

- (1) describing the status and trends of aquatic ecological factors in the estuary;
- (2) developing an understanding of environmental factors that influence observed aquatic ecological status and trends;
- (3) using knowledge of the previous information in a collaborative process to support natural resource planning, management, and regulatory activities in the estuary;
- (4) continually reassessing and enhancing long-term monitoring and research activities that demonstrate scientific excellence;
- (5) providing scientific information about the estuary that is accurate, accessible, reliable, and timely; and
- (6) responding to management needs in a timely fashion.

In the next five years, the IEP objectives are to:

- (1) complete its monitoring and special study program elements;
- (2) conduct a technical review of IEP's particle tracking model (DSM2);
- (3) provide near-real time data for use in water operations management, and continue providing data from the sampling programs to the public, via website access or personal requests;
- (4) report the abundance and distribution of numerous estuarine organisms in the annual Status and Trends issue of the IEP Newsletter; and
- (5) in collaboration with the Science Program, develop a plan for implementation of a comprehensive monitoring and assessment program.

Accomplishments

In 2006, the IEP continued its long-term monitoring studies, as well as all of its on-going special studies and initiated new POD related studies. IEP technical staff participated in several forums to share information about the estuary and its living resources, including IEP and Science Program sponsored workshops, Environmental Water Account (EWA) workshops, agency meetings on new biological opinions for the CVP/SWP operations, the CALFED Science Conference, the State Water Resources Control Board water quality control plan workshops and other professional conferences. IEP continued to upload its data sets to the Bay Delta and Tributaries website (BDAT, <http://bdat.ca.gov/>) and the California Department of Fish and Game website (<http://www.delta.dfg.ca.gov/>). Two IEP monitoring programs also provided near-real-time data on delta smelt abundance and distribution needed to make day-to-day water operations decisions during Data Assessment Team (DAT) conference calls and Water Operations Management Team (WOMT) meetings. The status and trends of fish, shrimp, crabs, zooplankton and phytoplankton as well as water quality parameters were reported in the annual Status and Trends issue of the IEP Newsletter. Several journal articles and peer-review technical reports were completed for specific studies. The latest bibliography of IEP publications can be found at http://www.iep.ca.gov/report/iep_bibliography.html.

The Interagency Ecological Program's commitment to collaborative work of direct relevance to CALFED program issues is demonstrated by short-term special studies that provide mechanistic understandings of the physical, chemical, biological, and ecological processes. Two on-going undertakings in 2006 that demonstrate this are the Yolo bypass fish monitoring study and the Hydrodynamics studies in the Delta. The Yolo bypass study collects baseline data on lower trophic levels, fish, hydrology, and physical conditions; examines fish community trends; determines whether managed seasonal flooding supports splittail and food web production; and evaluates potential effects of pesticides. The Hydrodynamics study collects data at a variety of locations that are suspected to be significant transport pathways to the export facilities. Data is analyzed with respect to the influence of pumps on transport of water and salt. Accomplishments for the major categories of IEP activities are summarized below.

Mandated Monitoring

Mandated monitoring includes those IEP monitoring program elements required through regulatory processes (e.g., SWP and CVP water right decision or biological opinions for SWP and CVP operations). Monitoring programs under this category include the Fall midwater trawl survey, 20 mm survey, Delta smelt larva survey, Summer townet survey, Spring Kodiak trawl, Upper estuary zooplankton/neomysid monitoring, Juvenile Chinook salmon monitoring at Knights Landing, Juvenile salmonid monitoring at Mill and Deer creeks, Bay salinity monitoring, Estuarine and marine fish, Shrimp and macro-invertebrate study, Delta juvenile fishes survey and the Environmental monitoring program. Annual accomplishments include the successful completion of all mandated monitoring programs, data processing, quality assurance, posting of all monitoring data, data analyses, index computation, and annual reporting of status and trends. The IEP also

reported data from key monitoring programs on a near-real-time basis to aid in EWA decisions.

Water Operations Monitoring

Water operations monitoring includes those IEP monitoring program elements that generate data and information used in managing SWP and CVP water project operations. Reservoir releases, Delta export levels, and operation of the Delta cross channel gates are all part of water project operations. Monitoring programs under this category include Delta flow and water temperature monitoring and database management, Sacramento and Chipps Island fish trawl surveys, SWP and CVP fish salvage programs. Annual accomplishments include the successful completion of all monitoring programs. Successful near-real time reporting of data on water conditions (e.g., flows and temperature) and fish distributions to the Data Assessment Team (DAT) and Water Operations Management Team (WOMT) for use in managing water project operations.

Fish and macro-invertebrate monitoring

IEP programs under this category include monitoring to determine the abundance and distribution of bay shrimp and crabs, and mitten crab monitoring and reporting. Annual accomplishments include the successful completion of all monitoring programs, data analyses, and annual reporting of status and trends.

Salmonid migration and survival studies

This category of IEP activities includes genetic studies that help identify races (e.g., winter-run, spring-run, or fall-run) of emigrating Chinook salmon captured at various locations in the system. In addition, there are several projects that mark and recapture young salmon to determine survival rates over various stages of their life cycle. Data and information from these studies is used to evaluate the effectiveness of various actions occurring under the Environmental Water Account program and the Vernalis Adaptive Management Plan. These studies also provide baseline life history information of wild and hatchery steelhead collected at the CVP and SWP salvage facilities and provides data to determine if environmental differences can be detected when the two groups are entrained.

Studies of Ecological Processes

These studies are aimed at increasing our understanding of how water flow and circulation affect the estuary environment and its living resources. Studies under this category include development of a 3-dimensional hydrodynamic model, use of a particle-tracking model to understand how SWP and CVP exports may affect the distribution and entrainment of young fishes, and detailed modeling studies to determine how water flows and Delta cross channel operations may affect the distribution of young salmon emigrating from the Sacramento River watershed. The IEP is also completing studies to define and better understand predator-prey dynamics of fishes inhabiting near-shore habitats in the Delta. All of these studies are in-progress.

Fish Facilities Studies

IEP efforts under this category include studies to investigate the use of new technologies and release site alterations that can improve survival of fish released as part of the collection, handling, trucking and release phases of the fish salvage process. IEP scientists also collaborate with researchers conducting studies of fish salvage dynamics at

the CVP facilities, including peer-reviews of proposals, technical reports and articles. All of these studies are in-progress.

Habitat Restoration Studies

Over the years, the IEP has offered technical assistance in the development, review, and monitoring of various projects to restore aquatic habitats in the San Francisco Estuary.

Pelagic Organism Decline Studies

In response to IEP abundance indices showing marked declines of four pelagic species, a large multidisciplinary effort, the Pelagic Organism Decline, continued. A few of the major studies initiated in 2006 include Acute and chronic invertebrate and fish toxicity tests, Striped bass health investigations, Analysis of threadfin shad population dynamics, and Estimations of pelagic fish population sizes. The POD Management team focused on refining the matrix and narrative conceptual models developed in 2005. The matrix conceptual models examined which stressors (entrainment at water intake facilities, toxic effects on fish, toxic effects on fish food organisms, harmful algal blooms, effects of the invasive clam *Corbula* on food availability, and disease and parasites) were most likely to be important, while the narrative models focused on linkages among different stressors and their possible pathways to produce the observed declines of more than one species.

IEP Program Management and Communication

As with any large, multidisciplinary program, a portion of the IEP effort goes to ongoing program management and planning. Activities under this category include development and approval of the annual IEP work plan, ongoing management during implementation, program element reviews, IEP database and website management, support for the IEP Newsletter and annual science meeting, and support of the external Science Advisory Group (SAG). Accomplishments in 2006 include successful implementation of the program, development of the 2007 work plan and budget, publication of the quarterly IEP Newsletter, completion of the annual IEP workshop and continued functionality of the public database and website.

Activities

The Interagency Ecological Program has been comprised of long-term monitoring, water operations monitoring and special studies. As mentioned previously, the special studies component has been cut back due to funding constraints; monitoring studies will be impacted as well if more funding is not identified. Major activities in the future will be dependent on how these funding issues are resolved. The IEP is committed to conducting the mandated monitoring studies required by NOAA Fisheries and FWS biological opinions and SWRCB Water Rights Decision D-1641. There is also a commitment to continue providing the “real-time” data needed to make water operation decisions. If additional funding is available, special studies will be solicited, evaluated, selected and implemented.

Recent concerns of low abundance indices calculated from the IEP monitoring studies for several pelagic fishes in the Sacramento-San Joaquin Delta and zooplankton prompted IEP to develop a “Pelagic Organism Decline (POD)” work plan. The work plan delineates expansion of existing IEP monitoring studies, analyses of existing data, new studies, and ongoing studies that will investigate whether there is a new threat to pelagic fish and their prey, and if so, what has caused it.

Following are the major tasks the IEP plans for 2007 and out-going years.

Monitoring

IEP monitoring activities focus on aquatic habitats and living resources in the San Francisco Estuary, Sacramento River, and San Joaquin River. Monitoring activities address all of the goals and objectives established for IEP. Monitoring activities are:

- Hydrodynamics monitoring
- Environmental monitoring
- Fish and macro invertebrates monitoring
- Water operations monitoring
- Estuarine monitoring

Special Studies

The IEP special studies component provides mechanistic understanding of the physical, chemical and ecological processes and evaluates current and new technology, sampling methodology and overall study design. These studies will provide additional information on how alterations of physical conditions and ecological interactions (e.g., predator-prey interactions) affect native and resident fishes in the estuary. These special studies address IEP goals 2, 3, 5, and 6. Special studies are:

- Salmonid migration and survival studies
- Resident fishes studies
- Ecological processes studies

- Fish facilities studies
- Agricultural and municipal diversion evaluation
- Habitat restoration evaluation
- Contaminants
- Synthesis of POD data using in conjunction with the National Center for Ecological Analysis and Synthesis

Program Management

Ongoing program management activities are dedicated to annual program planning and program implementation, IEP database and website management, and program element reviews. Program management activities address IEP goals 4-6. Program management activities are:

- Program planning and implementation
- Data Management and utilization
- Program element reviews of: 1) the particle tracking model DSM2, 2) the salmon monitoring program, and 3) the structure and function of IEP and IEP-Science Program integration
- Initiate activities to develop a comprehensive monitoring and assessment plan