

CALFED Bay-Delta Program

Science Program Program Plan Year 10 (State FY 2009-2010; Federal FY 2010) and Interagency Ecological Program (IEP) Attachment

Implementing Agencies:

CALFED Science Program: Natural Resources Agency/CALFED Bay-Delta Program

Interagency Ecological 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

July 1, 2009



Introduction

This Science Program Program Plan identifies the CALFED Program activities that are scheduled to be completed during State Fiscal Year (FY) 2009-2010 and Federal FY 2010. The Plan also describes progress made to date on the previous year's program plan. As appropriate, the Program Plan and activities will be adjusted during the year to reflect, for example, changes in priorities, funding, policies, or program direction.

Priorities

As described in the Record of Decision (ROD), the Science Program will provide the best scientific information possible to guide CALFED decisions on the four program objectives (water quality, levee system integrity, water supply, and ecosystem restoration) and to evaluate CALFED actions in an open and transparent way. Under the leadership of the Lead Scientist, the Science Program implements a focused program of activities that inform management and promote science integration. These activities include synthesizing scientific information, communicating science, coordinating science, facilitating independent peer review, and supporting research.

The Year 10 Science Program management and policy priorities include science in support of new Bay-Delta governance, the Bay-Delta Conservation Plan (BDCP), and other high priority issues presented by the CALFED implementing agencies. The following activities are planned to support these and other priority management needs to invest in a solid scientific foundation for managing the Bay-Delta system. The Science Program's planned activities have been divided into two groups: activities that can be accomplished with the current financial limitations, specifically the freeze on Prop 50 and Prop 84 bond expenditures for *new* grants and contracts and new staff hires, and activities that will be added when the freeze on new agreements has been lifted. **Note that the first list below will be shortened significantly if the freeze on *existing* contracts and grants remains or is lifted and then reinstated.**

The planned activities for Year 10 with the current bond freeze are to:

- Interpret and communicate scientific information to policy- and decision-makers, scientists, and the public through specific actions and products including Lead Scientist presentations and briefings with key policymakers, *Science News*, an updated Science Program website, concise science briefing papers, seminars, workshop summaries and symposia, the biennial *State of the Estuary Conference*, and the online peer-reviewed journal *San Francisco Estuary and Watershed Science*.
- Synthesize and summarize complex scientific information relevant to priority management needs by conducting workshops and providing special reports by the Lead Scientist and/or science advisors (when outside funding is available).
- Facilitate the use of best available science in important Bay-Delta efforts by promoting and providing independent science reviews of plans and documents (when outside funding is available).
- Continue to support existing research grants and fellowships addressing critical Bay-Delta issues as long as the freeze on existing bond-funded grants is lifted.

- Within current staffing capabilities, coordinate with CALFED agencies to promote science-based adaptive management, though direct staff involvement or identifying independent expert scientific advisors.
- Coordinate with and support the IEP by supporting the IEP Lead Scientist and actively participating with the IEP Coordinators.

Additional Year 10 activities when the bond freeze on *new* contracts and hires is lifted are to:

- Invest \$8 million of Proposition 84 funds in new priority scientific research with focused grants awarded through the Science Program's Proposal Solicitation Package (PSP) and the CALFED Science Fellows program.
- Establish a reconstituted Independent Science Board (termed Delta Science and Engineering Board in Delta Vision recommendations) that performs high level annual oversight of the use of science in Bay-Delta planning and management.
- Provide significant additional support for peer review panels, synthesis workshops and products, and direct Science Program staff coordination support for important Bay-Delta agency efforts such as performance measure and indicator development, informing science-based restoration in the Delta, and coordinating and supporting Bay-Delta modeling intercomparisons.

Year 9 Progress Report

Provide a brief progress report on the work outlined in last year's program plan.

- Released *The State of Bay-Delta Science 2008* report, the Science Program's first extensive synthesis of the current scientific understanding of the Bay-Delta system. This report has been requested by over 2000 readers since its release in October, 2008.
- Hired the first IEP Lead Scientist and the fourth CALFED Lead Scientist to coordinate and integrate world-class science and peer review into every aspect of the CALFED program.
- Hosted the 5th Biennial CALFED Science Conference where more than 1,100 people viewed over 250 Delta-relevant science presentations.
- Funded nearly \$4 million in scientific research to fill critical gaps in our understanding of the current and changing Bay-Delta system to inform managers and policy-makers.
- Convened four policy-relevant independent review panels on the National Marine Fisheries Service Operations Criteria and Plan analytical framework and draft Biological Opinion, the Delta Risk Management Strategy and the CALFED Water Quality Program Stage 1 Final Assessment Report. These reviews consisted of teams of nationally recognized independent science experts, to provide thorough, unbiased, and authoritative scientific evaluations of priority issues and efforts.
- Hosted three informational workshops on Bay-Delta future scenarios, delta smelt hatcheries, and ammonia/ammonium, to synthesize the science related to these complex environmental issues and provide information for undertaking tasks in support of Delta planning and decision-making.

Summary of Accomplishments by Objective

(Details and lists of all items below are available through the Science Program website at <http://www.science.calwater.ca.gov>.)

Objective: Synthesize Scientific Information

Compile, analyze, and integrate scientific information across disciplines.

The State of Bay-Delta Science, 2008

In October 2008, the CALFED Science Program released *The State of Bay-Delta Science, 2008* report, its first extensive effort at compiling, synthesizing and communicating the current scientific understanding of the San Francisco Bay Estuary and Sacramento-San Joaquin Delta ecosystems. Intended for resource managers, policymakers, and the public, the report provides relevant scientific information to help make important policy choices about the Delta. The report focuses on what was learned during the first stage of the CALFED Program and provides a basis for upcoming decisions for developing and implementing the Delta Vision Strategic Plan, Bay-Delta Conservation Plan, and other Delta planning initiatives. Printed copies were requested by more than 1,100 people and it has been downloaded from the Science Program website more than 950 times. The report was used as the text for a graduate seminar at UC Davis.

Workshops

The Science Program convened three workshops in Year 9 in order to provide timely information on high priority management needs.

1. The Development of a Research Framework to Assess the Role of Ammonia/Ammonium on the Sacramento-San Joaquin Delta and Suisun Bay Estuary Ecosystem – March 10 & 11, 2009
2. Comparing Futures for the Sacramento-San Joaquin Delta (PPIC II) – November 12 & 13, 2008
3. The Use of Artificial Propagation as a Tool for Central Valley Salmonid and Delta Smelt Conservation – July 24, 2008

Objective: Communicate Science

Interpret and communicate scientific information to policy- and decision-makers, scientists, and the public.

CALFED Science Conference (2008)

The Science Program hosted the 5th Biennial CALFED Science Conference – October 22-24, 2008. Over 250 Delta-relevant science presentations were given that highlighted the latest scientific findings and provided valuable information for Bay-Delta managers, scientists and the public. The conference was attended by more than 1,100 people over the three-day period. Of hundreds of survey respondents, 98% rated the conference as excellent or good.

Science News

The Science Program released five new issues of its electronic newsletter, *Science News*, to highlight science issues and events relevant to the California Delta including upcoming events, research, and key developments. The December 2008 issue premiered a new easy-to-read web-based design.

Online Journal

The Science Program supported the online, open access, peer-reviewed journal, *San Francisco Estuary and Watershed Science*, and the companion online *Archive*. One issue containing 3 new research papers about the science and resource management of San Francisco Bay, the Sacramento-San Joaquin River Delta, and the upstream watersheds was released in Year 10. Efforts on the journal were halted in December 2008 due to the bond freeze. There are numerous research papers in the cue for when the contract gets restarted. All issues and archives are available through the Journal website at <http://repositories.cdlib.org/jmie/sfews>.

Seminars

The Science Program sponsored or co-sponsored seven seminars in Year 9. Seminars provided the latest technical information from Science Program research grants or new perspectives on science related to resource management and water operations to a public audience of agency scientists, resource managers and university researchers.

1. A Statistical Model of Central Valley Winter Run Chinook Salmon: Oncorhynchus Bayesian Analysis (OBAN) by Science Program research grant recipient Dr. Noble Hendrix, R2 Resource Consultants and Dr. Robert Lessard, University of Washington – May 20, 2009
2. Effects on Environmental Stress on Fish Health. As part of the UC Davis Center for Aquatic Biology and Aquaculture (CABA) seminar series, six researchers presented findings on disease and disease impacts on the Klamath River Salmon, the improved Flatfish health in the Puget Sound, and the monitoring of harmful algal blooms on fish in the San Francisco Estuary – December 18, 2008
3. A Statistical Model of Central Valley Chinook Salmon Incorporating Uncertainty by Science Program research grant recipient Dr. Noble Hendrix, R2 Resource Consultants, and colleagues – December 16, 2008
4. The Delta Dialogue: Perspectives on Science and Policy with Dr. Clifford Dahm, CALFED Lead Scientist, past Lead Scientists Dr. Michael Healey and Dr. Sam Luoma, and Dr. Jeff Mount, chair of the Independent Science Board – October 20, 2008
5. Biomarkers and Life History Indicators in Green and White Sturgeon: Essential Tools for Understanding Environmental Effects on Bay-Delta Sturgeon Populations by Science Program grant recipient, Dr. Dietmar Kueltz, UC Davis – October 2, 2008

6. Fish Nursery Habitat: Unraveling the Secrets of the Estuary for Population Health by Dr. Stacey Luthy, University of the Pacific. This was part of the CABA seminar series - May 20, 2008
7. Establishment of a Delta Smelt Refugial Population: Lessons from Other Species, Challenges, and Current Status. As part of the CABA seminar series, four researchers discussed challenges faced by the UC Davis Fish Conservation and Culture Laboratory in establishing a refugial Delta smelt population - May 14, 2008

Direct communication by the Lead Scientist, Independent Science Board (ISB), and science advisors

Former CALFED Lead Scientist Mike Healey and the ISB Chair Jeff Mount, appointed as Delta Vision science advisors by Secretary for Resources Michael Chrisman, spoke to or provided information to the Delta Vision Blue Ribbon Task Force at several 2008 meetings, presenting important memos on topics including proposed Delta Science Programs for the Delta Vision Strategic Plan, Levee-facing Materials and Delta Ecology, a Report on the Science Program Workshop on Linking Hydrodynamic and Ecological Modeling in the Delta, and a Summary of the Science Program Workshop on Organic Carbon in the Delta.

Since his appointment in July, CALFED Lead Scientist Clifford Dahm has served on numerous review and advisory panels and has spoken about the CALFED Science Program and high priority science issues at 13 local, national and international conferences.

Objective: Coordinate Science

Coordinate with CALFED agencies to promote science-based adaptive management.

CALFED Lead Scientist

Natural Resources Secretary Mike Chrisman, with strong support of the Independent Science Board and CALFED Science Program staff, appointed the 4th Independent Lead Scientist, Dr. Cliff Dahm from the University of New Mexico, to promote and coordinate the use of peer-reviewed science throughout the CALFED Program.

Independent Science Board

The Independent Science Board (ISB) met four times and provided extensive recommendations to the Delta Vision Blue Ribbon Task Force on the important role and organization of science in future Delta governance. Many of the ISB recommendations were incorporated into the Delta Vision Strategic Plan completed in December 2008. There currently is no ISB because all contracts for ISB members expired in December 2008. A reconstituted board with revised membership and role was planned for early 2009, but has not been implemented because of the bond freeze.

Coordinate CALFED monitoring and assessment activities

The Science Program funded a team of experts to develop an overall framework for Bay-Delta monitoring and assessment. This work was put on hold starting in December 2008 because of the bond freeze.

Priority Research Topic Selection Panel

The priorities for new scientific research for the planned 2009 focused Proposal Solicitation Package (PSP) for research grants and the CALFED Fellows program (see the Promote Research objective below) were developed by a panel consisting of a diverse array of key stakeholders, agency leaders, and independent scientists that met in November 2008. Coordinated by the Science Program and chaired by the CALFED Lead Scientist, this panel developed focused research priorities for the upcoming year by identifying areas where the need for new research is perceived to be greatest and balancing short term pressing needs with long term goals and objectives of the CALFED program. The priority topic areas are native fish biology and ecology, Delta food webs, integrated hydrodynamic and ecological modeling, and decision support systems for water and ecosystem management.

Interagency Ecological Program (IEP)

The CALFED Bay-Delta Program provided a position and funding for an IEP Lead Scientist, Dr. Anke Mueller-Solger, who started in July 2008, to ensure IEP activities are based on a strong scientific foundation. Dr. Mueller-Solger works out of the CALFED offices to facilitate thorough coordination and communication between the Science Program and IEP implementing agencies. See IEP program plan attached.

Objective: Facilitate Independent Peer Review

Promote and provide independent scientific peer review of processes, plans, programs, and products.

Review Panels

Four technical review panels, consisting of teams of nationally recognized independent science experts, were coordinated by the Science Program to give independent review of priority issues. These review panels included:

1. Review of the National Marine Fisheries Service Operations Criteria and Plan Draft Biological Opinion – January, 2009
2. Review of the National Marine Fisheries Service Operations Criteria and Plan Biological Opinion Analytical Framework – October, 2008
3. Independent Review of the revised Delta Risk Management Strategy Phase I report – September, 2008.
4. Review of the CALFED Water Quality Program Stage 1 Final Assessment Report – July, 2008

Objective: Promote Research

Initiate, evaluate and fund research that will fill critical gaps in our understanding of the current and changing Bay-Delta system.

Ongoing Research Grants and Science Fellowships

In Year 9 the Science Program provided continued support for 28 full research grants and 28 CALFED Science Fellowships awarded through previous competitive proposal solicitations. In late December 2008, 56 bond-funded research projects out of a total of 58 were put on hold because of the bond freeze. Two research projects funded by US Geological Survey, which were not subject to the state bond freeze, are continuing.

2009 Full Proposal Solicitation Package

The Science Program released a full Proposal Solicitation Package (PSP) in early December 2008 to make approximately \$8 million of Proposition 84 funds available for research grants to fill critical gaps in our understanding of the current and changing Bay-Delta system. The specific topics were chosen by a Priority Research Topic Selection Panel (see above under Coordinate Science). The 2009 PSP was put on hold because of the December 2008 bond freeze. The grant solicitation will remain on hold until the bond freeze is lifted for new grants and contracts.

CALFED Science Fellows

In 2008, the Science Program, in collaboration with California Sea Grant, awarded \$1.5 million to 13 new Science Fellows in September 2008. The Fellows will work with CALFED agency scientists and senior academic research mentors to collaborate on research of direct relevance to CALFED's goals for maintaining a reliable water supply and improving ecosystem health. As noted earlier, all of the Fellow projects were stopped by the December 2008 bond freeze.

Year 10 Objectives and Activities

The Year 10 Science Program management and policy priorities include science in support of new Bay-Delta governance, the Bay-Delta Conservation Plan (BDCP), and other high priority issues presented by the CALFED implementing agencies. The following activities are planned to support these and other priority management needs to invest in a solid scientific foundation for managing the Bay-Delta system. Explanation is provided below for which activities can be accomplished with the current financial limitations, specifically the freeze on Prop 50 and Prop 84 bond expenditures for new grants and contracts and new staff hires, and activities that will be added or restarted when the freeze on new agreements has been lifted.

Objective: Synthesize Scientific Information

Compile, analyze, and integrate scientific information across disciplines.

Workshops

The Science Program will convene workshops in Year 10 in order to provide timely information on high priority management needs. Topics currently being discussed for workshops include environmental flows and north delta restoration. The number of workshops will depend on access to our bond dollars and/or our ability to find other funding to support expert panels.

Objective: Communicate Science

Interpret and communicate scientific information to policy- and decision-makers, scientists, and the public.

State of the Estuary Conference (2009)

The Science Program will participate in the Biennial State of the Estuary Conference – September 29, 30 and October 1, 2009 titled “Our Actions, Our Estuary”. Staff is working with the conference organizing committee on a panel focused on the Delta.

Seminars

The Science Program will sponsor informational seminars including short workshops and brown bag talks for projects that have funding not affected by the bond freeze. Seminars provide current and highly relevant technical information or new perspectives on science related to resource management and water operations to a public audience of agency scientists, resource managers and university researchers.

Science News

Science News will continue to be produced every other month. The online newsletter highlights science issues and events relevant to the California Delta including upcoming events, research, and key developments.

Online Journal

The Science Program will continue to support the online, peer-reviewed journal, *San Francisco Estuary and Watershed Science*, and the companion online *Archive*. Issues are scheduled to be released quarterly. All past issues and archives are available through the Journal website at <http://repositories.cdlib.org/jmie/sfews>.

Direct communication by the Lead Scientists and Deputy Director

CALFED Lead Scientist Cliff Dahm, IEP Lead Scientist Anke Mueller-Solger, and Deputy Director Lauren Hastings will continue to discuss and promote the

implementation of Science Program objectives through active participation in meetings with Agency Directors and speaking engagements at conferences and workshops.

Objective: Coordinate Science

Coordinate with CALFED agencies to promote science-based adaptive management.

Independent Science Board (Delta Science and Engineering Board)

There currently is no ISB because all contracts for ISB members expired in December 2008. A reconstituted board with revised membership and role was planned for early 2009, but has not been implemented because of the bond freeze. Once money and staff are in place, the Independent Science Board or Delta Science and Engineering Board as envisioned by Delta Vision will be reconstituted to perform high level annual oversight of the use of science in Bay-Delta planning and management.

Coordinate CALFED monitoring and assessment activities

The Science Program funded a team of experts to develop an overall framework for Bay-Delta monitoring and assessment. This work was put on hold in December 2008 because of the bond freeze.

Interagency Ecological Program (IEP)

The Science Program will continue to work closely with IEP Lead Scientist, Dr. Anke Mueller-Solger, to ensure IEP activities are based on a strong scientific foundation. Dr. Mueller-Solger facilitates thorough coordination and communication between the Science Program and IEP implementing agencies. The IEP program plan is attached.

Objective: Facilitate Independent Peer Review

Promote and provide independent, scientific peer review of processes, plans, programs, and products.

Review Panels

Review panels, consisting of teams of nationally recognized independent science experts, will be coordinated by the Science Program to give independent review of priority issues presented by the CALFED implementing agencies when funding is available. The panels will review high priority proposals, projects and actions associated with water and ecosystem management in the Delta. Panels under consideration include:

1. Review of the 2-gates proposal by Metropolitan Water District. Funding will be provided for experts by the State Water Contractors.
2. Review of the Vernalis Adaptive Management Plan if outside funding can be found for review panelists.
3. Review of the US Fish and Wildlife Service OCAP Fall X2 study proposal if outside funding can be found for review panelists.

Objective: Promote Research

Initiate, evaluate and fund research that will fill critical gaps in our understanding of the current and changing Bay-Delta system.

2009 Proposal Solicitation Package

The Science Program has posted a Proposal Solicitation Package (PSP) to make approximately \$8 million in grants available to fund research that will fill critical gaps in our understanding of the current and changing Bay-Delta system. The specific topics were chosen by a Priority Research Topic Selection Panel and are native fish biology and ecology, Delta food webs, integrated hydrodynamic and ecological modeling, and decision support systems for water and ecosystem management. This investment in priority scientific research will not be completed until the bond freeze on new grants and contracts is lifted.

CALFED Science Fellows

The Science Program plans to support a sixth class of CALFED Sea Grant Fellows. The Fellows work with CALFED agency scientists and senior academic research mentors to collaborate on research of direct relevance to Delta Science needs. The priority topic areas for the Fellows are the same as used for the PSP. This investment in priority scientific research will not be completed until the bond freeze on new grants and contracts is lifted.

Year 10 Budget

Two budgets are presented for year 10 because expenditures are dependent upon the lifting of the bond freeze on new grants and contracts and the ability for the Program to access its allocated bond dollars.

Budget With Bond Freeze on new grants and contracts* FY 09/10 (in thousands)

| | |
|--------------------------------------|----------------|
| Staff | \$1,200 |
| Research Projects – ongoing* | \$4,000 |
| Research Projects - new | \$0 |
| Science Experts and Support Projects | \$200 |
| Total | \$5,400 |

*assumes currently frozen bond funded projects will be restarted

Budget Without Bond Freeze FY 09/10 (in thousands)**

| | |
|-------------------------------------|----------------|
| Staff | \$1,600 |
| Research Projects - ongoing | \$3,600 |
| Research Projects – new ** | \$600 |
| Science Expert and Support Projects | \$1,100 |
| Total | \$6,900 |

** estimate for initial expenditures for new PSP grants and Science Fellows. The Science Program is contracting with DWR for \$8 million of Proposition 84 funds for research grants. The proposal solicitation process cannot be conducted without access to bond dollars and ability to develop new contracts. Given the delay in the solicitation due to the freeze, the research grants will most likely not be under contract until FY10/11 so these dollars will be reflected in the Year 11 Program Plan.

ATTACHMENT

Interagency Ecological Program (IEP)
Program Plan Year 10

Activity: Interagency Ecological Program including the Scientific Investigations of the Pelagic Organism Decline. The Interagency Ecological Program is a long-term monitoring program that provides information on the factors that affect ecological resources in the San Francisco estuary and Sacramento-San Joaquin Delta, allowing for more efficient management of the estuary and Delta. The Pelagic Organism Decline is a multi-disciplinary research program initiated in response to several IEP abundance indices showing marked declines of pelagic species. The POD focus is on determining the mechanisms causing the widespread decline of four pelagic fish species in the Delta. This program supports a variety of projects including expansion of existing IEP monitoring studies, analyses of existing data, initiation of new studies, and continuation of ongoing studies that are being guided by a new conceptual model focused on pelagic habitat alternatives in a changing estuary.

Year 9 Accomplishments: Work conducted during Year 9 included the following accomplishments:

- Successful implementation of the 2008 POD work plan
- Development of the 2009 POD work plan
- Establishment and successful recruitment of a new position, the IEP Lead Scientist, which provides scientific leadership and coordination to the program
- Coordination of a comprehensive overview of hydrodynamic and coupled physical-biological modeling in the San Francisco estuary with a peer-review by an independent panel of experts, the Science Advisory Group.
- A full day technical session devoted to POD results during the 5th Biennial CALFED Science Conference
- Development of a series of five focused, local IEP Workshops aimed at contributing to the overall goal of improving IEP monitoring and research in the estuary.

Year 10 Activities: Planning and implementation of Year 10 activities will continue on the activities identified in the appendix. Monitoring activities are focused on aquatic habitats and living resources in the San Francisco estuary and the Sacramento-San Joaquin Delta. Categories of monitoring include:

- Environmental monitoring
- Hydrodynamics monitoring
- Fish and Macro invertebrate monitoring
- Operations monitoring

IEP special studies provide mechanistic understanding of the physical, chemical and ecological processes and evaluate current and new technology, sampling methodology and overall study design. Special studies during Year 10 have an emphasis on modeling and integration of results and responds to management interests by including temperature modeling, wastewater impacts, contaminants, salvage efficiency, 3-dimensional particle tracking and individual based modeling for striped bass and longfin smelt. The ammonia work includes source, fate, and transport modeling, field studies, and a review and syntheses of data and studies on the effects of ammonia on aquatic species. The temperature work is closely coordinated with the CALFED-funded CASCaDE project, and will analyze the trends of water temperature stress zones and refugia in the Delta. Categories of special studies include:

- Ecological processes
- Resident species

- Modeling
- Contaminants

Estimated FY09/10 Cost (IEP including POD): \$30,097,000

Funding Sources: DWR, USBR, USGS, DFG, USEPA, USFWS, NMFS, SWRCB and USACE.

Participating Agencies: DWR, USBR, USGS, DFG, USEPA, USFWS, NMFS, SWRCB, USACE and various academic institutions.

Linkages to Other Program Elements: IEP monitoring and POD research is closely linked to the Science Program and ERP, Levees and Water Quality programs.

Potential Problems: Freezes of bond-funded work, mandatory furloughs of state scientists and increased work related to agency litigation have caused delays in sample collection, contract funding, program implementation, data reporting and analyses. The impacts of these delays are far reaching and include the loss of integration between closely coordinated projects, missed field seasons, stranded investments, delayed results, contract expirations and extensions, and the inability to retain experienced investigators, provide data used in management decisions, and conduct subcontracted work. In addition to harming individual study elements and investigators, the delayed work will impair the crucial integrative nature of the IEP and POD work. The tight conceptual, spatial and temporal coupling of many individual study elements is a critical and deliberate design feature for achieving the final ecosystem-level analysis and synthesis that is the goal of the POD investigations. The IEP and CALFED Science Program have found alternative sources of bridge funding to accomplish some of the work, but at the moment the broader ramifications are still uncertain.

Activity Appendix. Summary and Costs of the 2009/2010 Interagency Ecological Program Monitoring, Special Study and Fish Facility Activities Adjusted for Year 10 the CALFED Bay Delta Program Plan

(Element costs are approximate and expressed in thousands of dollars)

6/14/09

I. Monitoring Elements

| PROGRAM ELEMENT | ELEMENT DESCRIPTION | COST | FUNDING SOURCE | |
|--|---|-----------------|--------------------------|------------------------------------|
| A. HYDRODYNAMICS | | | IEP Core | IEP POD and Coordinated |
| 1. Bay salinity monitoring a. (2009-029) b. Mandates – D1641 | Salinity, water temperature, tide and meteorological measurements are collected in San Francisco Bay. Data is used to better understand the hydrodynamics of the estuary and calibration of multi-dimensional flow and transport models. Deliverables: a) Time series of salinity, water temperature wind speed, wind direction, air temperature, atmospheric pressure and visible radiation; b) annual USGS report “Water Resources Data for California” and c) IEP Newsletter article prepared July 2009. (P. Buchanan and G. Shellenbarger, USGS). | \$227 | DWR-\$184 USBR - \$43 | \$0 |
| 2. Delta flow measurement and database management a. (2009-030) b. Mandates - none c. POD | Channel flow and flow splits at key Delta sites are measured via UVMs and ADCPs. Data is used to evaluate fish transport and migration issues and to validate hydrodynamic models. This element will also maintain the time series database of Bay and Delta hydrographic data (tides, currents salinity, wind, and Delta flows information collected by USGS. Deliverables: a) Time series of measured tidal and daily net-flow for each station in the flow network; b) IEP Newsletter article, IEP Technical Report and peer-reviewed journal contributions made as appropriate. (C. Ruhl and J. Burau, USGS) | \$992 | DWR-\$647 USGS-\$287 | City of Stockton-\$38 CCWD-\$20 |
| | | \$ 1,219 | | |

| PROGRAM ELEMENT | ELEMENT DESCRIPTION | COST | FUNDING SOURCE | |
|--|---|---------|-----------------------------|--------------------------------|
| B. ENVIRONMENTAL MONITORING | | | IEP Core | IEP POD and Coordinated |
| 1. Environmental monitoring program a. (2009-072) b. Mandates –D1641 c. POD | This element implements the D-1641 mandate to monitor water quality at 22 sites in San Pablo Bay, Suisun Bay, and the Delta. In addition to basic water quality parameters, chlorophyll, phytoplankton, benthic and zooplankton samples are collected. Deliverables: none identified. (K. Gehrts, DWR) | \$2,950 | DWR-\$1,475 USBR \$1,475 | \$0 |

| PROGRAM ELEMENT | ELEMENT DESCRIPTION | COST | FUNDING SOURCE | |
|--|--|-----------------|-------------------------|--------------------------------|
| B. ENVIRONMENTAL MONITORING - Continued | | | IEP Core | IEP POD and Coordinated |
| 2. Upper estuary zooplankton sampling a. (2009-077) b. Mandates –D1641 c. POD | Neomysis shrimp and other zooplankton are sampled monthly in San Pablo Bay, Suisun Bay and the Delta. The monthly sampling is coordinated with the Environmental Monitoring Program (2009-072). Deliverables: a) Status and Trends IEP Newsletter article, Spring 2010; b) updated ACCESS database; c) zooplankton chapter in an annual Water Quality report, July 2009. (A. Hennessy, DFG) | \$318 | DWR-\$160 USBR-\$158 | \$0 |
| 3. Operation of thermograph stations a. (2009-104) b. Mandates -none | This element maintains the operation of the thermograph and sediment sampling stations at Vernalis on the San Joaquin River and the Sacramento River below Wilkins Slough. Deliverables: a) Data for water year 2009 will be published in the USGS annual report series “Water Resources Data for California,” Spring 2010. (C. Nagel and J. Smithson, USGS). | \$36 | DWR-\$22 USGS-\$14 | \$0 |
| | | \$ 3,304 | | |

| PROGRAM ELEMENT | ELEMENT DESCRIPTION | COST | FUNDING SOURCE | |
|--|---|-------|------------------------------------|--------------------------------|
| C. FISH & MACROINVERTEBRATES | | | IEP Core | IEP POD and Coordinated |
| 1. Adult striped bass population estimates a. (2009-002) b. Mandates –none c. POD | Annual tagging of adult striped bass for the purpose of making mark-recapture estimates of legal-size striped bass abundance, age distribution, mortality rates and evaluating factors affecting abundance. Deliverables: a) Sportfish Restoration Act report, September 2009; b) updates to the adult striped bass population estimates as data becomes available; c) maintenance of long-term database (J. DuBois, DFG) | \$901 | DWR-\$436 DFG-\$465 | \$0 |
| 2. Fall midwater trawl survey a. (2009-003) b. Mandates –OCAP c. POD | Fall midwater trawl sampling (since 1967) from San Pablo Bay through the Delta to monitor pelagic fish abundance and distribution. Data is used to calculate young-of-the-year indices of several important species including striped bass, delta smelt, longfin smelt, American and threadfin shad. Deliverables: a) Status and Trends IEP Newsletter article, Spring 2010; b) web-based updates of annual indices for six species, September – December 2009; c) maintenance of long-term ACCESS database. (R. Baxter and D. Contreras, DFG) | \$307 | DWR-\$83 USBR-\$82 DFG-\$142 | USBR POD \$31 |

| PROGRAM ELEMENT | ELEMENT DESCRIPTION | COST | FUNDING SOURCE | |
|--|--|---------|------------------------------------|--------------------------------|
| C. FISH & MACROINVERTEBRATES- Continued | | | IEP Core | IEP POD and Coordinated |
| 3. Adult sturgeon population estimates a. (2009-005) b. Mandates –none | Legal-sized green and white sturgeon are tagged to provide estimates of abundance, age distribution and mortality rates that are used to set angling regulations and evaluate factors affecting year-class strength. The frequency of the field work was periodic (every 2-4 years) but is now annual to provide better estimates. Deliverables: a) Sportfish Restoration Act report, September 2009; b) IEP Newsletter articles as appropriate; c) maintenance of long-term database. (M. Gingras, DFG) | \$425 | DWR-\$303 DFG-\$122 | \$0 |
| 4. Summer Townet survey a. (2009-007) b. Mandates –OCAP c. POD | Spring-summer sampling with a towed, small mesh net from San Pablo Bay throughout the Delta to monitor the annual abundance and distribution of juvenile fish in the upper estuary and evaluate factors affecting abundance. Annual delta smelt and striped bass indices are used to track long-trends of relative abundance. Water quality profile and simultaneous zooplankton samples will be collected as well. Deliverables: a) Annual delta smelt and striped bass indices, September 2009; b) IEP Newsletter article, Spring 2010; c) ACCESS database; d) catch data available at http://www.delta.dfg.ca.gov/data/projects/?ProjectID=TOWNET , September 2009. (R. Baxter and V. Afentoulis, DFG) | \$307 | DWR-\$77 USBR-\$65 DFG-\$129 | USBR POD \$36 |
| 5. Estuarine and marine fish abundance and distribution survey a. (2009-011) b. Mandates –D1641 | Monthly mid-water and otter trawling survey (since 1980) at 52 channel and shoal stations from South San Francisco Bay to the lower Sacramento and San Joaquin rivers to track abundance and distribution trends of marine and estuarine fishes. Data is used to assess the status of marine and estuarine fishes in the estuary as required by D-1641. Deliverables: a) Status and Trends IEP Newsletter article, Spring 2010; b) maintenance of ACCESS database; c) catch data uploaded monthly and available at http://www.delta.dfg.ca.gov/data/BayStudy/CPUE_Map.asp (M. Fish, DFG) | \$690 | DWR-\$363 USBR-\$327 | \$0 |
| 6. Bay shrimp and crab abundance and distribution surveys a. (2009-012) b. Mandates –D1641 | The trawling survey described for 2009-011 also include the collection and processing of Caridean shrimp and <i>Cancer</i> crab species to track abundance and distribution trends of Bay and estuarine shrimp species. Data is used to assess the status of shrimp in the estuary. Deliverables: a) Status and Trends IEP Newsletter article, Spring 2010; b) ACCESS database. (K. Hieb, DFG) | \$254 | DWR-\$122 USBR-\$132 | \$0 |
| 7. Juvenile delta fishes abundance and distribution sampling a. (part of 2009-053) b. Mandates –OCAP | Sampling at key sites in the lower rivers, Delta and estuary targeting all races of juvenile salmon emigrating through and rearing in the Delta. The program provides information on the timing of emigration, extent of rearing in the Delta and annual production. Although this effort focuses on juvenile salmon, information is also collected on other delta fishes. \$15,000 supports the use of DFG boat operator staff. Deliverables: a) The main deliverable is an extensive fisheries database updated daily and dating back to the mid 1970's; b) real-time summaries are provided to the DAT, October – June annually; c) IEP Newsletter articles as appropriate. (J. Netto, USFWS) | \$1,601 | DWR-\$315 USBR-\$1,286 | \$0 |

| PROGRAM ELEMENT | ELEMENT DESCRIPTION | COST | FUNDING SOURCE | |
|--|---|----------------|-------------------------|--------------------------------|
| C. FISH & MACROINVERTEBRATES - Continued | | | IEP Core | IEP POD and Coordinated |
| 8. Knight's Landing juvenile salmon monitoring a. (part of 2009-074) b. Mandates –OCAP | Continuous sampling by rotary screw traps of juvenile salmonids emigrating from the Sacramento River. Near real-time reporting of data provides early detection of salmon entering the Delta for management purposes. Deliverables: a) Daily catch of juvenile Chinook transmitted weekly to the DAT during salmon outmigration , October 2010; b) technical reports as appropriate. (R. Vincik, DFG) | \$14 | DFG-\$14 | \$0 |
| 9. Spring Kodiak trawl a. (2009-088) b. Mandates –OCAP c. POD | Monthly Kodiak trawl sampling between February and April from San Pablo Bay through the Delta to monitor pre-spawning adult delta smelt during late winter and spring. Data collected determines the abundance, distribution and maturity status of adult delta smelt. Deliverables: a) Near real-time data of delta smelt distribution, sexual maturity stage and CPUE are uploaded to http://www.delta.dfg.ca.gov/data/projects/?ProjectID=SKT Jan – April; b) maintenance of ACCESS database; c) IEP workshop and newsletter articles as appropriate. (Julio Adib-Samii, DFG). | \$295 | DWR-\$176 USBR-\$119 | \$0 |
| 10. UCD Suisun Marsh fish monitoring a. (2009-093) b. Mandates –none | Monthly monitoring of fish abundance and distribution in Suisun Marsh channels using otter trawls or beach seines. Larval fish sampling using a towed fine-mesh plankton net is done at 5 sites on a monthly basis between February and June. All work is done by UCD personnel. Deliverables: a) Data summarized in annual reports, April 2010; b) long-term Suisun Marsh ACCESS database. (P. Moyle, UCD) | \$97 | \$0 | DWR ^b -\$97 |
| 11. Larval fish survey a. (2009-096) b. Mandates – OCAP c. POD | Sampling larval fish, particularly delta smelt, throughout the Delta. Sampling will begin in January instead of mid-March as recommended by the Pelagic Organism Decline workplan. Results could guide pumping operations and become a monitoring program for delta smelt as required by the USFWS OCAP BO. Deliverables: a) Weekly updates of delta smelt catch to the Smelt Working Group; b) real-time updates of catch data to http://www.delta.dfg.ca.gov/data/projects/?ProjectID=SLS (B. Fujimura, DFG) | \$428 | DWR-\$102 USBR-\$71 | USBR POD \$255 |
| 12. Yolo Bypass a. (2009-047) b. Mandates – none | The objectives of this interdisciplinary monitoring effort are to: (1) continue collection of baseline data on lower trophic levels (phytoplankton, zooplankton and aquatic insects), juvenile and adult fishes, hydrology and physical condition and (2) analyze Yolo Bypass data collected during 1997 – 2008 to elucidate potential influences on fish community trends. Deliverables: a) Peer reviewed journal article, December 2009; b) upload survey data to IEP data vaults, October 2009. (T. Sommer, DWR) | \$200 | DWR-\$200 | \$0 |
| | | \$5,550 | | |

| PROGRAM ELEMENT | ELEMENT DESCRIPTION | COST | FUNDING SOURCE | |
|--|--|---------|-------------------------|-------------------------|
| | | | IEP Core | IEP POD and Coordinated |
| D. OPERATIONS MONITORING | | | | |
| 1. 20mm delta smelt survey a. (2009-033) b. Mandates –OCAP c. POD | A fine-mesh survey of the estuary and Delta to determine the distribution and abundance of post-larval delta smelt. Zooplankton sampling is conducted simultaneously; data collected is used to calculate density. Sampling is conducted every two weeks from April through July at 35-40 stations from San Pablo Bay through the Delta. The real time processing of the 20mm samples is included in this element. Deliverables: a) ACCESS database, June 2008; b) IEP Newsletter article as appropriate; c) real-time catch data available at http://www.delta.dfg.ca.gov/data/projects/?ProjectID=20mm (J. Adib-Samii, DFG) | \$486 | DWR-\$287 USBR-\$199 | \$0 |
| 2. Juvenile delta fishes abundance and distribution sampling a. (part of 2009-053) b. Mandates -OCAP | Sampling juvenile salmon and other delta fishes with midwater trawls, Kodiak trawls and beach seines in the delta to support or provide information useful to water project operations. Deliverables: a) The main deliverable is an extensive fisheries database updated daily and dating back to the mid 1970's; b) real-time summaries are provided to the DAT, October – June annually; c) IEP Newsletter articles as appropriate. (J. Netto, USFWS) | \$1,065 | DWR-\$534 USBR-\$531 | \$0 |
| 3. Mossdale spring trawl a. (2009-071) b. Mandates – none | This money supports Region 4 field work, collation and reporting of data from the Mossdale sampling program during April through June. Overall effort is to provide "near-time" information on the relative vulnerability of key fish species to water project operations. Sampling results are made available within 48-hours via the Internet along with data to guide the decision making of the CALFED Ops Group. Deliverables: a) Sampling results are made available within 48-hours via the internet along with data to guide the decision making of the CALFED Ops Group, April – June 2010. (T. Heyne, DFG) | \$62 | DWR-\$62 | \$0 |
| 4. Water quality telemetred data collection a. (part of 2009-072) b. Mandates – D1641 | Collection of water quality data, mainly electrical conductivity or salinity, from 7 telemetry sites used for day-to-day CVP and SWP operational decisions. Data is made available near a real-time basis. Deliverables: None identified. (D. Kaff, DWR) | \$982 | DWR-\$491 USBR-\$491 | \$0 |
| 5. San Joaquin River dissolved oxygen monitoring a. (2009-073) b. Mandates - none | Summer and fall monitoring of dissolved oxygen and temperature levels at several sites in the San Joaquin River near Stockton to evaluate the cause of seasonal dissolved oxygen levels and trigger placement at the Head-of-Old-River Barrier. Data is used to guide water project operations and barrier placement. Deliverables: None identified. (K. Gehrts, DWR) | \$60 | \$0 | DWR ^a -\$60 |

| PROGRAM ELEMENT | ELEMENT DESCRIPTION | COST | FUNDING SOURCE | |
|--|--|-----------------|----------------|---|
| | | | IEP Core | IEP POD and Coordinated |
| D. OPERATIONS MONITORING - Continued | | | | |
| 6. Knights Landing juvenile salmon monitoring a. (part of 2009-074) b. Mandates – OCAP | Continuous sampling by rotary screw traps of juvenile salmonids emigrating from Knights Landing for to determine the distribution and abundance of juvenile salmonids. Deliverables: a) Daily catch of juvenile Chinook transmitted weekly to the DAT, October 2009; b) Technical reports as appropriate. (R. Vincik, DFG). | \$105 | DFG-\$43 | USBR ^f -\$31 DWR ^a -\$31 |
| 7. Mill and Deer creeks juvenile salmonid monitoring a. (2009-075) b. Mandates – OCAP | Continuous sampling by rotary screw traps of juvenile salmonids emigrating from Mill and Deer creeks. Near real-time reporting of data provides early detection of salmon entering the Delta for management purposes. Deliverables: a) Daily catches of Chinook and steelhead summarized twice weekly for DAT, October 2009; b) Fish length database, June 2010. (C. Harvey-Arrison, DFG) | \$76 | DFG-\$24 | USBR ^f -\$26 DWR ^a -\$26 |
| | | \$ 2,836 | | |

TOTAL FOR ESTUARY MONITORING:

\$ 12,909

II. Special Study Elements

| PROGRAM ELEMENT | ELEMENT DESCRIPTION | COST | FUNDING SOURCE | |
|---|--|--------------|----------------|--|
| | | | IEP Core | IEP POD and Coordinated |
| A. SALMONID MIGRATION & SURVIVAL | | | | |
| 1. Chinook race identification (DNA) a. (2009-004) b. Mandates – OCAP | Conduct genetic studies to develop unambiguous identifiers of the various races of Central Valley Chinook salmon. Definitive, genetic identification of Chinook salmonid runs is required by NOAA Fisheries OCAP BO for winter-run and spring-run Chinook salmon. Deliverables: None identified. (S. Greene, DWR) | \$291 | DWR-\$291 | \$0 |
| 2. IEP support for DFG Ocean Salmon Project a. (2009-009) b. Mandates - none | Assistance in port sampling for coded-wire tagged (CWT) fish and to collect and process CWTs from Central Valley hatcheries and spawning surveys. This information allows population estimates of salmonids. Deliverables: None identified. (C. Armor, DFG) | \$147 | \$0 | DWR ^h -\$147 |
| 3. Coleman Nat. Fish Hatchery late-fall run production tagging a. (2009-059) b. Mandates - none | Coded-wire tagging of all CNFH late-fall run production to ensure proper race identification during subsequent recovery of fish at Delta export facilities and in juvenile and adult sampling programs. Recovery of tagged late-fall run fish is also part of the spring-run recovery plan. Tags will be purchased by USBR. Deliverables: a) This money supports the tagging of 25% of the annual late-fall production at CNFH. (P. Brandes, USFWS) | \$242 | \$0 | DWR ^a -\$150 USBR POD - \$92 |
| | | \$680 | | |

| PROGRAM ELEMENT | ELEMENT DESCRIPTION | COST | FUNDING SOURCE | |
|---|--|-------|----------------|-------------------------|
| | | | IEP Core | IEP POD and Coordinated |
| B. RESIDENT SPECIES | | | | |
| 1. Otoliths analysis of pelagic fish a. (2009-060) b. Mandates – none c. POD | This study will analyze the otoliths of delta smelt to determine daily growth rate and area of origin. Analyses could provide detailed information on fish origin and growth that can be related to histopathology and potentially ambient water toxicity. Deliverables: a) Semi-annual reports to the POD MT; b) presentations at appropriate workshops. (W. Bennett, UCD-BML) | \$350 | \$0 | CALFED ERP \$350 |
| 2. Liver histopathology for pelagic fish a. (2009-061) b. Mandates – none c. POD | This element will use histopathology analyses of the liver and glycogen to determine if larval and juvenile delta smelt, striped bass and inland silversides are exposed to toxins and/or food limitations. Samples will be obtained primarily from existing monitoring projects. Deliverables: a) semi-annual reports to the POD MT and b) presentations at appropriate workshops. (S. Teh, UCD) | \$350 | \$0 | CALFED ERP \$350 |

| PROGRAM ELEMENT | ELEMENT DESCRIPTION | COST | FUNDING SOURCE | |
|---|--|-------|-----------------|-------------------------------------|
| B. RESIDENT SPECIES - Continued | | | IEP Core | IEP POD and Coordinated |
| 3. Fish Diet and Condition a. (2009-062) b. Mandates – none c. POD | This study will examine the stomach contents of many fish and zooplankton for changes in diet composition, feeding success and parasite load. Weights of fishes will be examined in relation to regions of the estuary, as well as environmental conditions such as conductivity,, temperature, and water clarity. Changes to stomach contents or parasite load may be associated to growth rate, relative weight or liver condition. Deliverables: a) draft delta smelt diet and condition manuscript, July 2009; b) ACCESS database; c) newsletter articles or presentations where appropriate. (Steve Slater, DFG) | \$170 | \$0 | USBR POD \$170 |
| 4. Striped bass life cycle modeling a. (2009-038) b. Mandates – none c. POD | Models that integrate the effects of multiple stressors have been developed for striped bass. This next step will generalize the model and make it applicable to longfin smelt. Models will provide better understanding of what factors drive the population dynamics and what management strategies should be implemented. Deliverables: a) Progress reports and workshop presentations as appropriate; b) submission of 3 peer-reviewed manuscripts; c) computer codes for each model and supporting documentation explaining use, inputs and outputs. (Frank Loge, UCD) | \$0 | \$0 | \$0 |
| 5. Modeling delta smelt populations a. (2009-041) b. Mandates – none c. POD d. CALFED Science | Models of delta smelt life cycle will be developed in this study. The models will integrate the effects of multiple stressors on delta smelt population so a better understanding of what factors drive the population dynamics and what management strategies could be implemented. Deliverables: a) Final project reports and manuscripts ideally submitted to journals by January 2009 but this has been postponed to a later date. (W. Kimmerer, SFSU-RTC; B. Bennett, UCD-BML; K. Rose, LSU) | \$332 | \$0 | CALFED Science \$332 |
| 6. Estimation of pelagic fish population sizes a. (2009-043) b. Mandates – none c. POD | Development of methods to calculate population estimates of many pelagic species will be investigated based on previous efforts. This effort will include particle tracking models to define boundaries of sampling regions and volumes represented by fixed stations in existing monitoring surveys and test the assumption of randomness in the data. Deliverables: This work is expected to result in several publications over the next three years. (Ken Newman, USFWS.) | \$171 | \$0 | DWR POD \$85 USBR POD \$86 |
| 7. Longfin smelt habitat requirements a. (2009-098) b. Mandates – none c. POD | This analysis will investigate what the habitat requirements are for longfin smelt are and if suitable habitat has shifted spatially and/or temporally. Preexisting data from the FMWT and Towntnet survey will be used to help answer this question. This work will be conducted with redirected staff effort. Deliverables: none identified. (R. Baxter, DFG) | \$0 | \$0 | \$0 |

| B. RESIDENT SPECIES - Continued | | | IEP Core | IEP POD and Coordinated |
|--|--|-------|-----------------|--------------------------------------|
| 8. Striped bass bioenergetics a. (2009-115) b. Mandates – none c. POD | This element will couple bioenergetics analyses with the striped bass adult population estimates to track the long- and short-term (i.e., POD years) trends in consumption demand of piscivorous striped bass. This analysis will investigate the trends in estimated population consumption demand of age 1 and older striped bass and determine if consumption demand has decreased more slowly than prey relative abundance/relative biomass. Deliverables: Draft manuscript for publication, December 2009. (G. Bengino DWR and E. Loboshefsky) | \$30 | \$0 | DWR POD \$30 |
| 9. Delta smelt culture facility a. (2009-108) b. Mandates – none c. POD | Funding for this element will help subsidize the baseline costs of producing larval, juvenile, and adult delta smelt for research projects conducted by various agencies and academia. This money covers the baseline cost of producing 5,000 adult and 10,000 juvenile delta smelt. Deliverables: 64,000 larvae, 26,000 juvenile and 16,000 adult delta smelt for research conducted in 2010; b) 2008-2009 production report. (Joan Lindberg, UCD) | \$383 | \$0 | USBR POD \$287 DWR POD \$96 |
| 10. Impacts of largemouth bass on the Delta ecosystem a. (2009-133) b. Mandates – none c. POD | “Top-down” effects are a key part of the POD conceptual model, however predation from inshore piscivores is a relatively poorly understood source of mortality. There is good evidence that centrarchid populations have thrived as a result of the expansion of Egeria beds but, it is unclear whether this may have contributed to the POD. Specifically, we need estimates of inshore predator abundance, and information about their effects on pelagic habitat. Deliverables: a) Semi-annual progress reports, December 2009 and June 2010; b) oral progress report to POD MT, September 2009; c) presentation at IEP workshop, March 2010, d) manuscript to IEP newsletter or professional journal, June 2010. (A. Sih, UCD) | \$373 | \$0 | USBR POD \$373 |
| 11. Delta smelt genetics a. (2009-135) b. Mandates – none c. POD | This study will examine (1) the current genetic structure (microsatellite markers) of the delta smelt population, (2) to what extent hybridization between delta smelt and wakasagi smelt or longfin smelt occur, (3) spawning strategies using breeding experiments and microsatellite markers to understand delta smelt population dynamics and (4) will develop a breeding plan to maintain natural genetic variation and population structure in closed populations using information obtained from population structure, population dynamics, and spawning strategies of delta smelt. Deliverables: a) progress reports to USFWS; b) year-end final contract reports; c) determine population structure, 2010; d) assessment of hybridization between delta smelt, longfin smelt and wakasagi, 2010. (Bernie May, UCD) | \$215 | USFWS \$134 | USBR POD \$81 |
| 12. Bioenergetics of zooplankton species a. (2009-136) b. Mandates – none c. POD | Videographic techniques will be used to record observations of predator-prey interactions and specific patterns of prey selection to develop quantitative models of prey selection. Growth rates of larval delta smelt will be measured in laboratory experiments.. Data on respiration, ingestion, growth and excretion will be used to create an energy budget for larval delta smelt, allowing for the possibility of more accurate models of population dynamic. Deliverables: a) Presentation at State of the Estuary Conference, October 2009; b) journal article submissions, winter 2009. (Lindsay Sullivan, SFSU) | \$68 | \$0 | DWR POD \$68 |

| PROGRAM ELEMENT | ELEMENT DESCRIPTION | COST | FUNDING SOURCE | |
|--|--|----------------|----------------|-------------------------|
| B. RESIDENT SPECIES - Continued | | | IEP Core | IEP POD and Coordinated |
| 13. Population genetics and otolith geochemistry of longfin a. (2009-137) b. Mandates – none c. POD | This study seeks to address some of the data gaps in longfin smelt life history by (1) identifying population structuring among tissue collections from the San Francisco Bay/Delta, Klamath River, coastal Oregon, and Columbia River, (2) comparing the life-history variability from pre-POD to POD era using strontium isotope 87Sr:86Sr ratios to reflect salinity history, and (3) evaluate multiple annual collections of longfin smelt collected pre and post POD decline to compare genetic variation in the population during these periods which can assess demographics, effective population size, and population bottlenecks. Deliverables: a) Semi-annual progress reports, December 2009 and June 2010; b) oral progress report to POD MT, September 2009; c) presentation at IEP workshop, March 2010; d) manuscript to IEP newsletter or professional journal, June 2010. (J. Israel, B. May and J. Hobbs, UCD) | \$245 | \$0 | USBR POD \$245 |
| 14. Lower trophic levels of Suisun Bay food web a. (2009-142) b. Mandates – none c. POD | This project is designed to obtain a coarse “time-series” of food sources being utilized by the dominant zooplankton inhabiting the central portion of the upper SFB estuary (Suisun Bay) with biomarker-specific, multiple isotopes. This project focuses on Suisun Bay because it a critical habitat for the threatened Delta Smelt, has been an area of particular concern for the pelagic organism decline investigations, and is likely to be strongly affected by changes to water project operations. Deliverables: Completion of four sampling cruises, sample and data analysis, full synthesis of all data, and first paper submission, August 2009. (Susan Lang, UC San Diego) | \$76 | \$0 | CALFED Science \$76 |
| | | \$2,763 | | |

| PROGRAM ELEMENT | ELEMENT DESCRIPTION | Cost | FUNDING SOURCE | |
|---|---|-------|------------------------|-------------------------|
| | | | IEP Core | IEP POD and Coordinated |
| C. ECOLOGICAL PROCESSES | | | | |
| 1. Hydrodynamic studies in the Delta a. (2009-027) b. Mandates – none | Funds for this element will support A) developing the capability to map spatial structure of salinity and temperature throughout the Delta (“slack water plots”), B) investigation of transport mechanisms in Suisun Marsh, C) circulation and mixing in Cache Slough/Liberty Island Complex, and D) documentation of spatial and temporal variation in hydrodynamic and salt transport processes. Deliverables: a) Analyze existing historical and current hydrodynamic and salinity data to document the spatial and temporal variations in hydrodynamics and salt transport processes; b) deploy hydrodynamic and water quality instrumentation to understand circulation and mixing in the Cache Slough/Liberty Island complex and fluxes of constituents (e.g. Chl-a, turbidity, etc.) in collaboration with DWR; c) use hydrodynamic field investigations and numerical modeling in collaboration with DWR’s Suisun Marsh Branch to understand how geometric complexity affects ecosystems. (J. Burau, USGS) | \$264 | DWR-\$63 USGS-\$118 | DWR ^b -\$83 |
| 2. Field survey of <i>Microcystis aeruginosa</i> bloom biomass and toxicity a. (2009-079) b. Mandates – none c. POD d. CALFED Science | This survey will measure the bloom biomass and toxicity of <i>Microcystis aeruginosa</i> . Sampling will be closely connected to fish surveys to examine if there is a link between <i>Microcystis</i> biomass and toxicity and its direct effects on zooplankton and fish. This work was started with POD funding and is now funded by a two-year CALFED Science grant. (P. Lehman, DWR) If it is determined that spatial and temporal coverage of <i>Microcystis</i> sampling needs to be increased, the POD will supplement the above program with additional field collections. Deliverables: a) Semi-annual reports, December 2009 and June 2010; b) oral or poster presentation, March 2010; c) peer reviewed journal submission or IEP newsletter, June 2010. (P. Lehman and D. Riordan, DWR) | \$250 | \$0 | CALFED Science \$250 |
| 3. Zooplankton fecundity and population structure a. (2009-044) b. Mandates – none c. POD | Effort will examine archived samples from the IEP zooplankton monitoring survey to determine some population dynamics parameters of both <i>Pseudodiaptomus forbesi</i> and <i>Eurytemora affinis</i> . This information is needed to examine what factors could be limiting zooplankton in Suisun Bay. Deliverables: a) IEP workshop or CALFED Science workshop presentation. (Wim Kimmerer, SFSU-RTC) | \$75 | \$0 | DWR POD \$75 |

| PROGRAM ELEMENT | ELEMENT DESCRIPTION | COST | FUNDING SOURCE | |
|--|--|---------|----------------|---------------------------------------|
| | | | IEP Core | IEP POD and Coordinated |
| C. ECOLOGICAL PROCESSES - Continued | | | | |
| 4. CASCaDE computational assessment of scenarios a. (2009-081) b. Mandates – none c. POD d. CALFED Science | CASCaDE (Computational assessments of scenarios of change for the delta ecosystem)-using simulations with linked models, this element will project changes under a range of plausible scenarios such as global warming, hydrologic responses, land-use change, reconfigurations of within-Delta habitats, and sea level rise. Predictions from this model could be used in resource management. Deliverables: A final report is required and shall be submitted by 2/28/2009. The final report must include copies of any publications or reports produced. A draft manuscript(s) will suffice for a final report. Final manuscript(s) must be submitted after publication. The CASCaDE project agrees to present project findings at the biennial CALFED Science Conference and/or other CALFED Science Program workshops and symposia. (J. Cloern, USGS). | \$554 | \$0 | CALFED Science \$554 |
| 5. Synthetic analysis a. (2009-046) b. Mandates – none c. POD | This is a collaborative effort between the POD and the National Center for Ecological Analyses and Synthesis (NCEAS), which provides the setting, tools and staff support for individual scientist and working groups to conduct analysis and synthesis of complex ecological data. The focus will be the identification and testing of hypotheses about individual and interacting stressor(s) associated with the observed POD trends. Deliverables: Three different working groups facilitated by NCEAS are targeting submission of nine journal articles during FY09/10. (L. Brown, USGS) | \$1,357 | \$0 | USBR POD \$994 DWR POD \$363 |
| 6. Trends in Submerged Aquatic Vegetation a. (2009-102) b. Mandates – none c. POD | This work will calculate annual acreage of submerged aquatic vegetation (SAV) in the Delta from hyperspectral imagery, quantify SAV distribution trends, and investigate methodology for detecting and monitoring turbidity trends in the Sacramento-San Joaquin River Delta using surface and aircraft hyperspectral remote sensing instruments and satellite remote sensing data. Deliverables: a) Semi-annual progress reports, December 2009 and June 2010; b) oral progress report to IEP PWT, September 2009; c) presentation at IEP workshop, March 2010; d) manuscript to IEP newsletter or professional journal, June 2010. (S. Ustin, J. Greenberg and E. Hestir, UCD) | \$103 | \$0 | DWR POD \$103 |

| PROGRAM ELEMENT | ELEMENT DESCRIPTION | COST | FUNDING SOURCE | |
|--|---|----------------|-----------------------|--------------------------|
| | | | IEP Core | IEP POD and Coordinated |
| C. ECOLOGICAL PROCESSES - Continued | | | | |
| 7. Effects of Cache Sl. On N. Delta pelagic habitat a. (2009-132) b. Mandates – none c. POD | The proposed study will examine the hydrodynamic “footprint” of Liberty Island, the major body of water in the Cache Slough Complex. Flux of phytoplankton out of Liberty Island will be studied as part of the Breach III study, providing a good opportunity to examine the fate of the exported material. We suspect that transport of biological and physical constituents from Liberty Island has a dominant effect on the channels of the Cache Slough Complex and perhaps a large area of the north Delta. The study approach will include both continuous monitoring and 24-hour flux studies. Deliverables not yet identified. (P. Lehman, DWR and J. Burau, USGS) | \$610 | DWR-\$71 USGS-\$71 | USBR POD \$468 |
| 8. 3-D modeling of the Delta a. (2009-141) b. Mandates – none c. POD | This study will address the entrainment of delta smelt in the export facilities and the exposure of delta smelt to toxins and available food items given that location controls the exposure of delta smelt to these items. The UnTRIM Bay-Delta model will be extended throughout portions of the Delta not included in the present UnTRIM model. The resulting tool will predict a large range of processes including hydrodynamics, salt intrusion, movement of organisms and sediment transport. Deliverables: a) IEP Workshop presentation, February 2010; b) final technical report, May 2010. (Ed Gross) | \$290 | \$0 | DWR POD \$290 |
| 9. BREACH III a. (2009-147) b. Mandates – none | The purpose of this study is to provide a predictive level of understanding about (1) how abiotic and biotic factors in a restoring wetland (levee breach), Liberty Island and Little Holland Tract, control vegetation colonization and expansion and subsequent responses by native fish and wildlife, and (2) how restoration processes influence local flooding and levee erosion over the course of the restoration. Models being developed will be valuable in interpreting flood conveyance scenarios as the island evolves. Deliverables: a) Quarterly progress reports; b) Restoration Practitioners and Resource Managers Modeling Workshop; c) final task report; d) Liberty Island Basin Model; e) several peer-reviewed journal articles. (P. Hrodey, USFWS and C. Simensted, University of Washington) | \$1,500 | \$0 | CALFED ERP \$1,500 |
| | | \$5,033 | | |

| PROGRAM ELEMENT | ELEMENT DESCRIPTION | COST | FUNDING SOURCE | |
|--|---|-------|----------------|-------------------------|
| | | | IEP Core | IEP POD and Coordinated |
| D. ESTUARINE MONITORING | | | | |
| 1. Mitten crab monitoring and reporting a. (2009-026) b. Mandates – none | Element will operate the online reporting system for mitten crab collections and observations and would implement summer surveys of mitten crab distribution and abundance. The main part of this element will be funded and staffed by USFWS exotic species personnel with some sharing of resources from IEP. Deliverable: not identified (K. Webb, USFWS) | \$53 | USFWS \$53 | \$0 |
| 2. Benthic macrofauna biomass trends a. (2009-065) b. Mandates – none c. POD | This study will measure and examine the biomass of benthic organisms collected quarterly from 1975-2004. The information will improve our understanding of benthos roles in the estuary, including feeding potential of various functional groups, availability and transmission of contaminants bioaccumulated in benthos, and trends in production. The cost to do this work will be absorbed in the Environmental Monitoring Program. Deliverables: a) CALFED final report, October 2010; b) CALFED Science Conference presentation, October 2010. (K. Gehrts, DWR) | \$0 | \$0 | \$0 |
| 3. Analysis of historical population dynamics a. (2009-084) b. Mandates – none c. POD | Analyses for long-term patterns in fishes and invertebrates, including trends, step changes, regime shift and changes in distribution among sampling stations. The analyses will look if there are joint patterns in catch of pelagic species and factors that affect abundance of fishes and invertebrate. Deliverables: a) methods paper already published; b) second journal article not yet published. (M. Chotkowski, USBR) | \$0 | \$0 | \$0 |
| 4. Investigation of power plant impacts a. (2009-087) b. Mandates – none c. POD | Analyses will be conducted for trends in fish entrainment and impingement at power plants. This effort will analyze whether or not pelagic fishes are vulnerable to entrainment and thermal effects and the scale of impact these power plants have on pelagic fish populations. Deliverables: a) Monthly progress reports; b) Annual summary report, August 2009. (C. Raifsnider, Tenera and F. Mejia, DWR). | \$25 | \$0 | DWR POD \$25 |
| 5. Field support of all POD activities a. (2009-089) b. Mandates – none c. POD | This element provides the funding for the supplemental collections and sampling of water, fish and zooplankton needed for various POD activities. (Mates, DFG). Deliverables: Field samples for various analyses such as liver histopathology, water toxicity, and striped bass health. (Various Mates and Technicians, DFG). | \$145 | \$0 | USBR POD \$145 |
| 6. Corbula salinity tolerance, distribution and grazing rates a. (2009-076) b. Mandates – none c. POD | Salinity tolerance of Corbula clam will be measured in a controlled laboratory setting to evaluate if increases in salinity level in Suisun Bay influenced the change in distribution of Corbula. Two surveys will also be conducted to assess distribution, abundance and size (and therefore grazing rates) of benthic bivalves. Deliverables: Presentation at IEP Workshop, spring 2010. (J. Stillman, SFSU-RTC) | \$24 | \$0 | DWR POD \$24 |

| PROGRAM ELEMENT | ELEMENT DESCRIPTION | COST | FUNDING SOURCE | |
|---|---|--------------|----------------|-------------------------------------|
| | | | IEP Core | IEP POD and Coordinated |
| D. ESTUARINE MONITORING - Continued | | | | |
| 7. Feasibility of using towed imaging systems a. (2009-130) b. Mandates – none c. POD | This study will examine limitations of the gear including turbidity, velocity, and variation in fish size. If technical issues can be overcome, a more detailed study in 2009 will address questions such as 1) Are towed video imaging systems a feasible technique for measuring the abundance and distribution of pelagic fishes in the Delta and Estuary? 2) If so, what species, life stages, and regions would be most suitable for this technique? Deliverables: a) Progress reports; b) presentation at IEP Workshop Series, Tools for the 21 st Century, October 2009. (G. Beningo, DWR and D. Portz, USBR) | \$70 | \$0 | DWR POD \$41 USBR POD \$29 |
| 8. Use of acoustics to estimate trawl dimensions a. (2009-131) b. Mandates – none c. POD | This study will employ the use of a commercially-available transmitter, transponder, computer system to calculate dimensions of a net while the net is being towed during routine monitoring surveys and special deployments. What are the dimensions – particularly the opening – of a midwater trawl? The information should improve the accuracy of abundance indices and abundance estimates for Delta smelt and other fishes susceptible to the trawl and may suggest appropriate alternative configurations and/or deployment of trawls. Deliverables: a) memos following deployment and a final report with tables of pertinent trawl dimensions and recommendations; b) IEP Newsletter article. (J. Messino, DFG) | \$0 | \$0 | \$0 |
| 9. Effects of wastewater treatment a. (2009-138) b. Mandates – none c. POD | 1) Do WWTP effluents affect phytoplankton primary production and community composition in the Delta? 2) Do different wastewater treatment levels (secondary vs. tertiary) result in different phytoplankton responses? Field studies will include transect surveys of nutrients and phytoplankton as well as phytoplankton "grow-out" enclosures experiments at or near the Sacramento and San Joaquin WWTPs. Laboratory experiments with added effluent, ammonium, and nitrate will complement the field study. Deliverables: Annual reports to the SWRCB, CALFED, POD MT, IEP Newsletter articles, presentations as appropriate, and a journal article. (R. Dugdale, A. Parker, F. Wilkerson, SFSU,RTC) | \$144 | \$0 | CALFED Science \$144 |
| 10. Effects of Microcystis on threadfin shad a. (2009-139) b. Mandates – none c. POD | The elements of this task will evaluate: 1) Acute toxicity of microcystins on larval and juvenile fish; 2) Water exposure of larval and juvenile threadfin to environmentally-relevant concentrations of microcystins and dietary exposure of larval and juvenile threadfin to single-celled and colonial forms of microcystins; 3) examine sublethal <i>Microcystis</i> studies on TFS including growth, histopathological, and reproductive effects, 4) determine bioaccumulation and fate of microcystins in threadfin. Deliverables: a) Semi-annual progress reports, December 2009 and June 2010; b) oral progress report to POD MT, September 2009; c) presentation at IEP workshop, march 2010; d) Manuscript to IEP newsletter or professional journal, June 2010. (S.Teh, UCD and P. Lehman, DWR) | \$370 | \$0 | USBR POD \$370 |
| | | \$831 | | |

| PROGRAM ELEMENT | ELEMENT DESCRIPTION | COST | FUNDING SOURCE | |
|---|---|-------|----------------|----------------------------|
| | | | IEP Core | IEP POD and Coordinated |
| E. FISH FACILITIES | | | | |
| 1. TFCF efficiency evaluation for Chinook salmon a. (2009-TF1) b. Mandates – CVPIA, OCAP (ESA) | The salmon efficiency evaluation work involves running a series of trials to determine present day salvage efficiency for Chinook salmon at the federal TFCF. Tests will be run under varying different pumping (export) scenarios. (C. Karp, USBR) | \$55 | \$0 | USBR ^c \$55 |
| 2. Evaluation of an above ground holding tank and pumped bypass system a. (2009-TF19) b. Mandates – CVPIA, CALFED | This study element evaluates and assesses an above ground holding tank as an alternative to the presently used recessed collection tanks at the south delta fish facilities. An above ground holding tank could allow for better separation of fish and debris while awaiting transport to the release sites by reducing stress and predation. Deliverables: a) A volume in a Tracy Technical Report Series, September 2009; b) several peer-reviewed manuscripts. (B. Mefford, USBR) | \$50 | \$0 | USBR ^c \$50 |
| 3. Evaluation of holding tank influences on Chinook and delta smelt a. (2009-TF3) b. Mandates – CVPIA, OCAP (ESA) | This study element will complete recessed holding tank swirl tests to assess stress associated with the existing recessed holding tanks located at the south delta fish facilities. This information is useful in conjunction with CHTR study efforts. (C. Karp, USBR) | \$50 | \$0 | USBR ^c \$50 |
| 4. TFCF efficiency for splittail and white sturgeon a. (2009-TF17) b. Mandates – CVPIA, OCAP (ESA) | This study element will allow for continued assessment of the existing TFCF for splittail and white sturgeon salvage efficiency. No assessment for salmon has been conducted since the facility was first built in the 1950s. This information will be helpful towards establishing baseline conditions for present TFCF operation. Deliverables: Study results will be presented to TTAT by September 30, 2008 and compiled into a draft Tracy series report in FY09. (C. Karp, USBR) | \$110 | \$0 | USBR ^c \$110 |
| 5. TFCF efficiency for delta smelt a. (2009-TF5) b. Mandates – CVPIA, OCAP (ESA) | This element will continue assessment of the existing TFCF for delta smelt salvage efficiency. No assessment for delta smelt has ever been conducted at the TFCF. This information will be helpful towards establishing baseline conditions for present TFCF operation. Deliverables: Final study report, September 2009. (M. Bowen, USBR) | \$87 | \$0 | USBR ^c \$87 |

| PROGRAM ELEMENT | ELEMENT DESCRIPTION | COST | FUNDING SOURCE | |
|--|--|-------|----------------|----------------------------|
| | | | IEP Core | IEP POD and Coordinated |
| E. FISH FACILITIES - Continued | | | | |
| 6. Evaluation of the use of CO2 to remove predators a. (2009-TF6) b. Mandates – CVPIA, OCAP (ESA) | This study element will evaluate the use of CO2 as an aid in the removal of predators from the bypass system at the TFCF. Deliverables: a) Draft report for TTAT covering the first four phases, March of 2009; b) draft report for TTAT, March 2010. Preliminary information will be presented to TTAT and at the IEP Workshop, Spring 2010. (B. Wu, USBR) | \$30 | \$0 | USBR ^c \$30 |
| 7. Predator impacts on salvage rates a. (2009-TF8) b. Mandates – CVPIA, OCAP (ESA) | This study will help determine whether the existing predator load in the primary channel of the TFCF is significantly reducing the number of fish reaching the recessed holding tanks. Paired whole facility efficiency trails will be performed with high and low predator loads. Deliverables: Field work will be done in fiscal year (FY) 2008 and FY 2009. Data analysis and a Tracy series report will be written and completed in FY 2010 (R. Bark, USBR) | \$72 | \$0 | USBR ^c \$72 |
| 8. Fish behavior at the mitten crab traveling screen a. (2009-TF22) b. Mandates – CVPIA | This study element will allow for completion of fish passage assessment associated with operation of the mitten crab traveling screen located at the TFCF. This is a requirement placed on Reclamation for continued use of the traveling screen as part of the TFCF operations. The screen is also being assessed for debris removal in addition to mitten crab removal. Deliverables: Information gained through this research will be compiled into a TTAT presentation and a draft Tracy Technical Series Report in FY08. (C. Karp, USBR) | \$48 | \$0 | USBR ^c \$48 |
| 9. TFFIP website a. (2009-TF23) b. Mandates – CVPIA | This activity allows for continued maintenance of Reclamation's Tracy Research Program web site. The website contains all previously released Tracy Volume Series Reports as well as water chemistry data and current year program information. It also provides links to other relevant sites. (D. Portz, USBR) | \$42 | 0 | USBR ^c \$42 |
| 10. Tracy Series Reporting a. (2009-TF24) b. Mandates – CVPIA | This activity provides for publishing of Reclamation's Tracy Research Volume Series Reports. To date, over 27 volumes have been published. Volumes 23, 29, 32, and 33 are expected to be published in 2007. (D. Portz, USBR) | \$148 | 0 | USBR ^c \$148 |
| 11. Evaluation of debris removal at the from circular holding tanks a. (2009-TF16) b. Mandates – CVPIA | This study will evaluate debris removal from the circular holding tanks via mechanical debris removal. (B. Mefford, USBR) | \$35 | 0 | USBR ^c \$35 |

| PROGRAM ELEMENT | ELEMENT DESCRIPTION | COST | FUNDING SOURCE | |
|--|--|-------|----------------|----------------------------|
| | | | IEP Core | IEP POD and Coordinated |
| E. FISH FACILITIES - Continued | | | | |
| 12. Evaluation of holding tank screen entrainment at TFCF a. (2009-TF9) b. Mandates – CVPIA | The primary purpose of this study is to determine the TFCF holding tank screen entrainment efficiency for four size classes of juvenile delta smelt. The results will help determine how many delta smelt are being lost through the screens and how this effects fish salvage numbers and fish loading densities. Deliverables: A draft report is tentatively scheduled to be completed by September 2008 and a final draft report will be finished by December 2008. (B. Wu, USBR) | \$35 | 0 | USBR ^c \$35 |
| 13. Evaluation of striped bass predators at TFCF a. (2009-TF14) b. Mandates – CVPIA | This study will help attempt to quantify the number of predator fish that are located between the trashrack structure and the primary louvers. This information will be helpful in determining their impact to salvage of fish at the TFCF. Predators will be released into the primary channel and captured using the Peterson mark-recapture technique. Deliverables: a) Draft report for peer review will be finished in January 2011; b) draft report for TTAT will be completed in March 2011. (B. Bridges, USBR) | \$50 | 0 | USBR ^c \$50 |
| 14. Bates Table Evaluation a. (2009-TF2) b. Mandates – CVPIA, OCAP | Evaluation of the current Bates Table used for guidance when holding and transporting fish to release sites. The Bates Table was originally produced in the 1960s and is in need of reassessment due to changing conditions. The information can be used by both south delta fish facilities for improved guidance and is linked to CHTR studies. Deliverables: The primary deliverable is an updated Bates Tables incorporating the information gathered in Phases 1 -3 of this work. These tables will be species-specific, and will identify the maximum number of fish that can be held in closed systems as a function of water quality parameters. (Z. Sutphin, USBR) | \$202 | 0 | USBR ^c \$202 |
| 15. Mark recapture to estimate pre-screen loss a. (2009-140) b. Mandates – none | This study will mark and recapture calcien-dyed hatchery reared delta smelt to estimate pre-screen loss and salvage efficiency. (Gonzalo Castillo, USFWS) | \$378 | 0 | CALFED Science \$378 |
| 16. Program management, regional support, & consultants a. (2009-TF25) b. Mandates – CVPIA | This element provides for costs associated with Tracy Research Program management and provides for regional support from other Reclamation Offices/Divisions within the MP Region and any local consultants/contractors. (R. Silva, USBR) | \$218 | 0 | USBR ^c \$218 |
| 17. Evaluation/Design of circular rotating screen in the recessed collect tanks a. (2009-TF16) b. Mandates – CVPIA | This study allows evaluation of a circular rotating screen to be installed within the recessed holding tanks at the TFCF. Removing additional debris from the recessed tanks will reduce stress and mortality of fish holding in the recessed tanks awaiting transport and release. (B. Mefford, USBR) | \$103 | 0 | USBR ^c \$103 |

| E. FISH FACILITIES - Continued | | | IEP Core | IEP POD and Coordinated |
|--|--|--------------|-----------------|--------------------------------|
| 18. Evaluation/Design of electric pulse fish crowders with TFTF development a. (2009-TF20) b. Mandates – CVPIA | This study will provide valuable information related to use of electric fish crowders (pulsed electric fields) as a means of moving fish along or preventing fish residency. Deliverables: We will produce a volume in the peer reviewed Tracy Technical Report Series as the expected deliverable from these experiments. Each year we will produce a progress report by Sept. 30. We also anticipate publishing several technical society papers based on the study. (B. Mefford, USBR) | \$42 | 0 | USBR ^c \$42 |
| 19. New Technologies and Release Site studies a. (2009-055) b. Mandates - none | Investigation into the use of new technologies and release site alteration that can improve survival of fish released as part of the CHTR process. (R. Padilla, DWR) | \$910 | 0 | DWR ^d \$910 |
| 20. Fish Facility history a. (2009-107) b. Mandates – none c. POD | This project will identify changes that have occurred at the state and federal fish facilities from 1956 to 2006 that may have impacted the reported number of salvaged fish. Changes will be documented in the form of metadata. \$26,000 required to complete this work has already been obtained. Deliverables: IEP Technical report, December 2009. (Brent Baskerville-Bridges, USBR; Jerry Morinaka, DFG) | \$0 | 0 | \$0 |
| | | 2,665 | | |

| F. CONTAMINANT EFFECTS | | | IEP Core | IEP POD and Coordinated |
|--|---|----------|----------|-------------------------|
| 1. In-situ biomarker study-endocrine disruptors a. (2009-121) b. Mandates – none c. POD | EPA-ORD and the DWR EMP program will conduct two- one month studies in November 2007 and February 2007. Batches of fat head minnows will be exposed in a flow through system to Sacramento and San Joaquin River water. The minnows will be processed and sent to ORD where they will be analyzed for endocrine disruptors. The tissue will be preserved and for future biomarker work with organo-phosphates and pyrethroids. Deliverables: None identified. (R. Breuer, DWR) | \$0 | \$0 | \$0 |
| 2. Contaminants and biomarkers work a. (2009-127) b. Mandates – none c. POD | The overall goal is to assess the potential for contaminated water to contribute to the observed declines of pelagic species in the Delta. The study will build from the results of the 2006 and 2007 Delta-wide monitoring project which investigated toxicity of Delta water samples to invertebrates and early life stages of fish species of concern. Like the 2006 and 2007 study years, if toxicity is detected, toxicity identification evaluations (TIEs) and chemical analysis will be used to identify toxicant(s). Deliverables: a) Semi-annual progress reports; b) oral progress reports to POD MT, September 2009; b) manuscript submitted to peer-reviewed journal, and/or summer 2009 IEP Newsletter. (I. Werner, UCD) | \$1,273 | \$0 | USBR POD \$1273 |
| 3. Pyrethroid pesticide monitoring a. (2009-144) b. Mandates – none c. POD | The goal of this study is to assess the potential for aquatic life beneficial use impairment in the Sacramento-San Joaquin Delta due to the occurrence and toxicity of pyrethroids pesticides in the water column. The question being answered is, Do pyrethroid pesticides occur in toxic concentrations in ambient source, near-filed, and Delta channel surface waters of the Delta? Deliverables: Final report, summer 2009. (Don Weston, UC Berkeley) | \$300 | \$0 | SWRCB POD \$300 |
| 4. Selenium analysis a. (2009-145) b. Mandates – none c. POD | The primary objective is to establish background selenium levels in the freshwater delta. Previously collected fish will be analyzed and contaminants levels will be compared with concentrations believe to harm wildlife and people. The data may also be helpful should the hydrology of the estuary change as a result of Delta Vision and the amount and residence time of San Joaquin River water increased in the Delta. Deliverables: Analysis results due in 2008, final report due in summer 2009. (DFG, Moss Landing) | \$0 | \$0 | \$0 |
| 5. Contaminant synthesis 2 a. (2009-146) b. Mandates – none c. POD | This study will answer the following questions: 1) What are the potential impacts of discharges from Delta islands on beneficial uses in the Delta? 2) Are there data gaps with respect to ammonia concentrations and potential effects to species residing in the Delta? Deliverables: a) Review and synthesis of existing ambient monitoring programs; b) review and synthesis of data and studies on the effects of ammonia on aquatic species. (Michael Johnson, UCD). | \$300 | \$0 | SWRCB POD \$300 |
| | | \$ 1,923 | | |

TOTAL FOR SPECIAL STUDIES:

\$ 13,865

III. Program Management Activities

| PROGRAM ELEMENT | ELEMENT DESCRIPTION | COST | FUNDING SOURCE | |
|---|---|---------------|-------------------------|---------------------------|
| | | | IEP Core | IEP POD and Coordinated |
| G. IEP FUNCTIONS | | | | |
| 1. Data Management and Utilization a. (2009-019) b. Mandates - none | Management and dissemination of data and information generated by IEP monitoring and special study activities. Deliverables: a) Maintenance and operation of DWR, DFG and IEP web pages; b) maintenance and operation of BDAT and IEP data vaults. (Sherrie Brubaker, DWR) | \$838 | DWR-\$192 USBR-\$416 | DWR ^a \$250 |
| 2. Science Advisory Group (SAG) a. (2009-020) b. Mandates – none | Funding to support travel and meeting costs for the Science Advisory Group. Deliverables: a) Review of IEP’s physical and biological modeling programs, August 2009. (Anke Mueller-Solger, CALFED) | \$20 | USBR- \$20 | \$0 |
| | | \$ 858 | | |

| H. IEP OVERSIGHT AND COORDINATION – For all agencies, Program Management refers primarily to management and oversight activities, such as performance of Coordinator and Management Team responsibilities. All funding from IEP Core except CALFED Science which is from IEP Coordinated. | | |
|--|--|-----------------|
| Dept. of Fish and Game | | \$1,124 |
| Dept. of Water Resources | | \$405 |
| Water Resources Control Board | | \$167 |
| U.S. Bureau of Reclamation | | \$336 |
| U.S. Fish and Wildlife Service | | \$122 |
| U.S. Geological Survey | | \$100 |
| U.S. Environmental Agency | | \$40 |
| National Marine Fisheries Service | | \$5 |
| U.S. Army Corps of Engineers | | \$16 |
| CALFED Science | | \$150 |
| | | \$ 2,465 |

TOTAL FOR PROGRAM MANAGEMENT ACTIVITIES \$ 3,323

| | |
|--|------------------|
| TOTAL MONITORING | \$ 12,909 |
| TOTAL SPECIAL STUDIES | \$ 13,865 |
| TOTAL PROGRAM MANAGEMENT ACTIVITIES | \$3,323 |
| 2009 OVERALL PROGRAM TOTAL | \$30,097 |

Notes:

- ^a = funding from DWR Operations
- ^b = funding from Suisun Marsh group (60% DWR and 40% USBR)
- ^c = funding from USBR Tracy Operations
- ^d = funding from DWR Prop 13 funds
- ^e = funding from DWR Planning
- ^f = funding from USBR Operations
- ^h = funding from DWR FERC
- ⁱ = funding from DWR Fish facilities
- ^j = funding from USBR CALFED