

SCIENCE PROGRAMS IN THE DELTA THAT SUPPORT ADAPTIVE MANAGEMENT

General

In preparation for the Delta ISB meeting in October 2011, Delta Science Program (DSP) staff sent approximately 60 questionnaires to various state agencies in order to determine if they had programs that met the legislative mandate of having research, monitoring and assessment programs that support adaptive management of the Delta. Several NGOs and federal agencies were similarly contacted. DSP received about 50 responses. In the process, we found that there were some duplications or that some of the programs that were contacted did not meet the mandate. In all, only two agencies did not respond.

The information below is provided as a reminder of the programs that the Delta ISB considered at the October meeting and is based on returned questionnaires as well as additional research that staff performed in order to gain information about one of the programs for which a questionnaire was not returned.

In addition, there is an accompanying spreadsheet that lists all of the programs and shows that a number of programs address more than one topic area. This information is also posted on the Delta ISB's website for today's meeting.

Water Supply

Staff received information from six programs.

1. The California Water Plan Update – Department of Water Resources
The Water Plan provides a collaborative planning framework and engages numerous interested parties to develop findings and recommendations that are used to make informed decisions regarding California's water future. The Plan guides state investments in innovation and infrastructure and advances integrated water management and sustainable outcomes. It is updated every five years.

Role of Adaptive Management:

"The Water Plan is strategic plan that does not investigate, develop or implement specific projects and hence, does not develop adaptive management plans per se. However, the concept of adaptive management at a strategic level is important for guiding State investment and policy decisions; particularly as a tool for addressing uncertainties. Update 2013 will emphasize the importance of adaptive management in the context of potential guidelines and/or project components that are desirable for water management activities that the State either administers or invests in. Update 2013 will also include development, and potential application, of a *California Water Sustainability Indicators Framework*. The indicators framework is expected to enhance adaptive resource management decision-support and policy change.

2. The Integrated Regional Water Management Grant Program – Department of Water Resources
The Integrated Regional Water Management Grant Program is a statewide competitive grant program designed to encourage integrated regional strategies for the management of water

resources. This program provides funding for planning and implementation projects that support integrated water management. The program result in the optimal investment of state funding to provide the maximum benefit through improved local and regional water management; it is transparent and provides opportunities for interested parties to engage in the process; and is consistent with legal, legislative, and DWR policy requirements for each funding source.

Role of Adaptive Management:

“The Financial Assistance program endeavors to continually improve our business processes to ensure the effective and efficient administration of state funding. Individual regional water management groups may include adaptive management as part of their IRWM Plans and individual local project sponsors may include adaptive management as part of their project implementation efforts.”

3. Agricultural Water Management Plans – Department of Water Resources

The purpose of developing Agricultural Water Management Plans is to promote agricultural water use efficiency through the implementation of efficient water management practices. DWR accomplishes this by providing technical, financial and administrative assistance to assist water districts throughout the State develop Agricultural Water Management Plans and implement cost-effect Efficient Water Management Practices.

DWR is required to submit a report to the Legislature every five years that summarizes the status of the Agricultural Water Management Plans. The report is required to identify the outstanding elements of the plan and provide an evaluation of the effectiveness of Agricultural Water Management Planning in promoting efficient agricultural water management practices.

Role of Adaptive Management:

“... the program is built around an adaptive management approach. During the review of Agricultural Water Management Plans submitted in any given 5-year cycle, the Department in its report to the Legislature, identifies outstanding elements as well as the effectiveness of promoting efficient water management practices (EWMPs). Subsequently, the Department makes recommendations relating to proposed EWMPs changes, as appropriate. This iterative process offers an adaptive management tool to consistently enhance and refine the EWMPs toward an increased efficiency of agricultural water use.”

4. California Statewide Groundwater Elevation Monitoring – Department of Water Resources

By law, DWR is required to establish a permanent, locally-managed program to regularly and systematically monitor groundwater elevations in all basins and sub-basins in California. DWR’s role is to work cooperatively with local agencies, coordinate the information that is collected and maintain a data base for the information collected. Several of the programs purposes include collecting sufficient data to demonstrate seasonal and long-term trends in groundwater elevations statewide, and determine the extent of groundwater elevation monitoring that is being done in California’s groundwater basins.

Role of Adaptive Management:

There is no role at this time. The program is designed to establish regular and systematic monitoring of groundwater levels.

5. Urban Water Management Plan – Department of Water Resources

The purpose of this program is to assist urban water suppliers in preparing and adopting plans that meet the requirements of the Water Code and provide useful information to the public about the supplier and its current and future water management program. The Program also reviews plans for grant eligibility, reports the status of the plan to the Legislature, and collects urban water use data from existing plans. There are approximately 470 urban water suppliers who are required to submit these plans every five years.

Role of Adaptive Management:

“Most of the requirements of the UWMP program are from the UWMP Act and SBx7-7 so DWR does not have a lot of flexibility to make changes or adapt. DWR was directed by the SBx7-7 legislation to develop a 4th method (option) for suppliers to use in setting water use targets and to update the method by December 31, 2014. The update of the method will be based on the targets and baselines identified in the 2010 and stakeholder input. SBx7-7 also directs the Department after receiving the 2015 UWMPs to analyze if the state is on track to meet the 20% statewide urban per capita water use reduction goal. If the state is not on track, the Department is to provide recommendations to the legislature on how the State can meet the savings goal.

For the 2010 cycle, DWR has developed an on line data submittal tool to simplify the review process and to improve the process of collecting urban water management plan data. DWR will adapt or change this tool to speed up the process of data entry in 2015.

Once the majority of plans submitted have been reviewed, DWR plans to hold a couple of meetings with suppliers and stakeholders to gather input on the guidebook and guidance DWR provided and how DWR can better assist suppliers in submitting plans.”

6. State Water Resources Control Board Bay-Delta Program – State Water Resources Control Board (State Water Board)

The Bay-Delta Program develops information and documents needed for the State Water Board to adopt and implement the Water Quality Control Plan for the Sacramento San Joaquin Delta Estuary. The Program facilitates the development and review of plans and policies to protect beneficial uses of the San Francisco Bay/Sacramento-San Joaquin Delta Estuary as required by state and federal laws. The Bay-Delta Program also facilitates water rights activities related to the Bay-Delta and oversees implementation of the State Water Board’s and Central Valley and San Francisco Bay Regional Water Quality Control Boards’ 2008 Strategic Workplan for Activities in the Bay-Delta.

Role of Adaptive Management:

“The utility of adaptive management in this program is described in the draft modifications to San Joaquin River flow objectives for the protection of fish and wildlife beneficial uses as contained in the State Water Board’s April 1, 2011 Revised Notice of Preparation and Notice of Additional Scoping Meeting:

‘The narrative San Joaquin River flow objective is to be implemented through water right actions, water quality actions, and actions by other agencies in an adaptive management framework informed by required monitoring, special studies, and reporting. The purpose of the implementation framework is to achieve the narrative San Joaquin River flow objective by providing more natural flow conditions, including more flow of a more natural spatial and

temporal pattern; providing for adaptive management in order to respond to changing information on flow needs and to minimize water supply costs; and allowing for and encouraging coordination and integration of existing and future regulatory processes’.”

Ecosystem Restoration

Staff received information from 13 programs. Additional information about the Department of Boating and Waterways Aquatic Invasive Pest Control Program is provided by DSP staff based on the program’s website.

1. Delta Science Program – Delta Stewardship Council

The purpose of the Delta Science Program is to provide the best possible unbiased scientific information to inform water and environmental decision making in the Delta. This is done by funding research, synthesizing and communicating scientific information to policy and decision makers, promoting independent scientific peer review, and coordinating with Delta agencies to promote science-based adaptive management. The Program also assists in development and periodic updates of the Delta Plan’s adaptive management program. The Program provides independent, scientific peer review of plans, programs and products; hosts workshops to summarize and communicate available scientific information on important topics; awards research grants (\$23 million since 2004); and supports postdoctoral and pre-doctoral fellows carrying out high priority research in the Delta. The Delta Lead Scientist is responsible for leading, overseeing, and guiding the Science Program.

Role of Adaptive Management:

One of the objectives of the Delta Science Program is to “coordinate with State and Federal agencies to promote science-based adaptive management.” In addition, the Delta Reform Act (Act) requires the use of science-based, transparent, and formal adaptive management strategies for ongoing ecosystem restoration and water management decisions (Water Code section 85308(f)). The Act requires the Delta Science Program to assist in development and periodic updates of the Delta Plan’s adaptive management program. Consistent with its objective and the Act, the Delta Science Program was lead author on Chapter 2, Science and Adaptive Management for a Changing Delta, which provides an adaptive management framework to be used by water management and ecosystem restoration actions covered under the Delta Plan. The Program will help covered action proponents develop their adaptive management plans through early consultation, and will evaluate appealed certifications of consistency for consistency with the Delta Plan’s AM framework. The Program also will help covered action proponents implement their adaptive management plan.

2. Interagency Ecological Program (IEP) – Led cooperatively by nine member agencies (DFG, DWR, SWRCB, US EPA, BOR, USGS, USFWS, NOAA Fisheries, and USACE.

The IEP was founded in 1970 to implement, coordinate, and integrate scientific activities in the San Francisco estuary carried out by four State and five Federal agencies. The original focus was on the effects of water project operations on fish and wildlife in the estuary. In 2011, the program focus was broadened and the IEP now has six Federal and three State member agencies. Working closely with the Delta Science Program, the IEP also provides a forum for coordinating other studies funded by the IEP agencies and by others and for synthesizing and

communicating results. The 2011 program includes nearly 150 individual monitoring and research projects carried out by collaborative teams of agency, academic, and private scientists with a total annual budget of \$39.1 million. IEP projects fall into three large program categories: 1) Core Program – Bay-Delta monitoring that provides long-term and real-time data sets, 2) Pelagic Organism Decline and Directed Studies – an integrated set of studies to investigate the decline of four species, and 3) Coordinated Studies Program – consisting of coordinated short-term studies and some monitoring.

Role of Adaptive Management:

Data and information collected, managed, analyzed, and synthesized by the IEP is used to adaptively manage the State and Federal Water projects. The IEP is also coordinating scientific activities associated with CVPIA adaptive management. In 2011, the IEP is assisting in developing and implementing the scientific aspects of the Federal “Fall Outflow Adaptive Management Plan” for delta smelt. And the IEP is expected to play a key role in carrying out monitoring and research needed for Delta Plan and BDCP implementation.

3. Ecosystem Restoration Program - Department of Fish and Game (State) and U.S. Fish and Wildlife Service and NOAA Fisheries (Federal)

Established as part of the multi-agency CALFED Bay-Delta Program, the Ecosystem Restoration Program (ERP) is intended to improve and increase aquatic and terrestrial habitats and improve ecological functions within the San Francisco Bay and Delta to support sustainable populations of diverse plant and animal species through the issuance of restoration grants. Approximately 600 restoration grants have been awarded over a 17-year time period in the Bay-Delta and associated tributaries in the Sacramento and San Joaquin Valleys.

Role of Adaptive Management:

Adaptive management is fundamental to the measure of success and the identification of future restoration and research needs for the ERP. Expressed in DFG’s [ERP Conservation Strategy](#) is an [adaptive management framework](#) that anticipates additional ecosystem enhancement components will be developed if ongoing ecosystem restoration implementation efforts are not achieving desired objectives for species recovery or habitat restoration. This is done by including numerous assessments and feedback loops to ensure that management decisions are based on the best and most current information. Additionally, and in support of continuing to develop and evaluate this framework, DFG coordinates with the Delta Science Program, Delta Stewardship Council, and with their Interagency Ecological Program partners to embrace a common approach to adaptive management.

4. Delta Levees Program – Department of Water Resources (DWR) funds and administers the Program. Under an interagency agreement with DWR, the Department of Fish and Game (DFG) performs mandated activities.

The purpose of this program is to maintain and improve Delta levees in conjunction with habitat improvement. DFG and DWR accomplish this by assuring that reclamation districts fully mitigate significant impacts to habitat and participate in programmatic habitat enhancement projects. In cooperation with DWR staff and reclamation districts, DFG designs and implements habitat restoration and monitoring plans, habitat enhancement projects, and invasive plant control measures.

Role of Adaptive Management:

In conjunction with reclamation districts and DWR, DFG monitors the success of mitigation and enhancement sites to assure that goals and objectives are being met. Based on the biological success of these sites, information from larger planning efforts, the literature, and successes in similar habitats in other programs, they propose or require new or adjusted measures in future mitigation and enhancement efforts.

5. Suisun Marsh Habitat Management, Preservation, and Restoration Plan – Joint effort among the Bureau of Reclamation, U.S. Fish and Wildlife Service, and Department of Fish and Game (State Lead).

The purpose of this plan is to enhance habitats and ecological processes, increase public and maintain private land use, improve levee system integrity, and improve water quality thereby balancing the benefits of tidal wetland restoration with other habitat uses in the Suisun Marsh. The Plan is to be implemented over the next 30 years and targets the creation of 5,000 to 7,000 acres of tidal wetlands, the maintenance of managed wetland, and contribution to the recovery of listed species.

Role of Adaptive Management:

Adaptive management plays a key role in the implementation of the preferred alternative. Lessons learned from early phases of this project and other similar projects will be adapted to either make changes to the preferred alternative or address the uncertainties that may arise during implementation of the Plan.

6. McCormack Williamson Tract Restoration Project –U.S. Army Corps of Engineers, The Nature Conservancy, California Department of Water Resources, California Department of Fish and Game

Restore a 1,600 acre tract in the northeastern Delta to floodplain and tidal marsh by degrading the upstream levee, removing the downstream levee and modifying side levees to provide a 10:1 slope for habitat restoration. This will provide flood control for neighboring islands by allowing the tract to flood during high water periods, provide fish and wildlife benefits through development of flood plain and tidal marsh in the Tract's lower end, and the development of riparian and other vegetation along the Tract's channel levees.

Role of Adaptive Management:

Adaptive management will inform project participants and interested parties whether or not project objectives are being achieved and the value of these benefits to targeted aquatic and terrestrial wildlife. This information can be used to inform other restoration projects. TNC/RD2110 will contract with UC Davis, PRBO (possibly other entities) and is in partnership with DFG's Ecosystem Restoration Project to develop a pre- and post-project monitoring and adaptive management program. Information developed from this program will be used to assess the benefits of tidal marsh and floodplain habitat in this region. This information can be used to inform other restoration projects in the Delta.

From Leo Winternitz (10/19/2011): They have obtained a \$1.9M grant for monitoring and research – monitoring will be pre- and post-project. They are contracting with UC Davis to do the work. The conceptual models that will be used will be evaluated using the DRERIP evaluation process and they are committed to using the adaptive management process described in Chapter 2 of the Delta Plan.

7. Five Programs of the San Francisco Estuary Institute (SFEI)

SFEI supports environmental management decisions of local, state and federal agencies. The five programs are:

Clean Water / RMP: The RMP is a long-term monitoring program that provides information needed to manage water quality in San Francisco Bay. A similar program for the Delta is under development and will become a core monitoring program (Delta RMP). The RMP is a core element of SFEI's programs, and has long-term funding.

Conservation Biology: Conservation biology is the scientific study of the nature and status of Earth's biodiversity with the aim of protecting species, their habitats, and ecosystems from excessive rates of extinction. It is an interdisciplinary subject drawing on sciences, economics, and the practice of natural resource management. Get at the biological integrity questions on the map; how do we best protect riparian vegetation. How do we define riparian versus uplands? How to deal with riparian corridors? Large scale ecology focus.

Watershed Science: The purpose of the Watershed Program is to provide Bay Area environmental managers with quality scientific information in the context of the whole system.

Historical Ecology: The Historical Ecology Program studies how the Bay Area landscape has changed since native times, thereby guiding environmental restoration and management efforts throughout the region.

Environmental Data, Information & Technology: Applying Information Technology to support the environmental stewardship of the San Francisco Estuary and its watersheds. This program develops tools for decision support; populates rapid assessment tools with data; has the capacity to integrate multiple data sources – manifested in the Water Quality Portal (via the water quality monitoring council). There is about 1/3 of SFEI staff working on this.

Role of Adaptive Management:

SFEI indicated that adaptive management does not apply to their programs.

8. SFCWA Coordinated Science Program – State and Federal Contractors Water Agency (This also relates to Ecosystem Restoration)

The purpose of this program is to “Research and publish findings on Delta ecosystem stressors toward [the] development [of] management actions that further California’s co-equal goals of a restored Delta ecosystem and water supply reliability.” The emerging core functions include supporting research (fill critical gaps, evaluate key assumptions, synthesize scientific information), communicating results, and developing partnerships.

Role of Adaptive Management:

“The development of the Science Program itself is being adaptively managed. We have developed, and we track a suite of performance measures, that when considered collectively will promote the effective management of the Science Program. A major program component for SFCWA is habitat restoration; adaptive management of each project will be used to enhance each site and inform new restoration efforts.”

9. Central Valley Project Improvement Act (CVPIA) Anadromous Fish Restoration Program (AFRP) – U.S. Fish and Wildlife Service

Federal law requires that the Secretary of the Interior develop and implement a program that makes all reasonable efforts to at least double natural production of anadromous fish in California's Central Valley streams on a long-term, sustainable basis. Since 1995, the AFRP has helped implement over 195 projects intended to restore natural production of anadromous fish. General objectives of the program include improving habitat for all life stages, improving survival rates, improving opportunities for adults to reach their spawning habitats, collect data to evaluate restoration actions, integrate efforts with harvest and hatchery management, and involve partners.

Role of Adaptive Management:

The AFRP will employ adaptive management to increase the effectiveness of restoration actions and to address scientific uncertainty. Adaptive management is an approach that allows resource managers to learn from past experiences through formal experiment or by altering actions based on their measured effectiveness. Monitoring programs are the foundation of the adaptive management approach. The program will continue to use the adaptive management process to design experiments that will improve management actions and inform the development of future projects.

10. Delta Juvenile Fish Monitoring Program – U.S. Fish and Wildlife Service, Stockton

The USFWS Delta juvenile Fish Monitoring Program (DJFMP) performs year round sampling throughout the Sacramento and San Joaquin Rivers, Delta and Bays using beach seine and trawls. The DJFMP also implements special studies and participates in a variety of research programs with partners as a member of the Interagency Ecological Program. The goal of the program is to document the relative abundance and distribution of juvenile salmonids and relative abundance and distribution other co-occurring fishes in the lower Sacramento and San Joaquin Rivers, Delta and Bay for the protection, restoration and management of naturally produced salmonids and other native species in the Central Valley of California.

Role of Adaptive Management:

Regular Program evaluations as well as project specific evaluations occur which lead to Program/project revisions. The program also responds to needs developed by the IEP, Science Program, CVPIA and other partners as needed. In addition, the data generated by this Program/projects is used extensively by other entities to evaluate alternatives and guide management decisions.

11. Juvenile Salmon Survival Studies – U.S. Fish and Wildlife Service, Stockton

Assess survival of juvenile salmon and test hypotheses (including the effects of various operations such as CVPIA b2 environmental water releases) affecting survival through the Delta using acoustic and coded wire tags.

Role of Adaptive Management:

The results of the juvenile survival studies can and should be used to inform activities that would propose to alter conditions and/or operations in the adaptive management context, i.e., highlight appropriate hypotheses and approaches to further improve outcomes. Though many

have committed to adaptive management concepts using the data from these programs, our experience does not reflect successful implementation.

12. Aquatic Invasive Species Program (AISP) – U.S. Fish and Wildlife Service, Aquatic Invasive Species Branch (Pacific Southwest Region)

This Program works with the public, watershed groups, state and local agencies and the private sector to develop and implement invasive species projects and conduct activities to prevent, control and manage AIS within California, Nevada, and the Klamath Basin. Though focused on AIS, the Program provides technical assistance for terrestrial invasive species within the San Francisco Bay Delta as well. Projects and activities include outreach, control, research, and eradication efforts for a variety of terrestrial and aquatic invasive species. Species of concern include Chinese mitten crab (*Eriocheir sinensis*), marine algae (*Caulerpa* spp.) and giant cane (*Arundo donax*). A national control and management plan for New Zealand mudsnail (*Potamopyrgus antipodarum*) is under development. The national outreach campaign to prevent the spread of zebra and quagga mussel (*Dreissena* spp.) and other aquatic invasive species is also a high priority.

Role of Adaptive Management:

Predicting the outcome of invasive species management and control is difficult given that the current level of experience and knowledge is based on a relatively short history of invasive species management. Taking an adaptive approach to managing invasives provides the most likely chances of success in controlling these organisms. Invasive species management planning is built upon a framework that takes into account a myriad of considerations—from operating under policies and laws, to working with adjacent landowners, to selecting control methods that are effective in a particular environment. Planning is an ongoing process that is adjusted or refined by assessing new information until invasive species management objectives are achieved.

13. South West Fisheries Science Center, NOAA

NOAA's South West Fisheries Science Center provided us with a list of projects that are located either in the Central Valley or in both the Central Valley and the Klamath areas. They indicated that they are not organized by "Program" but by geographic area. Activities in the Central Valley include work on: the SHIRAZ model, Dynamic Energy Budget studies of CV salmonids, Acoustic tagging studies (and there are several of them), science support for SWR Sacramento Winter-run Chinook biological assessment and opinion of Ocean Salmon Fisheries, an integrated genetic monitoring project, genetic analysis of hatchery broodstock, developing new linked hydrological and ecological models, evaluation of impacts of hatcheries on listed and non-listed salmonids, programmatic support for salmon and steelhead reintroductions as part of the San Joaquin river restoration project, organization of a life cycle modeling workshop in support of OCAP implementation, life history plasticity in steelhead, evaluating and predicting habitat suitability for California salmon, prey colonization and patterns in abundance with flow for restored side channels in the Mokelumne River, and a Stanislaus river juvenile salmonid survival study.

Activities that cross the Central Valley and Klamath geographic areas include: an assessment of California's salmon stock, a salmon fishery assessment, development and application of analytical methods for use in the analysis and interpretation of GIS data collected in ocean salmon fisheries, genetic assays for Pacific salmonids with emphasis on CV and Klamath populations, an evaluation of alternative marking/tagging systems for CV and Klamath Basin

hatchery-produced salmon, formation of a scientific panel to conduct an independent evaluation of current hatchery operations and programs, a juvenile salmon ocean survey from southern Oregon to Central California, the development of best practices for including climate change considerations in NMFS ESA activities, the development of best practices for reintroducing salmonids to habitats made available by fish passage dam removal, development of a recovery team for green sturgeon, determination of the southern boundary for coho salmon, continued support of a coastal salmonid life-history station on Scott Creek in Santa Cruz County, experimental studies of habitat restoration for juvenile coho salmon and steelhead, and the monitoring of a juvenile steelhead population in Soquel Creek.

Role of Adaptive Management:

No discussion of how adaptive management is used in these studies or how these studies are used to adaptively manage salmon and steelhead populations was provided.

14. U.S. Geological Survey

The USGS organizes their projects in much the same way as does NOAA. Due to time constraints, the USGS was not able to provide any information.

15. **NO RESPONSE** – Invasive Aquatic Pest Control Program - Department of Boating and Waterways – Information obtained from the website

State legislation requires that the Department control Water Hyacinth and *Egeria densa* in the Sacramento-San Joaquin Delta, its tributaries and the Suisun Marsh. These two invasive species have a negative impact on the Delta ecosystem by displacing native plants, blocking light needed for photosynthesis, reducing the amount of dissolved oxygen in the water, and depositing silt and organic matter several times the normal rate. The Department's program is that of "control" rather than eradication and it operates an extensive water quality monitoring program to monitor conformance of herbicide use with water quality standards.

Role of Adaptive Management:

A discussion of how adaptive management is used in this program was not provided on the website.

Water Quality

Staff received questionnaires regarding 14 programs.

1. Cache Creek Watershed and Basin Mercury Studies – Department of Water Resources, Division of Flood Management

The purpose of this program is to investigate and evaluate mercury impacts to the environment from the operation of the Cache Creek Settling Basin, as required by the Central Valley Regional Water Board. DWR is conducting several studies and evaluations: 1) Cache Creek Settling Basin Mercury Characterization Study intended to identify fate and transport characteristics, and develop an understanding of the amount and species of mercury entering, settling, and leaving the Cache Creek Settling Basin; and 2) Cache Creek Watershed Mercury Study intended to develop an understanding of the source areas and hydraulic conditions that have input mercury into the watershed, and determine potential feasible alternatives that could be conducted in the watershed to minimize input of mercury into the Cache Creek Settling Basin.

Role of Adaptive Management:

A response was not provided.

2. Municipal Water Quality Program Branch – Department of Water Resources, Division of Environmental Services

The Municipal Water Quality Program manages multiple sections that study and monitor Delta water quality including a) an investigations section that evaluates the suitability of Delta water as a drinking water source, identifies sources of water quality degradation, and evaluates means of eliminating or preventing degradation; b) a special studies section that provides expert consultation and technical assistance to the Department and Branch staff; c) a field support section, and d) a quality assurance/quality control section. In addition, the program provides technical and advisory resources for reviews of plans, designs, permits, and reports on Delta sustainability, long term conservation strategies, potential habitat restoration and water conveyance options as well as water quality monitoring support for ongoing efforts such as Delta habitat, tidal marsh, and levee restoration efforts, and the Bay Delta Conservation Plan.

Role of Adaptive Management:

This program works closely with the municipal drinking water contractors of the State Water Project and Contra Costa Water District in a structured, interactive process of optimal decision-making in the face of uncertain water quality within the Sacramento-San Joaquin Delta and with an aim to reducing uncertainty over time via systems monitoring of water quality in and around the Delta and its watersheds. Through monthly meetings, stakeholders are kept apprised of ongoing monitoring and research results. This feedback loop provides an environment for improvements and changes to study design. Outside experts and Program advisers also provide feedback. To ensure that research projects and real-time monitoring are meeting stakeholder research and monitoring needs, the program creates a yearly workplan that is produced in collaboration with its stakeholders. Tasks in the workplan reflect the research and monitoring needs of the stakeholders.

3. California Water Quality Monitoring Council – State Water Resources Control Board

The purpose of this Council is to a) coordinate California water quality and related ecosystem monitoring, assessment, and reporting activities of agencies and organizations both within and outside of state government; and b) deliver water quality and related ecosystem monitoring and assessment information to decision makers and the public via the internet. By law, the Council is to develop recommendations for maximizing the efficiency and effectiveness of existing water quality and associated ecosystem health data collection and dissemination and ensure that collected data are available for use by decision makers and the public. In December 2010, the Council prepared “A Comprehensive Monitoring Program Strategy for California.”

Role of Adaptive Management:

Theme-specific workgroups, under the overarching guidance of the Monitoring Council, continuously work to coordinate monitoring, assessment, and reporting activities of member agencies and organizations, addressing existing and newly encountered issues as needed to deliver data and information to decision makers and the public.

4. Surface Water Ambient Monitoring Program (SWAMP) – State Water Resources Control Board

SWAMP complies with the Legislature’s mandate for a unifying program that coordinates all water quality monitoring conducted by the State and Regional Water Boards. SWAMP’s mission is to provide resource managers, decision makers, and the public with timely information to evaluate the condition of surface waters throughout California. SWAMP accomplishes this through carefully designed, externally reviewed monitoring programs, and by assisting other entities statewide in the generation of comparable data that can be brought together in integrated assessments that provide answers to current management questions. SWAMP’s core implementation priorities for the next five years involve statewide and regional monitoring and assessment, internal and external coordination of monitoring and assessment, and continued development of infrastructure and tools for standardization and data comparability.

Role of Adaptive Management:

SWAMP’s monitoring priorities are evaluated annually and adjusted as new information is gained. In addition, SWAMP coordinates with monitoring conducted by other entities (e.g., State and Federal agencies, local agencies, or NGOs) and adjusts monitoring programs to ensure effective and efficient resource allocation. SWAMP’s monitoring programs also are adjusted as the overall agency’s priorities shift.

5. Perennial Stream Assessment – State Water Resources Control Board

The State Water Board is initiating the process to develop biological objectives for freshwater streams and rivers in California. Biological objectives will help improve water quality in California’s streams and rivers by providing the narrative or numeric benchmarks that describe conditions necessary to protect aquatic life beneficial uses. Creating biological objectives for the state will assist in supporting the Water Board’s Mission to preserve, enhance and restore the quality of California’s water resources, and ensure their proper allocation and efficient use for the benefit of present and future generations. This program concentrates on the inputs (tributaries) to the Delta, not the Delta itself.

Role of Adaptive Management:

This program results in the development of standards and protocols used by industry and/or municipal wastewater managers to adaptively manage their discharges.

6. Regional Monitoring Program (RMP)– Central Valley Regional Water Quality Control Board

The purpose of this program is to develop a regional monitoring program that coordinates monitoring and assessment of data collected in the Delta. Concerns with contaminants related to the decline of pelagic organisms in the Delta, wastewater treatment plant discharges, agricultural discharges, pesticides, blue-green algae toxicity, and unknown toxicity events all highlight the need for well-coordinated contaminants monitoring. The RMP will create a system that integrates contaminants monitoring from all Water Board programs (and possibly external efforts) into existing monitoring efforts whereby all data are synthesized and assessed on a regular basis. This will occur over the next 3-5 years.

Role of Adaptive Management:

The plan is that adaptive management would play a major role in the Delta RMP. Stakeholders have indicated a desire for a RMP with regular monitoring sites, but when issues arise, special studies funding would be directed toward researching that issue. A third prong to the RMP might be used for regional assessments of region-specific issues. These would all work together to ensure that “intelligent” monitoring was performed and produced useful information with purpose.

7. Section 401 Water Quality Certification Program – Central Valley Regional Water Quality Control Board

The Central Valley Regional Board regulates dredge and fill activities that result in a waste discharge to waters of the U.S. These activities are required to apply for a Water Quality Certification. Typical projects that require certification include new subdivisions, bridges, roads, pipeline construction; levee reconstruction; wetland habitat improvement; pier installation; boat harbor dredging; gravel mining; flood control excavation; and minor stream crossings. Dredging of the two large Ports in the Delta, and San Joaquin and Sacramento Deep Water Ship Channels also require a Water Quality Certification which is issued by staff in the Dredging Unit. Implementation of this program results in the protection of wetland resources in Central Valley rivers, streams, and pools.

Role of Adaptive Management:

For dredging projects, General Orders may be written for ongoing permitting requirements to expedite appropriate beneficial reuse of dredged material for economic activities, while providing the highest degree of water quality protection. These General Orders are developed with input from multiple federal and state agencies with regards to an effective long-term management strategy for dredging and beneficial reuse.

8. Irrigated Lands Regulatory Program – Central Valley Regional Water Quality Control Board

The purpose of this program is to evaluate impacts of waste discharges from irrigated agricultural operations to waters of the state. The program involves the formation of coalitions to prepare and implement monitoring and reporting program plans which are reviewed and approved by the regional board. If an agricultural waste discharger does not participate in a coalition, then the individual is required to prepare and implement their own monitoring and reporting program plan.

Role of Adaptive Management:

After exceedances are discovered in regular, prescribed monitoring, some adaptive management is used to help determine causes of those exceedances or determine remediation for the sources.

9. Storm Water – Central Valley Regional Water Quality Control Board

The Storm Water Program uses an integrated approach to regulate storm water discharges from industrial facilities, construction sites, and municipal systems. Most permits require monitoring to characterize waste discharges or impacts to surface waters. There are 4 Phase I Municipal Separate Storm Sewer System (MS4) and 11 Phase II MS4 municipalities that are located within the legal boundaries of the Delta. There are 36 municipalities outside the Delta, that are tributary to the Delta. All Phase I and certain Phase II municipalities conduct self-monitoring of their storm water discharge. At a minimum, Phase I municipalities conduct baseline monitoring for urban discharge, receiving water, urban and

water column toxicity, and dry weather characterization, sediment toxicity monitoring, water quality based monitoring (e.g., pesticide, low dissolved oxygen, mercury), and special studies monitoring (e.g., detention basin, Best Management Practices effectiveness). Medium and large Phase II municipalities may also conduct the same monitoring as Phase I municipalities.

Role of Adaptive Management:

Municipalities must meet the Maximum Extent Practicable (MEP) standard which is a technology-based standard established by the Clean Water Act and establishes the level of pollutant reductions that municipalities must achieve. MEP is generally a result of emphasizing pollution prevention and source control best management practices as the first lines of defense in combination with structural and treatment methods as additional lines of defense. The MEP approach is an evolving, flexible, and advancing concept, which considers technical and economic feasibility.

10. Total Maximum Daily Load Program (TMDL) – Central Valley Regional Water Quality Control Board

Federal law requires states to list water bodies that do not meet beneficial uses and develop TMDLs for each. State law requires that California develop and implement control programs to correct TMDL impairments. In response, California’s TMDL program is designed to develop and implement a series of scientifically defensible control programs to eliminate all beneficial use impairments in the Delta. Each TMDL and the associated control program includes a numeric target, source analysis, determination of the assimilative capacity of the water body, establishment of load allocations for all sources, a schedule, and monitoring plan to assess compliance. Most adopted TMDLs are periodically reviewed by the Regional Board in a public forum to insure that satisfactory progress is being achieved. Some TMDLs have been phased to allow more time to gather additional information while at the same time moving forward on making improvements on how to resolve impairment. Phasing allows the Regional Board to make adaptive management changes to the program as more information becomes available.

Role of Adaptive Management:

No response provided.

11. Confined Animal Facility Program – Central Valley Regional Water Quality Control Board

The regional board regulates several types of confined animal facilities in order to protect surface and groundwater quality. The Program prohibits discharge of wastewater to surface water from a dairy production area or cropland. A dairy may apply wastewater to cropland to serve as a fertilizer after developing a Nutrient Management Plan. The plan requires, among other things, that the volume of water, nitrogen, phosphorus, potassium and total dissolved solids content of the waste be periodically measured and reported. The Nutrient Management Plan must be modified if monitoring shows that storm water discharges or discharges of fresh irrigation tailwater from cropland fail to meet surface water quality objectives or criteria. No discharges, including storm water, were reported in 2009; data for 2010 have not yet been reviewed.

Role of Adaptive Management:

The Central Valley Water Board may revise and modify the General Order adopted to regulate waste discharge requirements for existing milk cow dairies to address changes in state plans, policies or regulations. Monitoring and reporting requirements may be revised by the Executive Officer of the Regional Board at any time.

12. National Pollution Discharge Elimination System (NPDES) Self Monitoring Program – Central Valley Regional Water Quality Control Board

The NPDES Wastewater Program has responsibility for regulating wastewater discharges to surface waters. Primary program activities include: (1) issuing NPDES permits (new and renewals), (2) monitoring discharger compliance with permit requirements (review of discharger self-monitoring reports and compliance inspections), (3) taking enforcement action as appropriate (Notices of Violations, Mandatory Minimum Penalties, etc.), (4) investigating spills and illegal discharges, and (5) handling petitions and litigation. There are 15 NPDES facilities in the Delta and 40 upstream (below major dams) in the Central Valley.

All dischargers conduct self monitoring of their effluent, some also monitor the receiving water both upstream and downstream of their discharge. Acceptable discharge limits are based on self monitoring reports as well as water quality objectives, implementation programs, and policies in the Water Quality Control Plan for the Sacramento and San Joaquin River Basins. Typical effluent limits in POTWs include pH, temperature, electrical conductivity, biochemical oxygen demand, total suspended solids, acute and chronic toxicity, total residual chlorine, total coliform organisms, ammonia, and trace metals.

Role of Adaptive Management:

Each permit is reviewed and readopted in a public hearing by the Regional Board every five years.

13. Public Health Goals Program – Cal EPA/Office of Environmental Health Hazard Assessment (OEHHA)

Required under the California Safe Drinking Water Act of 1996, the Program performs human health risk assessments and hazard evaluations of chemical contaminants in drinking water. These activities include developing public health goals for chemical substances in drinking water and providing toxicological assistance for the California Department of Public Health's chemical monitoring activities for the drinking water supply. The program also provides educational information to the public and other governmental agencies on drinking water contamination and drinking water regulatory standards development.

Role of Adaptive Management:

The risk assessments on which Public Health Goals are based are performed using the most current principles, practices, and methods in the fields of epidemiology, risk assessment, and toxicology. In fulfilling the mandated reviews of PHGs every five years, the Program evaluates and incorporates new data as they become available to capture the most current information on human health risk and emerging concerns about contaminants.

14. California Sport Fish Advisory Program – CALEPA/Office of Environmental Health Hazard Assessment (OEHHA)

The Program evaluates potential public health risks from chemical contaminants in sport fish and issues fish consumption advisories. Contaminant data obtained from other agencies

are used in these evaluations. The Program protects public health and safety by developing and disseminating fish advisories telling the public how often fish species can be safely consumed from California water bodies.

Role of Adaptive Management:

Although they do not manage directly their Program does adapt to changing environmental data and toxicology information. They revise advisories when new data show changes in chemical concentrations in fish. The Program bases evaluations on the best current toxicology information and studies. They evaluate new studies as they become available and change their threshold values and evaluations to reflect evolving information on human health risk and emerging contaminants.

Risk Reduction

Staff received information from eight programs.

1. Delta Levees Program – Department of Water Resources in partnership with the Department of Fish and Game

The purpose of the Delta Levees Program is to provide flood risk reduction to protect people, property and water supply. The Program consists of the Subventions Program and the Special Flood Control Projects Program (Special Projects.) The Subventions Program provides cost sharing with Local Levee Maintaining Districts in the Delta primarily for levee maintenance. The Special Projects Program provides cost sharing to the levee districts generally for larger levee rehabilitation projects in the Delta under a competitive grant program. The Special Projects Program is also responsible for funding habitat mitigation and enhancement and other special studies.

Role of Adaptive Management:

Adaptive management has been used in the past primarily on larger habitat enhancement projects in conjunction with monitoring to improve plant and animal communities, make minor improvements to project area and improve design in subsequent projects.

2. Early Implementation Program – Department of Water Resources

This program provides funding to local agencies for flood control projects that are critical or urgent and are ready to proceed to construction. The projects must comply with the following: (1) are/will become part of the State Plan of Flood Control (SPFC) for the Central Valley; and (2) are consistent with the objectives and requirements of Propositions 1E and 84. Early Implementation projects are projects that rehabilitate, reconstruct, replace, improve or add facilities to the SFPC with the goal of improving flood protection for “urban” areas (greater than 10,000 residents). Projects may include design projects, repair projects and improvement projects. There are two projects that may have an impact on the Delta and they will be required to mitigate those projects accordingly.

Role of Adaptive Management:

No response provided.

3. Levee Evaluation Program – Department of Water Resources

Under this program, DWR is conducting an evaluation of state-federal project and non-project urban (470 miles) and non-urban (1,620 miles) levees to determine whether they meet defined geotechnical criteria and, where needed, to identify remedial measures and estimate costs to meet those desired geotechnical criteria. There are four primary goals: 1) inform other integrated FloodSAFE programs, 2) support federal and local flood management programs, 3) improve geotechnical information exchange methods, and 4) identify critical levee repairs.

Role of Adaptive Management:

Not applicable; however, other programs may choose to correct levee deficiencies based on program results.

4. Flood Corridor Program – Department of Water Resources, Division of Flood Management
The Flood Corridor Program is a local assistance program focused on flood-risk reduction using nonstructural methods integrated with habitat and agricultural conservation to restore the beneficial values and functions of flood corridors. Its purpose is to fund projects that acquire, restore, enhance and protect real property using primarily nonstructural flood risk-reduction solutions such as setting back levees, creating detention basins, restoring floodplains, and removing at-risk structures from flood-prone areas. Projects must conserve wildlife habitat, agriculture, or both, in and near flood corridors. Central Valley Nonstructural Grants are specifically to be used for non-urban projects that reduce flood risk for areas protected by the State Plan of Flood Control facilities.

Role of Adaptive Management:

New projects include a hydraulic and hydrologic model (H&H) analysis, environmental compliance documentation, and monitoring and reporting to ensure that project goals and objectives are achieved including addressing unanticipated issues.

5. Lower Feather River Corridor Management Plan – Department of Water Resources (INCLUDING THIS IS QUESTIONABLE)
The corridor management strategy (CMS), developed by the Interagency Flood Management Collaborative Program, is an approach designed to support integrated management of the flood control system for public safety, water supply, and the ecosystem. DWR has initiated development of a Corridor Management Plan on a 20-mile reach of the lower Feather River, from Yuba City to the Sutter Bypass as its first pilot for CMS. The LFRCMP will include strategies for managing and maintaining flood protection facilities, flood conveyance channels, floodplains and associated uplands; and developing a habitat restoration plan and policies for compatible land uses such as agriculture and recreation within the corridor. Multiple agencies are participating in the development of this plan.

Role of Adaptive Management:

A CMP must be adaptable to changing conditions in the channel, changes in regulations, and changes in our understanding of best management practices. The LFRCMP work group is currently working on the best adaptive management strategy to incorporate in the LFRCMP. The Management actions in the CMP will be re-evaluated on a recurring interval and changed if doing so would provide significant benefits to public safety, the ecosystem, or management efficiency without compromising the integrity of the flood control system.

6. USACE/CVFPB Studies – Department of Water Resources, Flood Projects Office, Project Development Branch

The State participates in and cost-shares with the US Army Corps of Engineers and local partners for studies (Studies Section) that investigate flood protection alternatives prior to design and construction and re-evaluate project alternatives after a construction project has received authorization to proceed or has already begun construction. The primary goal of the Studies Section is to assure that the USACE develops a feasible alternative with a favorable benefit/cost ratio and that the state receives the maximum credit possible for any work constructed and funded by the state and local agencies. These credits can then be used on other authorized projects. Some of the Studies and general re-evaluation reports have the Delta as one of their boundary conditions. Those that do not would affect the conditions in the Delta by allowing unmitigated flood waters to be directed to the Delta. All of the studies must take transfer of risk into consideration in development of their alternatives.

Role of Adaptive Management:

No response provided.

7. Inland Administrative Region (Inland Region) – California Emergency Management Agency (Cal EMA)

The Inland Region is responsible for assisting local governments with their emergency planning, training, exercising, response and recovery activities. The objective is to improve the quality and effectiveness of all-hazard emergency response in the Delta region and maintain a level of readiness consistent with identified threats and current capabilities. The Inland Region provides an interface between local government and state level emergency management, assisting in the development and implementation of emergency management policies and procedures that are consistent with the Standardized Emergency Management System (SEMS) and the National Incident Management System (NIMS).

Role of Adaptive Management:

Adaptive management, defined as a systematic process for continually improving management policies and practices by learning from the outcomes of previously employed policies and practices, closely mirrors the emergency preparedness cycle followed by Cal EMA and Inland Region. Preparedness is achieved and maintained through a continuous cycle of planning, organizing, training, equipping, exercising, evaluating, and taking corrective action.

8. California Levee Vegetation Research Program - Department of Water Resources, SAFCA, California Levees Roundtable

Researchers from UC Berkeley, UC Davis, University of Georgia, and HDR Engineering (Science Team) are studying the effects of woody vegetation and burrowing mammals on levees in the Central Valley. The goal is to collaboratively pursue objective research, utilizing the scientific method, to create new knowledge or correct and integrate previous knowledge regarding levee vegetation. Research results will contribute to the scientific foundation for future policy about the management of vegetation on levees in California. The research is also intended to inform the FloodSAFE Levee Evaluations Program, which is evaluating and prioritizing all geotechnical factors that impact the safety and performance of Central Valley levees.

Role of Adaptive Management:

No response was provided.