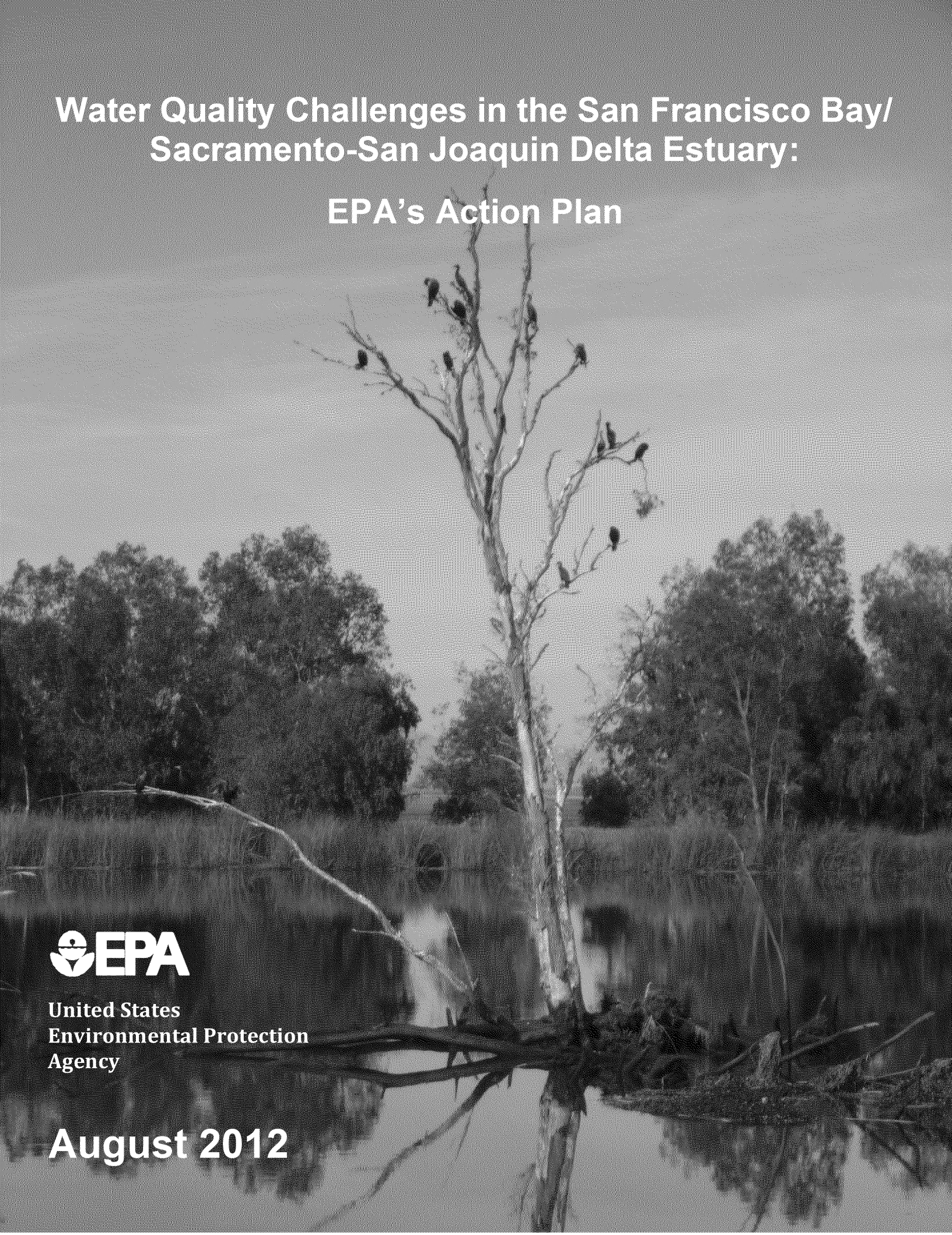
Water Quality Challenges in the San Francisco Bay/ Sacramento-San Joaquin Delta Estuary:

EPA's Action Plan



United States
Environmental Protection
Agency

August 2012

Water Quality Challenges in the San Francisco Bay/ Sacramento-San Joaquin Delta Estuary: EPA's Action Plan

Table of Contents

Executive Summary...……1

Background…….……2

Clean Water Act Regulatory Assessment.. …….....6

EPA's Action Plan…….……....9

1 - Strengthen estuarine habitat protection standards
2 - Advance regional water quality monitoring and assessment
3 - Accelerate water quality restoration through Total Maximum Daily Loads
4 - Strengthen selenium water quality criteria
5 - Prevent pesticide pollution
6 - Restore aquatic habitats while managing methylmercury
7 - Support the Bay Delta Conservation Plan

Appendix I - Staff Report: analysis of water quality issues in EPA's February 2011 ANPR
Appendix II - Synthesis of public comments in response to ANPR
Appendix III - Unabridged Advance Notice of Proposed Rulemaking, February 2011

Executive Summary

The U.S. Environmental Protection Agency (EPA) developed this Action Plan after assessing the effectiveness of current regulatory mechanisms designed to protect water quality in the San Francisco Bay Sacramento-San Joaquin Delta Estuary (Bay Delta Estuary) and its tributaries. EPA's assessment concludes that Clean Water Act (CWA) programs currently are not adequately protecting aquatic resources of the Bay Delta Estuary. In this document, EPA recommends actions to restore water quality for aquatic species protection using existing EPA authorities and resources, as well as actions EPA believes are important and appropriate for the State Water Resources Control Board (State Water Board).

The Bay Delta Estuary is one of the largest and most important estuarine systems on the Pacific Coast of the United States, supporting over 750 animal and plant species. The Estuary is the hub of California's water distribution system, supplying drinking water to 25 million people and irrigation water to 4 million acres of farmland. For more than 25 years, the decline of aquatic resources in the Estuary, along with the corresponding impacts on urban and agricultural water districts who rely on water exported from the Estuary, has drawn increased attention from federal, state and local agencies responsible for addressing these related problems. The most recent drought (2006-2009) highlighted the increasing fragility of both ecosystem health and water supply reliability.

EPA is one of more than 25 state and federal governmental agencies with responsibilities in the Bay Delta Estuary. EPA's major statutory mission in the Estuary is to implement the CWA. EPA has delegated many CWA program authorities to the State Water Board while providing financial support,[1] technical assistance, and oversight (including, in some cases, review and approval of State actions). Much of EPA's work in this Action Plan (as well as elsewhere in California) is done in support of and in partnership with the State. For example, water quality standards, which define water quality goals for our waterbodies, are typically developed and adopted by the State with EPA assistance, review, and ultimately, approval or disapproval.

To learn more about the San Francisco Bay Delta watershed and EPA activities, go to:

www.epa.gov/sfbaydelta

In the Bay Delta Estuary, EPA focuses on assuring that the many designated uses of the Estuary's aquatic resources are protected. EPA emphasizes the CWA goals of maintaining and improving water quality – the chemical, physical, and biological integrity of the water – to ensure the Bay Delta Estuary can function as a vibrant, healthy estuary. About 90 species of fish are found in the Delta. The Delta's channels serve as a migratory route and nursery area for Chinook salmon, striped bass, white and green sturgeon, American shad, and steelhead trout. These anadromous fish spend most of their adult lives either in

[1] In federal fiscal year 2012, EPA grants to the State Water Resources Control Board totaled $123,547,800, including a $101 million State Revolving Fund capitalization grant and other grants under the authority of CWA Sections 106, 319 and 604.

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the lower bays of the Estuary or in the ocean. Resident fish in the Estuary include delta smelt, longfin smelt, Sacramento splittail, catfish, largemouth bass, black bass, crappie, and bluegill. All Bay Delta Estuary waters are impaired by one or more contaminants. In addition, the reduction in the quantity and quality of estuarine habitat limits the Estuary's ability to support aquatic species. EPA's Action Plan describes a suite of activities to:

1. Strengthen water quality standards to protect estuarine habitat
2. Advance regional water quality monitoring and assessment
3. Accelerate water quality restoration through Total Maximum Daily Loads
4. Strengthen selenium water quality criteria
5. Prevent pesticide pollution
6. Restore aquatic habitats while managing methylmercury
7. Support the Bay Delta Conservation Plan

Collectively, these activities will contribute to the restoration of the Bay Delta Estuary. Even if they are all successfully implemented, however, they are not sufficient to resolve the complex problems that have stressed the ecosystem to the point of collapse. Any solution to the ecological problems of the Bay Delta Estuary must be multi-faceted, including providing sufficient flows, physical habitat which is sufficiently large, connected, diverse, and self-sustaining, as well as a reduction of many types of stressors, such as contaminants, invasive species, and predation.

Background

In response to the most recent drought and resulting conflicts in California water resource management, EPA joined five other federal agencies in issuing the Interim Federal Action Plan (IFAP) in December 2009.[2] The IFAP described actions each agency would take, in partnership with the State of California, to address the many interrelated water issues associated with the Bay Delta Estuary. As part of this interagency effort, EPA committed in the IFAP to "assess the effectiveness of the current regulatory mechanisms designed to protect water quality in the Delta and its tributaries, including standards for toxics, nutrients, and estuarine habitat protection."

As a first step in this assessment, on February 10, 2011, EPA issued an Advance Notice of Proposed Rulemaking for Water Quality Challenges in the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (ANPR)[3] (attached as Appendix III). This ANPR summarized the status of aquatic species of concern in the Bay Delta Estuary; the current scientific and technical understanding of seven major stressors affecting those aquatic resources; and the state of the regulatory response to the

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[2] Interim Federal Action Plan for the California Bay-Delta (Dec. 22, 2009), *available at* http://www.doi.gov/documents/CAWaterWorkPlan.pdf. (last visited 08/17/12).

[3] U.S. ENVTL. PROT.AGENCY, WATER QUALITY CHALLENGES IN THE SAN FRANCISCO BAY/SACRAMENTO –SAN JOAQUIN DELTA ESTUARY, 76 Fed. Reg. 9709 (Feb. 22, 2011). The unabridged version of this notice is available at http://www.epa.gov/sfbay-delta/pdfs/BayDeltaANPR-fr_unabridged.pdf .

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dramatic decline in those resources. The seven stressors EPA considered of most significance included: ammonia, selenium, pesticides, contaminants of emerging concern, declining estuarine habitat, fragmented migratory corridors and wetlands loss. The purpose of the ANPR was to solicit comment from the public and other agencies on what EPA might do differently to implement the programs under its purview – most notably the CWA – to address these named stressors for which EPA has existing authority.[4]

EPA received 55 comments from state, local and federal agencies, nongovernmental organizations and individuals in response to the ANPR. Some of these comments provided technical information or scientific research not reflected in the ANPR. Some comments included suggestions for new or augmented EPA activities in the Bay Delta Estuary. Other comments disagreed with EPA's findings and suggested that further regulatory action was unnecessary. The comments are summarized in Appendix II.[5]

Based on the ANPR and the comments received, as well as on more recent scientific and technical information, EPA is now: (1) summarizing certain conclusions about the current regulatory mechanisms protecting water quality in the Bay Delta Estuary; and (2) setting forth EPA's priorities and commitments to improve water quality for aquatic species in the Bay Delta Estuary. This document does not answer all of the questions raised in the ANPR, nor does it attempt to provide a comprehensive blueprint for solving all of the problems in the Bay Delta Estuary. Instead, this document defines EPA's priorities in the Bay Delta Estuary and recommends changes in EPA (or other agency) activities or policies, given our current authorities and our understanding of the threats to aquatic resources.

EPA's Action Plan focuses on the CWA, the primary federal statute protecting water quality. Where relevant, other federal laws which provide EPA additional tools are discussed. These include pesticide regulation under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA); chemical regulation under the Toxic Substances Control Act (TSCA); remediation of sites contaminated with hazardous substances under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, or "Superfund"); and the review of Environmental Impact Statements for federal projects under the National Environmental Policy Act (NEPA).[6] In addition, California has significantly broader authority under its Porter-Cologne Act (such as the authority to regulate agricultural discharges and discharges to ground water) and under state

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[4] EPA's review was focused on the most significant water quality factors adversely affecting aquatic species in the Bay Delta Estuary. This document does not address water quality issues related to other designated uses, including uses related to drinking water (which is also protected under the Safe Drinking Water Act which EPA implements with the California Department of Public Health), recreation, fish consumption, agriculture, etc. EPA acknowledges the ongoing need to evaluate and address these other critical water quality issues.

[5] Also posted at http://www.epa.gov/sfbay-delta/anpr-pubcomments.html.

[6] NEPA requires Environmental Impact Statements (EIS) for major federal actions significantly affecting the environment. Clean Air Act Section 309 mandates EPA's review and comment on EISs prepared by other federal agencies.

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pesticide law, which provide authorities to control pesticide use and protect surface water from pesticide residues. These California authorities provide critical tools to supplement federal law.

As discussed in detail in the ANPR, the regulatory response to water quality issues in the Bay Delta Estuary is complex. This is due in part to the nature of the problem and in part to the multi-layered and sometimes fragmented regulatory structure in California, where the task of identifying water quality goals and defining and implementing regulatory solutions is shared by the State Water Board and the nine Regional Water Quality Control Boards (Regional Water Boards), as well as between the water quality and water rights functions of the State Water Board.[7]

Other state and federal agencies perform vital functions which intersect or impact programs of EPA and the Water Boards. The California Department of Water Resources (DWR) and the federal Bureau of Reclamation (USBR), as water management agencies, provide water to their contractors and are subject to water quality and endangered species laws. The natural resource agencies (California Department of Fish and Game (DFG) and the federal Fish and Wildlife Service (FWS) and National Marine Fisheries Service (NMFS) have responsibility and authority to recover threatened and endangered species. As the CWA (and California water quality law) protects all beneficial uses of water, including aquatic habitat, Endangered Species Act (ESA) measures to protect threatened and endangered aquatic species can overlap with state and/or federal CWA requirements. In addition, the California Department of Pesticide Regulation (DPR) implements programs to protect surface water from the impacts of pesticides, a role which they undertake in coordination with the Water Boards. The U.S. Army Corps of Engineers (Corps), with assistance and oversight by EPA, issues permits for activities that unavoidably fill waters and wetlands. The Natural Resources Conservation Service supports voluntary conservation on private agricultural lands with the goal of addressing water supply, water quality, and habitat restoration needs.

There are several processes underway to improve Bay Delta Estuary resources and stabilize water supplies. Notable among these are the Bay Delta Conservation Plan (BDCP) and the Delta Plan. The BDCP is a multi-agency (state and federal agencies and local water districts) effort to recover endangered species and ensure a reliable water supply through reconfiguring water conveyance facilities and restoring large-scale aquatic habitat. EPA is supporting development of the BDCP by participating as a cooperating agency in its environmental review process. EPA's input is focused on ensuring that water quality impacts of conveyance and operations changes are analyzed and appropriately considered and that information needed for CWA permitting is developed as early as possible. (See page 21 for additional comments related to the BDCP.)

Another significant effort, the Delta Plan, will be finalized by the Delta Stewardship Council (DSC) in 2013 and includes a set of legally enforceable policies to achieve California's policy of "co-equal goals", i.e., a more reliable water supply and a restored, enhanced Delta ecosystem. Although the role of the Delta Plan in regulatory activities affecting the Bay Delta Estuary is evolving, EPA

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[7] Noting this complex structure is not intended as criticism. Under the federalism concept of the Clean Water Act, EPA is respectful of how each state organizes its various water quality functions, as long as the goals of the Clean Water Act are attained.

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supports the DSC's effort to comprehensively address the multiple goals inherent in Delta protection, and especially the importance it places on the State Water Board's work to promulgate new Delta water quality standards.

In addition, many other agencies and organizations are working to improve Bay Delta Estuary water quality and aquatic species protection, pursuant to their authorities and responsibilities. In developing this Action Plan, EPA considered these activities and processes. EPA's intent is to complement and, where possible, support the efforts of these other organizations. Some of these efforts include:

- DFG's draft Conservation Strategy for Restoration of the Sacramento-San Joaquin Delta Ecological Management Zone; and Quantifiable Biological Objectives and Flow Criteria for Aquatic and Terrestrial Species of Concern Dependent on the Delta;[8]
- Sacramento-San Joaquin Delta Conservancy's Strategic Plan;[9]
- San Joaquin River Restoration Program (as authorized in 2009);[10]
- Central Valley Flood Protection Board's Central Valley Flood Protection Plan;[11] and
- Natural Resource Conservation Service's Bay-Delta Initiative[12].

EPA's Action Plan was also informed by several recent efforts to assess the health of the ecosystem and the success of efforts to address Delta issues, from policy and scientific perspectives, including:

- Delta Regional Monitoring Program's first annual Pulse of the Delta, issued by the Central Valley Regional Water Board;[13]

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[8] CAL. DEPT. OF FISH AND GAME, CONSERVATION STRATEGY FOR RESTORATION OF THE SACRAMENTO-SAN JOAQUIN DELTA ECOLOGICAL MANAGEMENT ZONE AND THE SACRAMENTO AND SAN JOAQUIN VALLEY REGIONS (Draft July 2011), *available at* http://www.dfg.ca.gov/ERP/reports_docs.asp (last visited 06/26/12); CAL. DEPT. OF FISH AND GAME, QUANTIFIABLE BIOLOGICAL OBJECTIVES AND FLOW CRITERIA FOR AQUATIC AND TERRESTRIAL SPECIES OF CONCERN DEPENDENT ON THE DELTA (November 23, 2010), *available at* http://www.dfg.ca.gov/water/water_rights_docs.html (last visited 06/26/12).

[9] SACRAMENTO-SAN JOAQUIN DELTA CONSERVANCY 2012 STRATEGIC PLAN (adopted June 27, 2012), *available at* http://deltaconservancy.ca.gov/docs/meeting_materials/june_2012/Delta_Conservancy_Strategic_Plan_Designed_20June2012.pdf (last visited 08/21/12).

[10] CAL. DEPT. OF WATER RES., SAN JOAQUIN RIVER RESTORATION PROGRAM, *available at* http://www.water.ca.gov/rivers/sanjoaquin/program/ (last visited 06/26/12).

[11] CENT. VALLEY FLOOD PROTECTION BD., 2012 CENTRAL VALLEY FLOOD PROTECTION PLAN (adopted June 29, 2012) *available at* http://www.cvfpb.ca.gov/ (last visited 07/16/12).

[12] NATURAL RES. CONSERVATION SERVICE, BAY DELTA INITIATIVE, *available at* http://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/programs/farmbill/initiatives/?&cid=stelprdb1047519 (last visited 06/26/12).

[13] CENT. VALLEY REG'L WATER QUALITY CONTROL BD, THE PULSE OF THE DELTA – RE-THINKING WATER QUALTY MONITORING(2011), *available at*

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- San Francisco Estuary Partnership's State of the Estuary report;[14]
- Public Policy Institute of California's series of reports;[15]
- Delta Vision Foundation's Delta Vision Report Card series;[16]
- National Research Council's three scientific reviews of the basis of the actions taken and those that could be taken to achieve a sustainable ecosystem and a reliable water supply;[17]
- Interagency Ecological Program's Pelagic Organism Decline Synthesis (December 2010);[18] and
- Report to the California Fish and Game Commission on Stressors Impacting Delta Related Organisms.[19]

Clean Water Act Regulatory Assessment

The ANPR describes federal and state water quality programs to protect aquatic species in the Bay Delta Estuary, from establishing water quality standards to using various programs and regulatory tools (e.g., discharge permits, enforcement, total maximum daily loads (TMDLs), financial

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http://www.swrcb.ca.gov/rwqcb5/water_issues/delta_water_quality/comprehensive_monitoring_program/ (last visited 06/28/12).

[14] SAN FRANCISCO ESTUARY PARTNERSHIP, STATE OF SAN FRANCISCO BAY 2011 REPORT, *available at http://sfestuary.org/StateofSFBay2011/* (last visited 06/26/12).

[15] PUBLIC POLICY INSTITUTE OF CALIFORNIA, ENVISIONING FUTURES FOR THE SACRAMENTO-SAN JOAQUIN DELTA (2007); COMPARING FUTURES FOR THE SACRAMENTO-SAN JOAQUIN DELTA (2008); MANAGING CALIFORNIA'S WATER: FROM CONFLICT TO RECONCILIATION (2011); AND WATER AND THE CALIFORNIA ECONOMY (2012). *Available at* http://www.ppic.org/main/policyarea.asp?i=15 (last visited 06/26/12). PPIC has also published a number of other reports and monographs on California water issues, as noted on the website.

[16] DELTA VISION FOUNDATION, DELTA VISION REPORT CARDS (2012 and earlier), *available at* http://www.deltavisionfoundation.org/(last visited 06/26/12).

[17] NATIONAL RESEARCH COUNCIL: A SCIENTIFIC ASSESSMENT OF ALTERNATIVES FOR REDUCING WATER MANAGEMENT EFFECTS ON THREATENED AND ENDANGERED FISHES IN CALIFORNIA'S BAY DELTA (2010)(*available at* http://dels.nas.edu/Report/Scientific-Assessment-Alternatives/12881); A REVIEW OF THE USE OF SCIENCE AND ADAPTIVE MANAGEMENT IN CALIFORNIA'S DRAFT BAY DELTA CONSERVATION PLAN (2011) (*available at* http://dels.nas.edu/Report/Review/13148); SUSTAINABLE WATER AND ENVIRONMENTAL MANAGEMENT IN THE CALIFORNIA BAY/DELTA (2012) (*available at* http://dels.nas.edu/Report/Sustainable-Water-Environmental-Management/13394) (last visited 06/26/12).

[18] Baxter, R., R. Breuer, L. Brown, L. Conrad, F. Feyrer, S. Fong, K. Gehrts, L. Grimaldo, B. Herbold, P. Hrodey, A. Mueller-Solger, T. Sommer, and K. Souza. Interagency Ecological Program 2010 Pelagic Organism Decline Work Plan and Synthesis of Results. *Available at* http://www.water.ca.gov/iep/docs/FinalPOD2010Workplan12610.pdf (last visited 06/26/12).

[19] CAL. DEPT. OF FISH AND GAME, A REPORT TO THE CALIFORNIA FISH AND GAME COMMISSION ON STRESSORS IMPACTING DELTA RELATED ORGANISMS (September 1, 2010) , *available at* http://www.dfg.ca.gov/delta/reports/Delta-Organisms-Stressors-Report-20100728.pdf (last visited 06/27/12).

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assistance) to ensure those standards are met. EPA considered the information in the ANPR and the subsequent public comments in identifying water quality issues which are not effectively being addressed. EPA also considered the 2009 Periodic Review of the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (Bay-Delta WQCP) completed by the State Water Board and the 2011 Triennial Review of the Sacramento River-San Joaquin River Basin Plan completed by the Central Valley Regional Water Board in 2011. The conclusions of these reviews are generally consistent with EPA's findings.

Despite much ongoing activity, CWA programs are not adequately protecting Bay Delta Estuary aquatic resources, as evidenced by the pelagic organism decline. That said, the Water Boards have initiated work on the most significant tasks and are making steady progress. Other agencies have also strengthened relevant regulatory programs. Most notably, the Department of Pesticide Regulation recently finalized regulations designed to prevent surface water contamination by pesticides in non-agricultural settings.

In 2008, in response to the Bay Delta Estuary aquatic resource decline, the State Water Board, with the Central Valley and San Francisco Bay Regional Water Boards, adopted a five-year Strategic Workplan[20] targeting their collective efforts towards a suite of priority activities to help address the ecological crisis. The Strategic Workplan included flow-related and water quality actions, deploying CWA tools as well as California's broader authorities. For instance, the State Water Board's administration of water rights goes well beyond CWA authority and is a critical component of ensuring flow of adequate quality, quantity, and timing to sustain aquatic species. Development of the Strategic Workplan was an important effort to articulate the Water Boards' priorities and reinforce collaboration between the three Water Board offices.

The Water Boards have accomplished much since the Strategic Workplan was adopted.[21] Several major actions in the Strategic Workplan have been completed, notably:

- The Central Valley Regional Water Board studied the potential effects of ammonia on aquatic species and issued a new discharge permit to the Sacramento Regional County Sanitation District wastewater treatment facility requiring advanced treatment;
- The challenging Delta Methylmercury TMDL was adopted and implementation is under way;

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[20] STATE WATER RES. CONTROL BD., STRATEGIC WORKPLAN FOR ACTIVITIES IN THE SAN FRANCISCO BAY/SACRAMENTO-SAN JOAQUIN DELTA ESTUARY (July 2008), *available at* http://www.swrcb.ca.gov/waterrights/water_issues/programs/bay_delta/strategic_plan/docs/baydelta_workplan_final.pdf (last visited 06/26/12).

[21] STATE WATER RES. CONTROL BD., BAY-DELTA STRATEGIC WORKPLAN UPDATE TO THE BOARD (May 17, 2011), *available at* http://www.swrcb.ca.gov/waterrights/water_issues/programs/bay_delta/element_actions/ (last visited 06/26/12).

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- Key steps were taken toward developing a Delta Regional Monitoring Program (RMP), including publishing the first Pulse of the Delta report;
- New flow objectives to support migratory fish populations for the San Joaquin River and tributaries were proposed and are slated for adoption in 2013; and
- Water quality improvements were made through implementing TMDLs for selenium, organophosphate pesticides, and low dissolved oxygen (see Table 1 on page 23).

Although not in the Strategic Workplan, the Board also produced the Delta Flow Criteria Report[22] in August 2010, as mandated by the State's 2009 Delta Reform legislation. This significant effort drew upon the best available science to develop useful recommendations, though other activities were necessarily delayed due to the Water Board's finite resources.

Notwithstanding the Water Boards' comprehensive water quality program and the progress made, several efforts have fallen behind the original Strategic Workplan schedule, either due to resource constraints, unforeseen tasks (such as the Flow Criteria), or lengthy public process. Of most significance, the State Water Board only recently initiated its comprehensive review of the 2006 Bay-Delta WQCP, including Delta flow objectives. This was originally scheduled for completion in mid-2010, with implementation to begin by the end of 2011. The development of financial and governance options for the long-term Delta RMP has also been delayed. Lastly, though the Strategic Workplan set priorities for TMDL development and implementation, resources have not been sufficient to aggressively implement all of the adopted TMDLs (27) while concurrently developing new TMDLs (15 underway) to address other impairments. The Water Boards lack protocols for tracking TMDL implementation, providing regular updates on the status of achieving load limits, or connecting water quality monitoring data with TMDL progress.

EPA recommends the Water Boards update the 2008 Strategic Workplan, as it was envisioned as a five-year plan. Current knowledge of ecosystem stressors may suggest different or additional priorities. For example, the Board might consider prioritizing the development of site-specific temperature criteria, given how critical temperature is to fish viability in the San Joaquin watershed. During the 2011 Triennial Review, the Central Valley Regional Water Board noted concerns that its current narrative temperature objective is not adequately protective of anadromous fish, particularly during early life stages,[23] a conclusion also supported by DFG and NMFS. An updated Strategic

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[22] STATE WATER RES. CONTROL BD., DEVELOPMENT OF FLOW CRITERIA FOR THE SACRAMENTO-SAN JOAQUIN DELTA ECOSYSTEM PREPARED PURSUANT TO THE SACRAMENTO-SAN JOAQUIN DELTA REFORM ACT OF 2009 (August 3, 2010) *available at* http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/deltaflow/docs/final_rpt080310.pdf (last visited 06/27/12).

[23] CENT. VALLEY REG'L WATER QUALITY CONTROL BD., ISSUE LIST AND WORKPLAN FOR THE 2011 TRIENNIAL REVIEW OF THE WATER QUALITY CONTROL PLAN FOR THE SACRAMENTO RIVER AND SAN JOAQUIN RIVER BASINS (2011) at page 35. *Available at* http://www.waterboards.ca.gov/centralvalley/water_issues/basin_plans/2011_tr_workplan.pdf (last visited 06/26/12).

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Workplan might also reflect the Irrigated Lands Regulatory Program (ILRP), where the Central Valley Regional Water Board is working with water quality coalitions throughout the Central Valley to control farm run-off through water quality monitoring of receiving water and corrective actions when impairments are found. The ILRP goes beyond the authorities of the CWA in addressing agricultural discharges to surface water and groundwater and is critical to addressing the biggest source of nonpoint source pollution to the Estuary.

In addition, EPA encourages the Water Boards to more fully and specifically identify impairments to Bay Delta Estuary water quality where a designated use is impaired or a narrative standard is violated. One of the foundations of the CWA program is the biennial evaluation of water quality impairments included in the Integrated Water Quality Monitoring and Assessment Report under Sections 303(d) and 305(b)("Integrated Report"). The Integrated Report identifies waterbodies with water quality problems, assesses the cause of the problems, and proposes a remedial approach. Integrated Reports have tended to focus on impairments measurable by numeric objectives. In the Bay Delta Estuary, many of the beneficial uses are defined by ecological function (fish migration, warm freshwater habitat, etc.) or are protected by narrative objectives (anadromous fish doubling). Identifying impairments of these beneficial uses or violations of narrative objectives is complex. Nevertheless, the failure to do so results in a distorted picture of the status of water quality in the Bay Delta Estuary. EPA will work with the Water Boards to address this problem during the next (2014) Integrated Report cycle. As the information in the ANPR and this Action Plan suggests, many of the designated uses in the Bay Delta Estuary are impaired. Identifying those impairments and identifying the cause (whether it is a "pollutant" for purposes of Section 303(d) or some other cause) is a critical part of the Clean Water Act response to the Estuary's problems.

The State Water Board is also developing state-wide policies and general permits that will benefit the Bay Delta Estuary. In some areas, the Water Boards are undertaking groundbreaking work. For example, California's draft Toxicity Policy proposes new toxicity evaluation methods ("whole effluent toxicity") which will more consistently and effectively diagnose water quality problems caused by pesticides and other toxicants. Other state-wide policies are being developed related to nutrients (including guidance on developing numeric nutrient endpoints); biocriteria (i.e., biological objectives that will provide narrative and numeric benchmarks to describe conditions necessary to protect aquatic life beneficial uses); and methylmercury (including water quality criteria based on fish-tissue concentrations protective of human health).

In the face of complex ecological problems, declining budgets and a high degree of public and political interest, the Water Boards have accomplished much. They have targeted their efforts at the most crucial tasks and are making steady progress. EPA supports the State in these priority areas, which constitute much of EPA's Action Plan, below.

EPA's Action Plan

EPA believes the activities highlighted below are the most significant steps, within EPA's authorities and resources, toward restoring water quality and aquatic species health in the Bay Delta Estuary. Prioritizing the many Bay Delta Estuary stressors is difficult. The scientific community has not identified any single stressor as primarily responsible for diminishing fish populations. Instead, scientists on the Delta Stewardship Council's Independent Science Board, the Interagency

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Ecological Program, and the National Research Council describe contaminant and habitat stressors in the Bay Delta Estuary as interactive and highly dynamic. Informed by these experts, EPA concludes, from the perspective of the Clean Water Act, that updating and implementing the estuarine habitat water quality standard in the Bay-Delta WQCP is the most critical action for protecting aquatic life in the Bay Delta Estuary. EPA is committed to supporting the State Water Board in this important work.

Over the last decade, there has been much regulatory activity related to contaminant stressors, including pesticides, selenium, mercury, and ammonia. By contrast, the estuarine habitat water quality standard has not been updated for 17 years. Flow is a primary driver of physical habitat conditions, including turbidity, temperature, dissolved oxygen, and nutrient loading. In addition, the impacts of contaminant stressors are significantly altered by flow, as flows determine residence time, concentrations of contaminants, exposure duration and the salinity, temperature, and turbidity conditions that alter the chemistry and biological availability of contaminants.

This Action Plan relies on complementary State and EPA actions. EPA works closely with the Water Boards to develop a common understanding of how the resources and authorities of the CWA, supplemented by California's additional resources and authorities, can achieve mutual goals. EPA has consulted with the Water Boards in developing these recommendations and will continue this collaboration to address the priority water quality issues in the Estuary. EPA will evaluate progress on the proposed actions, as well as the underlying science and evolving understanding of aquatic resource protection in the Bay Delta Estuary, to ensure our resources are focused on the most critical needs.

EPA recognizes that the next 20 years will see significant change in the Bay Delta Estuary. Some changes will be the result of human decision (or non-decision) and are controllable – Delta conveyance, pollution, future invasive species, land use. Other changes are largely beyond local control – climate change, earthquakes, legacy pollution, existing invasive species, and population growth. While our response to these uncontrollable stressors will be mainly adaptive, any plans to restore the Estuary need to consider these likely threats.

Appendix I is a more complete discussion of each of the water quality issues in the ANPR, including highlights from public comments, EPA's assessment of the regulatory response to each issue, and areas where EPA believes additional focus would be helpful. Highlighted below are EPA's seven priority areas to help restore the aquatic resource beneficial uses of the Bay Delta Estuary.

1. Estuarine habitat water quality standards

The State Water Board should expeditiously review, modify, and implement estuarine habitat standards in the Bay Delta Water Quality Control Plan to more fully protect aquatic species. EPA concurs with the timeframe set for this action by the Delta Stewardship Council of June

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2014.[24] EPA will provide assistance and recommendations to the State Water Board as it considers new standards to protect estuarine habitat.

In 1991, the State Water Board designated Estuarine Habitat as a beneficial use of the waters in the Bay Delta Estuary. In 1995, the State Water Board established a Delta outflow standard designed to protect estuarine habitat and fisheries. This outflow standard[25] was designed to mimic the relationship between springtime precipitation and the geographic location and extent of estuarine habitat as had occurred in the late 1960s and early 1970s and was adopted as a springtime standard only; no attempt was made at that time to define standards explicitly protecting the estuarine habitat designated use during other times of the year.

From 1995 to 1999, there was a significant recovery of migratory and resident Delta fish populations, probably due primarily to a series of wet springs and probably helped by the newly implemented water quality standards. In about 2000, however, many critical pelagic species suffered an unexpected and dramatic decline (the "pelagic organism decline" or "POD"). This time period coincided with increases in fall pumping in the south Delta. Since then, during fall (except 2011), the low salinity zone has been consistently in the western Delta where poor quality estuarine habitat is compressed into modified, inhospitable river channels. Consequently, no matter how favorable conditions might be for pelagic fishes during the winter and spring, they have been forced into unfavorable habitat during the fall. The POD prompted wide-ranging scientific investigations.[26]

In 2009, the State Water Board conducted a Periodic Review of the 2006 Bay-Delta WQCP. The Periodic Review concluded that "[t]he available information indicates that further review and change of Delta outflow objectives may be required. Changes to Delta outflow patterns have likely contributed to the POD and are likely having an impact on the abundance of other species of concern…Based on current scientific information, recent regulatory actions, and expected recommendations from agencies and stakeholder groups, staff recommends the State Water Board conduct a detailed review of the Delta outflow objectives for possible revisions to the Bay-Delta Plan. Any revisions should also consider the need for Delta inflows."[27]

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[24] DELTA STEWARDSHIP COUNCIL, FINAL STAFF DRAFT OF THE DELTA PLAN (MAY 2012), *available at* http://deltacouncil.ca.gov/delta-plan/current-draft-of-delta-plan, at page 146 (last visited 6/28/12).

[25] The history and background of the X2 standard is discussed at length in the ANPR at pp. 52-56 and the associated footnotes.

[26] Baxter, R., R. Breuer, L. Brown, L. Conrad, F. Feyrer, S. Fong, K. Gehrts, L. Grimaldo, B. Herbold, P. Hrodey, A. Mueller-Solger, T. Sommer, and K. Souza. Interagency Ecological Program 2010 Pelagic Organism Decline Work Plan and Synthesis of Results, *available at* http://www.water.ca.gov/iep/docs/FinalPOD2010Workplan12610.pdf (last visited 06/26/12).

[27] STATE WATER RES. CONTROL BD. Staff Report, Periodic Review of the 2006 Water Quality Control Plan for the San Francisco Bay/Sacramento-Estuary, at p. 19, *available at* http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/periodic_review/docs/periodicreview2009.pdf (last visited 06/27/12).

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Over the last several years, the State Water Board has focused on the initial phase of the WQCP revision related to the Southern Delta Salinity and San Joaquin River Flow Objectives. Now that this first phase is well underway, on January 24, 2012, the Board initiated the process to review the remaining parts of the WQCP, including Delta outflow objectives (i.e., "X2"), with a goal of Board adoption of a revised WQCP by June 2014. Although this lags significantly behind the late 2011 date established in the Board's Strategic Workplan, EPA is encouraged by and supportive of the Board's commitment to this task.

The State Water Board's WQCP review has received significant attention. For example, the Delta Stewardship Council's draft Delta Plan includes a policy requiring the State Water Board (a) adopt and implement updated flow objectives for the Delta by June 2014; and (b) develop flow criteria for high-priority tributaries to the Delta by June 2018.

To assist the Board in harnessing the considerable scientific research done since 1995, EPA convened a technical workshop in March 2012 to assemble information on how biological indicators and ecological processes change in response to different locations of the low salinity zone. Input received at the Workshop was compiled and submitted to the State Water Board for use during their upcoming proceedings.[28] EPA provided initial scoping comments in April recommending that the Board consider standards to protect year-round conditions of physical factors that directly affect aquatic resources and which can be monitored and assessed in a way that will facilitate future review. An important aspect of this is developing metrics/performance measures to determine if the water quality objectives are contributing to a healthier ecosystem, and an adaptive management plan to support future revisions. Most recently, EPA submitted comments for the first of three State Water Board workshops on technical topics associated with the WQCP review.[29] EPA will continue to provide assistance and recommendations as the Board review proceeds. Additional discussion on this topic may be found in Appendix I beginning at page 20.

2. Regional Water Quality Monitoring and Assessment Program

EPA supports the establishment of Regional Water Quality Monitoring and Assessment Programs in the Central Valley. EPA applauds the Central Valley Regional Water Board's commitment to develop a Delta RMP, and has provided funding toward the Pulse of the Delta reports. With the Water Board, EPA will continue its support of an RMP in the San Joaquin River Watershed.

A significant impediment to improving water quality in the Delta and in the larger Central Valley is the lack of an effective, efficient system for collecting and assessing water quality data. There are many active monitoring programs in the Delta and its watersheds, most of which are narrowly

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[28] BROCK B. BERNSTEIN, FACILITATOR, U.S. ENVTL. PROT. AGENCY, WORKSHOP SUMMARY: TECHNICAL WORKSHOP ON ESTUARINE HABITAT IN THE BAY DELTA ESTUARY (March 27, 2012) *available at:* http://www.epa.gov/sfbay-delta/activities.html.

[29] http://www.epa.gov/sfbay-delta/activities.html

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focused to satisfy specific regulatory requirements. Some contaminants are monitored regularly; others occasionally or not at all. There is little standardization of monitoring procedures, data quality assurance or presentation protocols. Data is not accessible through a single database and some data are not accessible electronically. Most significantly, there is no regular attempt to integrate data into a meaningful assessment of water quality. The current situation makes it difficult to obtain timely access to monitoring results, to combine data for broader analyses and to strategically target and assess the effectiveness of corrective measures.

California has seen the success of regional monitoring programs in the San Francisco Bay, in Southern California, and elsewhere. In the Bay Delta Estuary, since 1970, the Interagency Ecological Program (IEP) has provided the foundational science for water management activities. Though its contributions to understanding aquatic resources in the Estuary have been invaluable, the IEP has not historically focused on contaminants. When IEP launched its POD investigations in 2005, the lack of any comprehensive assessment of water quality information impeded the understanding of the causes of the decline. In response, IEP directed numerous studies on fish health and contaminant effects and the Water Boards commissioned a University of California at Davis study to synthesize existing contaminants data. The UC Davis study concluded there were insufficient high-quality data to make conclusions about the potential role of specific contaminants in the POD.[30] A functioning RMP would include regular data collection and assessment, better preparing us to answer critical management questions.

The goals of a regional monitoring program are supported by many. The federal agencies, in their December 2009 Interim Federal Action Plan, committed to work together and with California to develop a comprehensive regional water quality monitoring and assessment program in the Delta and its tributaries.[31] In 2006, the California legislature established a Water Quality Monitoring Council to improve the State's system for collecting information on its water resources and make that information available to decision makers and the public. In its 2010 Comprehensive Water Quality Monitoring Program Strategy for California, the Council endorsed the California Environmental Data Exchange Network (CEDEN) as the mechanism for bringing monitoring data together from a wide variety of sources. The Council also committed to developing a series of internet portals (MyWaterQuality.com) to provide these data to the public. A Bay Delta Estuary portal is being developed jointly by the Water Board, IEP and the state and federal water contractors. The DSC also supports regional monitoring in its draft Delta Plan, identifying 2017 as a target date for developing and implementing a Delta RMP.[32]

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[30] Michael L. Johnson, et al., Evaluation of chemical, toxicological, and histopathologic data to determine their role in the pelagic organism decline (April 20, 2010) *available at:* http://www.swrcb.ca.gov/rwqcb5/water_issues/delta_water_quality/comprehensive_monitoring_program/contaminant_synthesis_report.pdf (last visited 06/27/12).

[31] INTERIM FEDERAL ACTION PLAN (December 22, 2009) at page 15, *available at* http://www.doi.gov/documents/CAWaterWorkPlan.pdf (last visited 06/27/12).

[32] DELTA STEWARDSHIP COUNCIL, FINAL STAFF DRAFT OF THE DELTA PLAN (MAY 2012), *available at* http://deltacouncil.ca.gov/delta-plan/current-draft-of-delta-plan (last visited 06/27/12).

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Development of a water quality RMP for the Delta and its watersheds will be an incremental process. In the Delta, the Central Valley Regional Water Board has taken initial steps, focusing on the contaminants-related monitoring under its direct control. In March 2011, the Central Valley Regional Water Board issued the first Pulse of the Delta report, an accessible summary of recent Delta water quality information related to ammonia, pyrethroid pesticides and other contaminants of emerging concern. The second "Pulse", scheduled for publication in September 2012, will highlight mercury, sediment quality and nutrients. The Central Valley Regional Water Board is developing governance and finance options for the RMP and working with dischargers to achieve more integrated monitoring. In June 2012, they released a draft "Regional Monitoring and Assessment Framework and its Implementation" describing proposed monitoring questions and design principles for the Delta RMP.

In the San Joaquin watershed, EPA has made a similar investment, in collaboration with the Water Boards and others. The Central Valley Watershed Monitoring Directory was built to promote and facilitate improved coordination of water quality monitoring across the basin. In March 2010, EPA produced a "Proposed Strategy for San Joaquin River Basin Water Quality Monitoring and Assessment" and is currently funding the Coalition for Urban and Rural Environmental Stewardship (CURES) to implement this strategy. As part of that effort, in February 2012, CURES convened a workshop "Who's Watching the San Joaquin River." This forum brought together agricultural and municipal water districts and federal and state agencies to discuss their respective water quality monitoring programs, the questions they are trying to answer, what they're learning from the data, and the potential benefit of increasing regional collaboration. A second workshop will focus on the next steps for setting up a San Joaquin Watershed RMP.

EPA recently awarded $59,660 to Revive the San Joaquin to establish a citizen-based water quality monitoring and pollution prevention education program in the Fresno area.

www.revivethesanjoaquin.org/

As the San Joaquin and Delta RMP efforts proceed, coordination with the IEP and the Delta Science Program is essential, especially as the IEP considers expanding its role to include more contaminant monitoring and/or additional monitoring upstream. Recently, IEP formed a Management, Assessment, and Synthesis Team (MAST) to conduct more timely synthesis and assessment of data. The nascent RMPs should consider supporting MAST and leveraging its expertise. Inclusion of the Central Valley Regional Water Board in the IEP Memorandum of Understanding would foster this collaboration. Recent work funded by the CALFED and Delta Science Programs, "Framework for a Unified Monitoring, Assessment and Reporting Program (UMARP) for the Bay-Delta"[33] provides guidance to help unite monitoring efforts to be more responsive to management needs.

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[33] S. Luoma, Chair, Framework for a Unified Monitoring, Assessment and Reporting Program (UMARP) for the Bay-Delta 2010 Report (Draft November 4, 2011), *available at* http://deltacouncil.ca.gov/science-program-event-products (last visited 06/27/12).

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3. Total Maximum Daily Load Implementation

EPA will work with the Water Boards to accelerate Bay Delta Estuary water quality restoration through strengthening the implementation of Total Maximum Daily Loads (TMDLs).

TMDLs are an important catalyst for restoring impaired water quality. They establish a technical foundation for identifying pollutant load reductions and actions needed to achieve water quality standards. EPA provides financial and technical assistance to the Water Boards to develop and implement TMDLs for impaired water bodies. EPA reviews and, if the TMDL complies with the CWA, approves final TMDLs. California has strong TMDL implementation plans and regulatory authorities, relative to other states, to address polluted runoff, habitat loss, and habitat degradation.

The Water Boards prioritize development of TMDLs based on the severity of impairments. There are nine adopted TMDLs in the San Francisco Bay Delta Estuary addressing stressors that EPA identified in the ANPR as having the most significant impact on fish populations. *see* Table 1 on page 23. These TMDLs are designed to eliminate selenium and pesticide-caused aquatic toxicity and to remove low dissolved oxygen (DO) conditions that kill fish and block fish migration. Selenium, pesticides, and poor habitat conditions, like low dissolved oxygen, are linked to declining resident and migratory fish populations. There are also five EPA-approved mercury TMDLs in the Bay Delta Estuary. *see* Table 2 on page 27.

Mercury and methylmercury pose unique water management challenges in the Bay Delta Estuary. Mercury contamination affects public health, aquatic-dependent wildlife, and subsistence, recreational, and commercial fishing. Some elemental mercury is transformed to toxic methylmercury in the low-oxygen conditions present in some wetlands. Large-scale tidal and freshwater wetland restoration is proposed for mercury-contaminated sites in the Delta to provide habitat needed for protecting and increasing populations of resident and migratory fish. (See action #6 for information on activities to minimize the formation and mobilization of methylmercury).

Although TMDLs in the Bay Delta Estuary have succeeded in reducing pollutant loads, they also illustrate challenges to fully attaining water quality standards, as shown in Table 1. DO levels in the Stockton Deepwater Ship Channel violate the standard despite improvement in DO values as a result of upgrading the Stockton wastewater treatment plant to tertiary treatment and installing an aerator in the ship channel. Water quality standards have been achieved in Salt Slough and the Grasslands Marsh by reducing selenium loads by two-thirds (from 1996 to 2007) through water management improvements and redirecting contaminated flow to Mud Slough. Nevertheless, the selenium load reductions needed to attain water quality standards in Mud Slough have not yet been met. Diazinon and chlorpyrifos TMDL implementation activities, along with FIFRA label changes and cancelation of registrations for most non-agricultural uses, resulted in meeting diazinon water quality standards in Bay Area and Sacramento urban streams and on 79-river miles in the Sacramento and Feather River systems.

To read more about how a watershed approach has led to water quality improvements in the Grasslands Marsh and the Sacramento and Feather Rivers, visit EPA's website at:

www.epa.gov/sfbay-delta/improvement.htm

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However, the majority of river miles identified as impaired by these pesticides in the Bay Delta Estuary still have levels which exceed water quality standards, and many now have pyrethroid pesticides that cause aquatic toxicity.

EPA is supporting efforts to strengthen TMDL implementation. TMDL implementation refers to completing required TMDL actions, achieving load limits, and removing water quality impairments. EPA will continue to work with the Regional Water Boards to implement TMDLs through the CWA nonpoint source program and the NPDES regulatory program. For example, incorporating TMDL Waste Load Allocations (WLAs) into Municipal Separate Storm Sewer System (MS4) permits is critical to addressing urban runoff, which significantly contributes to water quality impairments in the Bay Delta Estuary. There are four MS4 permits in the Bay Delta Estuary that are either expired or will expire by the fall of 2013. The updates of these MS4 permits need to include urban runoff WLAs as clear, measurable, and enforceable permit provisions. EPA also encourages the Water Boards to fully use their broad authorities to address water quality impairments, including the Irrigated Lands Regulatory Program and, where appropriate, the water rights program.

EPA and Water Board oversight of TMDL implementation can improve accountability and help align grant and program activities to ensure timely achievement of load limits and removal of impairments. EPA has identified several additional actions to address TMDL implementation challenges in the Bay Delta Estuary.

First, EPA will work with the Water Boards to assess progress in implementing approved TMDLs. This will begin with the TMDLs (identified in Table 1) for the contaminants EPA believes are of most importance to aquatic species in the Bay Delta Estuary. California began reporting TMDL implementation progress in the California Water Boards' 2010-2011 Annual Performance Report.[34] EPA will build on this effort with the Water Boards to identify complete, incomplete and overdue actions for TMDLs listed in Tables 1 and 2; evaluate overdue actions to achieve load limits; create a list of priority TMDL actions; identify methods for completing these actions; and confirm target dates for achieving TMDL load limits. This is the beginning of an EPA sustained effort to oversee progress towards achieving water quality restoration goals specified in the Bay Delta Estuary TMDLs.

Second, EPA will expand the use of watershed plans and decision tools to improve the efficiency and effectiveness of management practices necessary to achieve TMDL pollutant load reductions. Decision tools can identify cost-effective, individual TMDL actions focused on achieving water quality goals. For example, EPA worked with DWR and other partners to develop a pesticide risk assessment model, the "Spatial and Temporal Quantification of Pesticide Loadings to the Sacramento River, San Joaquin River, and Bay-Delta", that identifies the best locations and times

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[34] STATE WATER RES.CONTROL BD. , THE CALIFORNIA WATER BOARDS' ANNUAL PERFORMANCE REPORT - FISCAL YEAR 2010-11, *available at* http://www.waterboards.ca.gov/about_us/performance_report_1011/ (last visited 06/27/12).

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for BMP installation based on the presence of sensitive aquatic life and pesticide use.[35] This information can minimize aquatic life exposure to land-applied pesticides by informing choices about the type, location, and timing of BMPs. EPA will help make this tool widely available and encourage its use. This model could be used to inform choices about priority implementation areas for programs such as the California Nonpoint Source Program (CWA Section 319 funds) and the new Natural Resources Conservation Service' Bay-Delta Initiative. Decision-makers will have better information to make cost-effective implementation decisions to improve water quality and aquatic habitats by developing watershed plans and decision tools based on TMDLs.

Third, EPA will assist the Water Boards in developing tracking and accounting tools to document and publicly report TMDL progress. Reliable tracking and accounting of pollutant reduction efforts are essential for program managers and policy makers to determine if current strategies are sufficient or if new strategies are necessary to meet TMDL milestones and goals. In addition, accurate and transparent tracking and accounting are critical to maintaining public confidence that water quality restoration funds are being wisely invested and that watershed partners are fulfilling their commitments to reduce loads and enhance aquatic habitat.

4. Selenium water quality standards

By December 2012, EPA will draft new site-specific numeric selenium criteria to protect aquatic and terrestrial species dependent on the aquatic habitats of the Bay Delta Estuary.

EPA's selenium work continues a multi-decade effort responding to scientific evidence that the current selenium water quality standards do not adequately protect sensitive species. In 2000, FWS and NMFS drafted a Biological Opinion finding jeopardy under ESA for the selenium criteria which EPA proposed in the California Toxics Rule. To avoid a final jeopardy opinion, EPA agreed to develop site-specific water quality criteria for selenium, beginning in the Bay Delta Estuary. EPA is using an ecosystem-based model created by the U.S. Geological Survey (USGS)[36] with advice from the FWS and NMFS. The model reflects the food web in the Bay Delta Estuary, the diet of sensitive species and their use of habitats, and hydrological conditions. Certain threatened and endangered species, including sturgeon and certain birds, feed on clams. The *Corbula amurensis* clam species, which is the Estuary's dominant bivalve, bioaccumulates selenium very efficiently. More stringent selenium water quality criteria will require actions that decrease allowable concentrations of selenium in surface waters of the Bay Delta Estuary and may set allowable levels of selenium in the tissue of fish and wildlife. The new criteria would reduce the chronic (long-term) exposure of sensitive species to selenium.

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[35] Hoogeweg, C.G., W.M. Williams, R. Breuer, D. Denton, B. Rook and C. Watry. 2011. Spatial and Temporal Quantification of Pesticide Loadings to the Sacramento River, San Joaquin River, and Bay-Delta to Guide Risk Assessment for Sensitive Species. CALFED Science Grant #1055. November 2, 2011. *available at* http://gis.waterborne-env.com/downloads/CALFED_Final_Report_2011-Nov_2_FINAL.pdf (last visited 07/23/12).

[36] Theresa Presser & Samuel N. Luoma, *A Methodology for Ecosystem-Scale Modeling of Selenium* , 6 Integrated Environmental Assessment and Management 685 (October 2010), *available at* http://onlinelibrary.wiley.com/doi/10.1002/ieam.101/full (last visited 06/27/12).

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Following the development of the Bay Delta selenium criteria, site-specific criteria will be developed for other parts of California, including the San Joaquin Valley watershed.

EPA is engaged in other efforts to minimize selenium discharges to the San Joaquin River and the Bay Delta Estuary, including the Grasslands Bypass Project and the North San Francisco Bay TMDL. These are described in Appendix I beginning at page 2.

To learn more about EPA's Strategic Plan for the San Joaquin Valley, go to:

www.epa.gov/region9/strategicplan/sanjoaquin

5. Pesticide pollution prevention

EPA will help ensure that federal regulation of pesticides under FIFRA more fully considers effects on aquatic life. EPA will also work with our partners to minimize pesticide pollution in urban runoff.

EPA is committed to using its authority under FIFRA to minimize aquatic toxicity related to the use of pesticides. In California, pesticides registered by EPA under FIFRA have been found to cause aquatic toxicity and water quality impairments, even though they are applied in full compliance with FIFRA requirements. Data regarding these impacts is essential to a more thorough evaluation during the pesticide registration review process which is done every 15 years by EPA's Office of Pesticide Programs (OPP) in Washington D.C. EPA Region 9 is working with California agencies and OPP to ensure OPP has the most currently available pesticide water quality data for use in pesticide aquatic exposure assessments. California data will help OPP assess potential risk to aquatic organisms and develop the necessary use restrictions to prevent pesticide water quality problems in the future. OPP and EPA's Office of Water are also developing a "Common Effects Methodology" to establish a common approach under FIFRA and CWA for estimating effects of pesticides on aquatic life.

In addition, EPA will work with the Water Boards and other partners to mitigate pesticide pollution in urban runoff.[37] EPA supports the inclusion of measurable and enforceable Low Impact Development (LID) requirements in all MS4 permits for new development and redevelopment to minimize pollution in urban runoff. The Central Valley Regional Water Board has the opportunity to foster LID to minimize pollutants in urban runoff when they update MS4 permits for the cities of Fresno, Modesto, and Stockton and the county of Sacramento (all of which have expired or will expire within the next two years.)

EPA also recommends including LID requirements in CWA Section 401 Water Quality Certifications. CWA Section 401 applies to development projects that require a CWA Section 404

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[37] EPA notes that recent research has shown a significant reduction in diazinon and chlorpyrifos in urban settings after EPA's phase out of those pesticides. *See* K.R. RYBERG, ET AL., U.S. GEOLOGICAL SURVEY, TRENDS IN PESTICIDE CONCENTRATIONS IN URBAN STREAMS IN THE UNITED STATES, 1992-2008 (2010), *available at* http://pubs.usgs.gov/sir/2010/5139/pdf/sir2010-5139.pdf (last visited 06/26/12).

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permit from the Corps. These projects include many new residential and commercial developments. EPA recommends the Central Valley Regional Water Board consider EPA's June 5, 2012, guidance on integrated municipal stormwater and wastewater planning.[38] If aquatic toxicity from urban runoff persists in the Bay Delta Estuary and its tributaries, EPA recommends the Central Valley Regional Water Board evaluate the use of residual designation authority to establish a Delta Region Municipal MS4 permit.

EPA is funding pesticide pollution prevention efforts by the San Francisco Estuary Partnership (SFEP). SFEP's Pesticide Reduction Campaign will promote less toxic pesticide options through educating retail employees and Bay Area residents.

EPA has identified several other actions to support California's groundbreaking work to minimize pesticide discharges and accelerate the restoration of water quality in the Bay Delta Estuary. These are outlined in Appendix I beginning at page 9.

6. Restore aquatic habitats while managing methylmercury

EPA will advance both the restoration of aquatic habitats and the implementation of the Delta methylmercury (MeHg) TMDL. EPA will fund research by USGS to study whether treatment technology used for carbon capture in the Delta can also be used to sequester MeHg in accreting wetlands. EPA will also collaborate on proposed restoration projects to ensure MeHg is effectively managed.

Restoring wetlands in and near the Delta is an essential component of reviving the Estuary's health. However, nearly all the locations targeted for habitat restoration in the Delta have been, or are at risk of being, contaminated with mercury from historical mining sources and ongoing air deposition from industry. This mercury can be transformed into MeHg by the anaerobic (low oxygen) conditions prevalent in wetlands. This toxic form of mercury can accumulate in fish and people who eat them.[39] Health advisories have been issued for the Delta and several upstream rivers.[40] Given the long-term benefits of restoring aquatic habitats in the Delta (as well as the health benefits of eating fish), preventing the formation and mobilization of methylmercury in wetlands is critical. Scientific methods are being explored to prevent MeHg formation.

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[38] U.S. ENVTL. PROT.AGENCY, MEMORANDUM FROM NANCY STONER AND CYNTHIA GILES RE: INTEGRATED MUNICIPAL STORMWATER AND WASTEWATER PLANNING APPROACH FRAMEWORK (JUNE 5, 2012), *available at* http://www.epa.gov/npdes/pubs/integrated_planning_framework.pdf (last visited 06/27/12).

[39] *See generally* STATE WATER RES. CONTROL BD., SWAMP –SURFACE WATER AMBIENT MONITORING PROGRAM COASTAL STUDY – BIOACCUMULATION IN SPORT FISH, *available at* http://www.waterboards.ca.gov/water_issues/programs/swamp/coast_study.shtml. (last visited 06/27/12).

[40] The Central Valley Regional Water Board is developing an exposure reduction program, pursuant to the Delta Mercury TMDL adopted in 2010 and approved by EPA in 2011. See page 14 of the TMDL, *available at:* http://www.swrcb.ca.gov/rwqcb5/water_issues/tmdl/central_valley_projects/delta_hg/2011oct20/bpa_20oct2011_final.pdf (last visited 06/27/12).

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USGS has demonstrated on Twitchell Island that growing tules can rebuild peat soils, reverse subsidence, and sequester carbon dioxide. With DWR support, USGS is now studying the methane emissions from the restored wetlands and the treatment options for dissolved organic carbon (DOC) to safeguard water quality. EPA research funds will augment this work by enabling USGS to study whether the treatment technology used for DOC could also be used to sequester MeHg in the accreting wetlands. This work is consistent with the DSC's draft Delta Plan which calls for the linking of restoration projects with efforts to reverse subsidence on sunken Delta islands, sequester carbon, and address the effects of MeHg on food webs and the estuarine ecosystem.

In the Cosumnes River Preserve, using CWA Section 319 funds, the Central Valley Regional Water Board awarded the U.S. Bureau of Land Management and USGS $832,000 to develop management measures for ricelands to minimize the formation and transport of MeHg, including the control of irrigation water and the harvesting of organic matter specifically.

EPA will also collaborate on proposed restoration projects within the Yolo Bypass to ensure MeHg is effectively managed during both the near-term restoration phase and the long-term stewardship phase. The 59,000-acre Yolo Bypass was constructed as a flood control feature and retains some of its pre-settlement floodplain functions as it supports 42 species of fish, 200 species of birds, and an abundance of phytoplankton and zooplankton. Proposed restoration projects include increasing the areal extent of aquatic habitat beyond that already contained in the Yolo Wildlife Area and renovating weirs that have proved harmful to fish. However, sediments within the Bypass are contaminated with mercury and could provide the substrate necessary for the formation of methylmercury. In addition, Cache Creek transports mercury from abandoned mercury mines in the Coast Range to the Cache Creek Settling Basin and eastward to the Bypass, and accounts for 60% of all the mercury discharged within the Central Valley. EPA's Superfund Program (and responsible parties) have already substantially controlled mercury releases from the Abott/Turkey Run Mine and the Sulphur Bank Mercury Mine at Clear Lake, upstream of Cache Creek. EPA will build on these efforts to further reduce the environmental threats posed by methylmercury.

In addition, EPA has awarded $1.5 million to the California Coastal Conservancy to help restore tidal marsh and related habitats on the 1,166-acre Dutch Slough property in Contra Costa County, where Marsh Creek enters the Delta at Big Break. Marsh Creek receives acid mine drainage from the abandoned Mount Diablo Mercury Mine situated 30 miles upstream from Dutch Slough, and mercury-laden sediment occupies space within the Marsh Creek Reservoir upstream from Dutch Slough. EPA will work with stakeholders to ensure MeHg is effectively managed at Dutch Slough. The Dutch Slough Restoration Project presents a rare opportunity to restore tidal marsh and a floodplain on the delta of a creek and to do so in a way that prevents the formation and transport of MeHg as anaerobic processes take hold on a newly restored tidal marsh.

EPA recently awarded Friends of Marsh Creek $60,000 to help the local community improve water quality through pollution prevention, best management practices for agricultural discharges, and appropriate creekside land uses.

www.fomcw.org/

EPA is also funding the Coastal Conservancy to study mercury cycling in South Bay tidal wetlands and salt ponds in order to adaptively manage future restoration activities.

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These projects will provide lessons learned that may be applicable to other restoration projects in the Estuary. EPA will assist with this information transfer. Additional activities are described in Appendix I beginning at page 29.

7. Bay Delta Conservation Plan

EPA is supporting development of the Bay Delta Conservation Plan (BDCP) as one of the means of meeting the co-equal goals established by the California legislature – a more reliable water supply and a restored Delta ecosystem.

As the BDCP is an ESA mechanism, EPA does not have a direct regulatory role. However, under Clean Air Act Section 309, EPA will review and comment on NEPA documents for the BDCP. In addition, EPA shares permitting responsibilities under CWA Section 404 with the Corps, and several BDCP projects will require CWA 404 permits. EPA also has an interest in how changes in Delta hydrology caused by BDCP implementation might affect attainment of water quality standards in the Delta.

Given these interests, EPA has agreed to be a Cooperating Agency for the BDCP EIS to provide early input to the lead agencies (DWR, DFG, USBR, FWS and NMFS)) on the draft EIR/EIS.[41] We are also working with the Corps and the lead agencies to integrate CWA requirements into the process of NEPA and ESA compliance so that CWA permitting of BDCP projects can proceed efficiently.

In both these capacities (NEPA and CWA 404), EPA will focus on three issues. The first is antidegradation. Any change in the location and operations of Delta water diversions must not further impair water quality in the Estuary. The Central Valley watershed is the source of many pollutants of concern in the Delta, including pesticides, nutrients (including ammonia), selenium, and mercury. All of the water bodies in the Bay Delta Estuary have been identified as "impaired" (i.e. not meeting water quality standards) for one or more parameters. Existing concentrations and loads of contaminants entering the Delta from upstream harm the health of the Delta ecosystem, as well as the upstream waters. In particular, large storm pulses can flush contaminants into the Delta. Changes in the location, timing, and amount of Delta diversions could exacerbate this problem. As Sacramento River inflow is reduced and/or San Joaquin River inflow increases, water quality will be affected.

In addition to contaminants, EPA is concerned with the location and areal extent of the low salinity zone (LSZ), the area of the Estuary where sea water mixes with fresh river water creating important habitat. Many estuarine organisms show greater abundance or improved survival when the LSZ is

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[41] Letter from Kathleen Goforth and Karen Schwinn, USEPA, to John Engbring, USFWS (November 12, 2008), 2 pp. *available at* http://www.epa.gov/sfbay-delta/pdfs/EPA_CooperatingAgencyStatus_BDCP_111208.pdf (last visited 06/27/12).

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located in the broad, complex shallows of Suisun Bay rather than in the less hospitable, rock-lined channels of the Western Delta. The location and operation of Delta diversions can significantly affect the location of the LSZ. This is of particular concern given the record low levels of some pelagic fish species over the last decade.

Secondly, any new Delta diversion and conveyance facilities will have substantial impacts (direct and indirect) to "waters of the U.S.", including the Sacramento River and other Delta tributaries, sloughs and wetlands, depending on their location. Pursuant to EPA's shared responsibilities with the Corps, EPA will assist the Corps during the CWA 404 permitting process by: helping to verify the jurisdictional determination of the extent of impact to waters and wetlands; assessing the CWA Alternatives Analysis to ascertain the "Least Environmentally Damaging Practicable Alternative"; and reviewing the compensatory mitigation proposed for any unavoidable impacts to waters of the U.S.

Lastly, the California legislature and the Delta Stewardship Council (as well as many scientists) have identified a need to reduce reliance on the Delta for water supply. We are encouraged by the position of the lead federal agencies for the BDCP that the Purpose and Need Statement of the BDCP "is not intended to imply that increased quantities of water will be delivered under the BDCP."[42] We are also optimistic that the State Water Board's upcoming review of the Bay-Delta WQCP will appropriately address this California policy. Completion of the Board's work is essential for fully informed decisions on the BDCP.

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[42] Letter from Ren Lohoefener, et al. to Jared Blumenfeld, et al. (October 26, 2010), 3 pp. *available at* http://www.epa.gov/sfbay-delta/pdfs/LeadFedAgncysBdcpPurpose-NeedLtrOct262010.pdf (last visited 06/27/12).

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Table 1:
TMDLs in the San Francisco Bay Delta Estuary Addressing Aquatic Resource Impairments Identified in the ANPR

TMDL Pollutant/Stressor and water body (EPA Approval Date)	Primary Pollutant Sources & Allocations	Target Compliance Date	Load Limits/TMDL Targets Achieved Load Reduction/TMDL Progress
Selenium **Salt Slough** (1999)	• Major: Shallow ground water drainage (agricultural tile drainage) from the 97,000-acre Drainage Project Area of the Grassland Watershed (88% of total load) • Minor: Distributed inputs throughout the San Joaquin River Basin • 100% load allocation for non point source	October 2010[1]	• Selenium loads reduced by two-thirds (1996-2007) through water & crop management. • Selenium contaminated shallow ground water drainage is routed away from Salt Slough to achieve load limits (balance) • Selenium removed as impairment from Salt Slough on 303(d) List
Selenium **Grasslands Marshes** (2000)	• Major: Shallow ground water drainage (agricultural tile drainage) from the 97,000-acre Drainage Project Area of the Grassland Watershed (88% of total load) • Minor: Distributed inputs throughout the San Joaquin River Basin • 100% load allocation for non point source	October 2010[1]	• Selenium loads reduced by two-thirds (1996-2007) through water & crop management. • Selenium contaminated shallow ground water drainage is rerouted away from Grasslands Marsh to achieve load limits • Selenium removed as impairment from Grasslands Marshes on 303(d) List
Selenium **Lower San Joaquin River**[2] (2003)	• Major: Subsurface agricultural return flows (tile drainage) from the 97,000-acre Drainage Project Area of the Grassland Watershed (88% of total load) • Minor: Distributed inputs throughout the San Joaquin River Basin • 100% load allocation for non point source	December 2019	• Selenium removed as impairment downstream of the confluence with the Merced River on 303(d) list • Selenium loads reduced by two-thirds (1996-2007) through water & crop management. • Standards not yet achieved for Mud Slough North, from the end of the San Luis Drain to the San Joaquin River and in the San Joaquin River from Mud Slough, North, to the Merced River.

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TMDL Pollutant/Stressor and water body (EPA Approval Date)	Primary Pollutant Sources & Allocations	Target Compliance Date	Load Limits/TMDL Targets Achieved / Load Reduction/TMDL Progress
Diazinon & Chlorpyrifos Sacramento County Urban Streams[3] (2004)	• Urban runoff from applications of pesticide in non-agricultural areas	September 2013	• Elk Grove Creek impairment removed from 303(d) List • Central Valley RWQCB anticipates delisting most of these streams in the next 303(d)/305(b) Report. • FIFRA registrations cancelled for most non-agricultural uses. • Water quality improving.
Low Dissolved Oxygen (DO) Stockton Deep Water Ship Channel (2007)	• WWTP, urban and rural runoff sources of oxygen demanding substances[5] (e.g., organic nutrients). • Ship channel geometry.[6] • Reduced flow.[7] • TMDL assigns equal responsibility of impairment to all three factors.	December 31, 2011	• Substantial reduction in organic nutrient discharges from Stockton WWTP. • Installation of aerator. • DO levels improving, but are still too often below the objective.
Diazinon & Chlorpyrifos Lower San Joaquin River[4] (2006)	• Primarily agricultural applications. • Load and wasteload allocations are equal to the Delta Loading Capacity.	2011	• Approximately 46 miles of San Joaquin River de-listed for diazinon • 85 miles remain on the 303(d) list for diazinon.. • 130 miles remain on 303(d) list for chlorpyrifos.

Table 1: TMDLs in the San Francisco Bay Delta Estuary Addressing Aquatic Resource Impairments Identified in the ANPR

TMDL Pollutant/Stressor and water body (EPA Approval Date)	Primary Pollutant Sources & Allocations	Target Compliance Date	Load Limits/TMDL Targets Achieved	Load Reduction/TMDL Progress
Diazinon & Pesticide-Related Toxicity **Bay Area Urban Creeks** (2007)	• Urban runoff that contains pesticides as a result of pesticide application for structural pest control, landscape maintenance, agricultural, and other pest management purposes. • 100% of the TMDL is allocated to urban runoff as a "wasteload allocation" to stormwater point sources	Adjusts to changes in pesticides causing toxicity	• Diazinon and chlorpyrifos registrations cancelled for most non-agricultural uses are is no longer the source of aquatic toxicity.	• Aquatic toxicity in urban streams is caused by pyrethroid pesticides • Pesticide-related toxicity load limits are not met. Load limits are met for diazinon.
Diazinon & Chlopryifos **Sacramento-San Joaquin River Delta** (2007)	• Primarily agricultural applications. • Load and wasteload allocations are equal to the Delta Loading Capacity.	December 1, 2011	• 2011 monitoring shows diazinon concentrations below objective in some Delta waterways.	• 2011 monitoring shows chlorpyrifos concentrations exceeding objectives in some Delta waterways. • All waters in Delta remain on 303(d) List in for diazinon & chlorpyrifos.
Diazinon & Chlorpyrifos **Lower Feather River and Lower Sacramento River**[8] **(2008)**	• Primarily agricultural applications. • Load and wasteload allocations are equal to the Delta Loading Capacity objectives.	2010	• Diazinon impairment removed from 79-river miles of Lower Sacramento and Feather Rivers. • Load limits & objectives met for chlorpyrifos on Lower Sacramento.	• Chlorpyrifos impairment remains on Lower Feather River.

1. The 5 µg/L four-day average water quality objective for the SJR below the Merced River must be met in above normal and wet years starting in water year 2006. T he 5 µg/L four-day average objective must be met for critically dry, dry and below normal years starting in water year 2011. The 5 µg/L four-day average water quality objective must also be met for all year types in Mud Slough and the SJR from Sack Dam to the Merced River starting in water year 2011.
2. 50 miles of Lower San Joaquin River between Salt Slough (upstream border) and Vernalis at Airport Way Bridge (downstream border).
3. Arcade Creek, Elder Creek, Elk Grove Creek, Morrison Creek, Chicken Ranch Slough, and Strong Ranch Slough.
4. 130 miles of Lower San Joaquin River from Mendota D am to Vernalis at Airport Way bridge.
5. Stockton WWTP, algae loads from the watershed, and urban and agricultural runoff.

Table 1: TMDLs in the San Francisco Bay Delta Estuary Addressing Aquatic Resource Impairments Identified in the ANPR

6. Channel geometry reduces the assimilation capacity of oxygen demanding substances in three ways: 1) the deep wide channel red uces water velocity, increasing water residence time, concentration of organic material, and consumption of available oxygen; 2) the small water surface area to depth ratio reduce s the proportion of water that is naturally aerated at the water air surface; and 3) poor light penetration, the result of increasing the concentration of organic material, encourages algal death and consumptio n of oxygen through decay process.
7. Reduced flows from San Joaquin River water diversions to the State and Federal water projects , water transfers, and in basin diversions reduce reduces the assimilation capacity of oxygen demanding substances by reduces water velocity, increasing water residence time, and concentration of organic material which consumes available oxygen.
8. Sacramento River below Shasta Dam, Feather River below Oroville Dam.

ED_000733_DD_NSF_00049722-00028

Table 2: Mercury and Methylmercury TMDLs in San Francisco Bay Delta Estuary Watershed

TMDL Pollutant/Stressor and water body (EPA Approval Date)	Primary Pollutant Sources & Allocations	Target Compliance Date	Implementation Progress
Mercury **Clear Lake** **(2003)**	• 100% Load Allocation = nonpoint sources, Sulphur Bank mercury mine, atmospheric deposition, tributaries,	2023	• Implementation activities at Sulphur Bank mine are occurring.[1] • Water quality monitoring is done for special studies and associated with individual actions. • Monitoring data is not easily available and a periodic monitoring program has not been established.
Mercury Cache, Bear, & Sulphur Creeks & Harley Gulch **(2007)**	• 100% Load Allocation = nonpoint sources, mercury mines	2027[2]	• Water quality monitoring is done for special studies and associated with individual actions. • Monitoring data is not easily available and a periodic monitoring program has not been established.
Mercury **San Francisco Bay** **(2008)**	• Load Allocation = 85% to bed erosion, upstream watersheds, atmospheric deposition, non-urban and stormwater runoff. • Waste Load Allocation is ~ 15% of sources including NPDES facilities and MS4 outfalls.	2030	
Mercury & Methylmercury Guadalupe River Watershed **(2010)**	• ~85% Load Allocation. Nonpoint sources = mining waste, impoundments (tributary lakes and reservoirs), and atmospheric deposition. • ~ 15% Waste Load Allocation to urban storm water point sources (MS4s).	2030	
Mercury & Methylmercury Sacramento-San Joaquin Delta **(2011)**	• Load Allocation = 96% to Nonpoint sources including: Agricultural drainage, Atmospheric wet deposition, Open water, Tributary Inputs, Inputs from Upstream Subareas, Urban (nonpoint source), Wetlands. • Waste Load Allocation is ~ 4% of sources including NPDES facilities and MS4 outfalls.	2030	• Workplans for phase I control studies are being created. • Water quality monitoring will be part of control studies and other implementation actions. • Developing exposure reduction strategy • Monitoring data will be made available after it is generated.

1. Clear Lake Mercury TMDL 2010 Update http://www.swrcb.ca.gov/centralvalley/water_issues/tmdl/central_valley_projects/clear_lake_hg/cl_final_tmdl_5yr_update.pdf
2. Target date for load reduction achievement – 15 – 20 years after implementation of mercury control program; 5 – 10 additional years after water column objectives are met to reduce fish tissue concentrations to objective concentrations.