Chapter 2
The Delta Plan

THIS PAGE INTENTIONALLY BLANK

The Sacramento-San Joaquin Delta Reform Act established the Delta Stewardship Council to achieve more effective governance while providing for the sustainable management of the Delta ecosystem and a more reliable water supply, using an adaptive management framework, as reflected in the Water Code sections below.

> *85001 (c) By enacting this division, it is the intent of the Legislature to provide for the sustainable management of the Sacramento-San Joaquin Delta ecosystem, to provide for a more reliable water supply for the state, to protect and enhance the quality of water supply from the Delta, and to establish a governance structure that will direct efforts across state agencies to develop a legally enforceable Delta Plan.*
>
> *85020 (h) Establish a new governance structure with the authority, responsibility, accountability, scientific support, and adequate and secure funding to achieve these objectives*
>
> *85022 (a) It is the intent of the Legislature that state and local land use actions identified as "covered actions" pursuant to Section 85057.5 be consistent with the Delta Plan. This section's findings, policies, and goals apply to Delta land use planning and development.*
>
> *85052 "Adaptive management" means a framework and flexible decision making process for ongoing knowledge acquisition, monitoring, and evaluation leading to continuous improvement in management planning and implementation of a project to achieve specified objectives.*
>
> *85204 The council shall establish and oversee a committee of agencies responsible for implementing the Delta Plan. Each agency shall coordinate its actions pursuant to the Delta Plan with the council and the other relevant agencies.*
>
> *85211 The Delta Plan shall include performance measurements that will enable the council to track progress in meeting the objectives of the Delta Plan. The performance measurements shall include, but need not be limited to, quantitative or otherwise measurable assessments of the status and trends in all of the following:*
>
> > *(a) The health of the Delta's estuary and wetland ecosystem for supporting viable populations of aquatic and terrestrial species, habitats, and processes, including viable populations of Delta fisheries and other aquatic organisms.*
> >
> > *(b) The reliability of California water supply imported from the Sacramento River or the San Joaquin River watershed.*
>
> *85225.5 To assist state and local public agencies in preparing the required certification, the council shall develop procedures for early consultation with the council on the proposed covered action.*
>
> *85225.10 (a) Any person who claims that a proposed covered action is inconsistent with the Delta Plan and, as a result of that inconsistency, the action will have a significant adverse impact on the achievement of one or both of the coequal goals or implementation of government-sponsored flood control programs to reduce risks to people and property in the Delta, may file an appeal with regard to a certification of consistency submitted to the council.*
>
> > *(b) The appeal shall clearly and specifically set forth the basis for the claim, including specific factual allegations, that the covered action is inconsistent with the Delta Plan. The council may request from the appellant additional information necessary to clarify, amplify, correct, or otherwise supplement the information submitted with the appeal, within a reasonable period.*

(c) The council, or by delegation the executive officer, may dismiss the appeal for failure of the appellant to provide information requested by the council within the period provided, if the information requested is in the possession or under the control of the appellant

(c) The council shall review the Delta Plan at least once every five years and may revise it as the council deems appropriate. The council may request any state agency with responsibilities in the Delta to make recommendations with respect to revision of the Delta Plan.

(d) (1) The council shall develop the Delta Plan consistent with all of the following:

(A) The federal Coastal Zone Management Act of 1972 (16 U.S.C. Sec.1451 et seq.), or an equivalent compliance mechanism.

(B) Section 8 of the federal Reclamation Act of 1902.

(C) The federal Clean Water Act (33 U.S.C. Sec. 1251 et seq.).

(2) If the council adopts a Delta Plan pursuant to the federal Coastal Zone Management Act of 1972 (16 U.S.C. Sec. 1451 et seq.), the council shall submit the Delta Plan for approval to the United States Secretary of Commerce pursuant to that act, or to any other federal official assigned responsibility for the Delta pursuant to a federal statute enacted after January 1, 2010.

85300(a) The Delta Plan shall include subgoals and strategies to assist in guiding state and local agency actions related to the Delta.

85302(e) The following subgoals and strategies for restoring a healthy ecosystem shall be included in the Delta Plan:

(e)(1) Restore large areas of interconnected habitats within the Delta and its watershed by 2100.

(e)(2) Establish migratory corridors for fish, birds, and other animals along selected Delta river channels

(e)(3) Promote self-sustaining, diverse populations of native and valued species by reducing the risk of take and harm from invasive species.

(e)(4) Restore Delta flows and channels to support a healthy estuary and other ecosystems.

(e)(5) Improve water quality to meet drinking water, agriculture, and ecosystem long-term goals.

(e)(6) Restore habitat necessary to avoid a net loss of migratory bird habitat and, where feasible, increase migratory bird habitat to promote viable populations of migratory birds.

85300(a) The Delta Plan may also identify specific actions that state or local agencies may take to implement the subgoals and strategies.

85302(a) Implementation of the Delta Plan shall further the restoration of the Delta ecosystem and a reliable water supply.

85302(b) The Delta Plan may include recommended ecosystem projects outside the Delta that will contribute to achievement of the coequal goals.

85302(c) The Delta Plan shall include measures that promote all of the following characteristics of a healthy Delta ecosystem:

(c)(1) Viable populations of native resident and migratory species.

(c)(2) Functional corridors for migratory species.

(c)(3) Diverse and biologically appropriate habitats and ecosystem processes.

(c)(4) Reduced threats and stresses on the Delta ecosystem.

(c)(5) Conditions conducive to meeting or exceeding the goals in existing species recovery plans and state and federal goals with respect to doubling salmon populations.

85302(d) The Delta Plan shall include measures to promote a more reliable water supply that address all of the following:

(d)(1) Meeting the needs for reasonable and beneficial uses of water.

(d)(2) Sustaining the economic vitality of the state.

(d)(3) Improving water quality to protect human health and the environment.

85302(h) The Delta Plan shall include recommendations regarding state agency management of lands in the Delta.

85303 The Delta Plan shall promote statewide water conservation, water use efficiency, and sustainable use of water.

85304 The Delta Plan shall promote options for new and improved infrastructure relating to the water conveyance in the Delta, storage systems, and for the operation of both to achieve the coequal goals.

85305(a) The Delta Plan shall attempt to reduce risks to people, property, and state interests in the Delta by promoting effective emergency preparedness, appropriate land uses, and strategic levee investments.

85305(b) The council may incorporate into the Delta Plan the emergency preparedness and response strategies for the Delta developed by the California Emergency Management Agency pursuant to Section 12994.5.

85306 The council, in consultation with the Central Valley Flood Protection Board, shall recommend in the Delta Plan priorities for state investments in levee operation, maintenance, and improvements in the Delta, including both levees that are a part of the State Plan of Flood Control and nonproject levees.

85307(a) The Delta Plan may identify actions to be taken outside of the Delta, if those actions are determined to significantly reduce flood risks in the Delta.

85307(b) The Delta Plan may include local plans of flood protection.

85307(c) The council, in consultation with the Department of Transportation, may address in the Delta Plan the effects of climate change and sea level rise on the three state highways that cross the Delta.

85307(d) The council, in consultation with the State Energy Resources Conservation and Development Commission and the Public Utilities Commission, may incorporate into the Delta Plan additional actions to address the needs of Delta energy development, energy storage, and energy distribution.

85308 The Delta Plan shall meet all of the following requirements:

(a) Be based on the best available scientific information and the independent science advice provided by the Delta Independent Science Board.

(b) Include quantified or otherwise measurable targets associated with achieving the objectives of the Delta Plan.

(c) Where appropriate, utilize monitoring, data collection, and analysis of actions sufficient to determine progress toward meeting the quantified targets.

(d) Describe the methods by which the council shall measure progress toward achieving the coequal goals.

(e) Where appropriate, recommend integration of scientific and monitoring results into ongoing Delta water management.

(f) Include a science-based, transparent, and formal adaptive management strategy for ongoing ecosystem restoration and water management decisions.

Chapter 2
The Delta Plan

No single entity in California has the sole responsibility or authority for managing water supply and the Delta ecosystem. Instead, authority, expertise, and resources are spread out among a cadre of federal, State of California (State), and local agencies, with no single government agency empowered to provide leadership or a long-term vision. This is why governance reform enacted by the Delta Reform Act is fundamentally different from past approaches to managing the Delta. The milestone legislation created the Delta Stewardship Council (Council) and gave it the direction and authority to serve two primary governance roles: (1) set a comprehensive, legally enforceable direction for how the State manages important water and environmental resources in the Delta through the adoption of a Delta Plan, and (2) ensure coherent and integrated implementation of that direction through coordination and oversight of State and local agencies proposing to fund, carry out, and approve Delta-related activities.

Recommended in significant part by the Delta Vision Task Force effort in 2008, this new approach is different from governance attempts over the past several decades that have tried, but largely failed, to provide effective and stable leadership. The *Delta Vision Strategic Plan* referred to some 200 agencies that play some role in managing the Delta's varied resources (Delta Vision 2008). One of the major goals articulated in that strategic plan was the establishment of a new governance structure with sufficient authority, responsibility, accountability, science support, and secure funding to achieve the coequal goals of providing a more reliable water supply for California and protecting, restoring, and enhancing the Delta ecosystem. The creation of the independent Council was a significant step toward implementing this goal. The Council is made up of seven members who provide a broad, statewide perspective and diverse expertise and is advised by a 10-member board of nationally and internationally renowned scientists, the Delta Independent Science Board (ISB). The Delta Reform Act instructs the Council to "direct efforts across state agencies," but considerable challenges lie ahead in coordinating and supporting the multitude of agencies to achieve the goals of the Delta Plan.

The first major task for the newly created Council is the development of this Delta Plan. The Delta Reform Act requires the Council to develop and adopt a legally enforceable, long-term management plan for the Delta that uses best available science and is built upon the principles of adaptive management. The Delta Reform Act also established the Delta Science Program within the Council to provide the best possible unbiased scientific information to inform water and environmental decision making in the Delta. Because California's Delta is linked to so many statewide issues, described in Chapter 1, the Delta Plan's scope and purview encompasses statewide water use, flood management, and the Delta watershed, but with a specific focus on the legal Delta and Suisun Marsh. The Delta Plan contains a set of regulatory policies that will be enforced by the Council's appellate authority and oversight, described in this chapter. The Delta Plan also contains priority recommendations, which are non-regulatory but call out actions essential to achieving the coequal goals. The Council has chosen to apply its regulatory authority in a targeted manner, and does so in an effort to ensure that all significant activities occurring in whole or in part in the Delta become better aligned over time with State policy priorities, including—and especially—the achievement of the coequal goals. The process for demonstrating compliance with Delta Plan policies is described in detail in this chapter.

In developing the first Delta Plan, the Council sought extensive public, stakeholder, and government agency input and, based on that input, developed the foundational set of policies and recommendations detailed in the following chapters to guide actions over the first few years of plan implementation. Every stage of implementing the Delta Plan will necessitate leadership by the Council and ongoing coordination across a broad range of agencies, nongovernmental entities, and stakeholders.

About this Chapter

This chapter is presented in four sections. It begins with a discussion of the purpose and role of the Council in the context of Delta governance. The second section describes why best available science and adaptive management are particularly important tools in the Delta and proposes the development of a new Delta Science Plan to aid in the coordination and focus of science efforts across agencies. The third section describes the Council's approach to developing, implementing, and updating the Delta Plan, all within the framework of adaptive management. For state or local agencies that propose a plan, program, or project occurring in whole or in part in the Delta, this chapter contains a description of the regulatory application of the Delta Plan. Finally, the chapter concludes with a section which includes one policy and one recommendation.

The Delta Stewardship Council

As described in Chapter 1, the Delta of today is the result of centuries of natural and human-made actions and reactions. Government historically has worked to treat individual problems rather than adopt a systemwide approach. Dozens of agencies, task forces, and working groups have struggled to find the right combination of policy, science, and structure to address what are now California's fundamental goals for managing the Delta, the coequal goals.

The mission of the Council is to further the achievement of the coequal goals. To do so, the Council was charged with the development of a legally enforceable, long-term management plan for the Delta. To accomplish this, the Council will apply a common-sense approach based on a strong scientific foundation in an adaptive management framework to protect and restore the Delta ecosystem; improve the quality and reliability of California's water supplies; reduce risk to people, property, and State interests; and protect and enhance the Delta as an evolving place.

The Council's most important and challenging role is the facilitation, coordination, and integration of a range of actions and policies in support of the coequal goals. Implementation will occur through the Council's leadership of a formal interagency implementation committee, ongoing informal staff-to-staff agency coordination, development of science to support the Delta Plan, and use of the Council's various authorities to ensure progress and accountability in how the Delta is managed. See Table 2-1 for a reference list of agencies with responsibilities in the Delta or related to the management of the Delta.

In addition to its role in setting State policy for the Delta in the Delta Plan, and in facilitating and coordinating agencies to achieve policy objectives, the Council was granted specific regulatory and appellate authority over certain actions that take place in whole or in part in the Delta. To do this, the Delta Plan contains a set of regulatory policies with which State and local agencies are required to comply. The Delta Reform Act specifically established a certification process for compliance with the Delta Plan. This means that State and local agencies that propose to carry out, approve, or fund a qualifying action in whole or in part in the Delta, called a "covered action," must certify that this covered action is consistent with the Delta Plan and must file a certificate of consistency with the Council that includes detailed findings. This process is described in the section "Covered Actions and Delta Plan Consistency" later in this chapter.

Table 2-1
Agencies with Responsibilities in the Delta

STATE	
Delta Stewardship Council	Established in 2009 by the Delta Reform Act to further the achievement of the coequal goals through the development and implementation of a legally enforceable Delta Plan.
Department of Fish and Game	Fish and wildlife protection, including issuance of permits and actions to restore habitats.
Department of Water Resources	Owns and operates the State Water Project (which stores water upstream and conveys water through the Delta), has emergency response and flood planning responsibilities, holds water quality/supply contracts with Delta water agencies, and coordinates overall statewide water planning.
Delta Protection Commission	Prepares a comprehensive long-term resource management plan for land uses within the approximately 500,000-acre Primary Zone. Local government plans must be consistent.
Delta Conservancy	A primary State agency to implement ecosystem restoration in the Delta and also to assist/protect the region's agricultural, cultural, economic, and historical value.
State Water Resources Control Board	Required to develop in 2010 non-regulatory flow criteria for the Delta ecosystem necessary to protect public trust uses to inform planning proceedings for the Delta Plan and Bay Delta Conservation Plan (BDCP). Responsible for developing and implementing the Bay-Delta Water Quality Control Plan to establish water quality objectives, including flow objectives, to ensure reasonable protection of beneficial uses in the Bay-Delta. Responsible for establishing, implementing, and enforcing water right requirements to ensure the proper allocation and efficient use of water in and out of the Delta, including the role of the Delta Watermaster and implementation of the Bay-Delta Water Quality Control Plan. With regional boards, responsible for developing and implementing other water quality standards and control plans consistent with State and federal laws to reasonably protect aquatic beneficial uses.
California Emergency Management Agency	Plans, prepares emergency response, and coordinates the activities of all State agencies in connection to an emergency in the Delta; provides resources if local agencies are overwhelmed.
Central Valley Flood Protection Board	Plans flood control along the Sacramento and San Joaquin rivers and their tributaries in cooperation with the U.S. Army Corps of Engineers.
Office of the Delta Watermaster	Created in 2009 to oversee day-to-day administration of water rights, enforcement activities, and reports on water right activities regarding diversions in the Delta.
California Natural Resources Agency	In coordination with a group of local water agencies, environmental and conservation organizations, State and federal agencies, and other interest groups, developing the BDCP, a conservation strategy to be compliant with ESA and Natural Community Conservation Planning Act, to be implemented over the next 50 years.
Other state agencies	Have various roles or responsibilities in the Delta relevant to the agency's concern (for example, Department of Food and Agriculture, Department of Transportation, State Parks, Boating and Waterways, State Lands Commission, California Environmental Management Agency, and others).
FEDERAL	
U.S. Bureau of Reclamation	Owns and operates the Central Valley Project, which pumps water through and out of the Delta.
U.S. Fish and Wildlife Service	Develops plans for the conservation and recovery of fish and wildlife resources and addresses the variable needs of fish and wildlife pursuant to the ESA.
U.S. Army Corps of Engineers	Involved with both federal and non-federal partners in assessing channel navigation, ecosystem, and flood risk management projects in the Delta. Works cooperatively with its non-federal partners regarding the regulation, maintenance, and improvement of project levees in the Delta.
National Marine Fisheries Service	Develops plans for the conservation and recovery of salmonids in the Delta pursuant to the ESA.
U.S. Environmental Protection Agency	Responsible for protection and restoration of water quality in the Delta, pursuant to the Clean Water Act (CWA), which regulates the discharge of pollutants into waterways and sets standards for water quality. Oversees implementation of CWA programs and policies delegated to the State.
Other federal agencies	Various roles or responsibilities in the Delta relevant to the agency's concern (for example, U.S. Department of Agriculture, Natural Resources Conservation Service, and others).
LOCAL	
Hundreds of local reclamation districts, resource conservation districts, water districts, city and county governments, and other special districts.	

DP-177

To be effective, governance to support science and implement adaptive management for a changing Delta must be flexible and have the capacity to change policies and practices in response to what is learned over time. An adaptive management approach as detailed in this chapter will ensure that the Delta Plan is updated as often as necessary to incorporate new information or modify Policies and Recommendations to ensure achievement of the coequal goals. The following section discusses the particular importance of science and adaptive management as they relate to the Delta.

Science and Adaptive Management in the Delta

The Delta Reform Act requires that the Delta Plan be based on and implemented using the best available science and requires the use of science-based and formal adaptive management strategies for ongoing ecosystem restoration and water management decisions. This section describes the importance of science, especially as it relates to the Delta, describes how the Delta Plan itself uses an adaptive management plan, and proposes the development of a Delta Science Plan as a companion to the Delta Plan.

The State of Bay-Delta Science report concluded that most of the decision making in the Delta was occurring based on a false understanding that the Delta was a static system, and that "the Delta of the future would be much the same as the Delta of today" (Healey 2008). Science indicates that significant changes are expected in the Delta over the coming decades, including climate change and the potential for earthquakes and flooding, as described in Chapter 1. In addition, current planning processes for habitat restoration, changes to water conveyance in the Delta, urban expansion, and other human drivers could reshape the Delta as we know it today.

The State of Bay-Delta Science urged a new perspective for decision making in the Delta. Decision making should be based on best available science, should account for risk and uncertainty, should acknowledge the dynamic nature of ecosystems, and should be responsive and adaptive to future change. The Delta Reform Act, enacted 1 year after that report, requires a strong science foundation for Council decisions. This includes the ongoing provision of scientific expertise to support the Council and other agencies through the Delta Science Program and Delta ISB. The Delta Science Program's mission is to provide the best possible scientific information for water and environmental decisions in the Bay-Delta system. The Delta ISB provides oversight of the scientific research, monitoring, and assessment programs that support adaptive management of the Delta to ensure that the application of the best science is used in Delta programs. The Delta ISB reviewed early drafts of this Delta Plan to ensure that the best science was used in the Delta Plan.

Why is it important that the Delta Plan emphasize science? First, science provides the basis of nearly all current understanding of the Delta's status (Healey et al. 2008, Lund et al. 2010). Second, new perspectives on science and policy in the Delta instill urgency for addressing the health of Delta ecosystems and the need for a more reliable water supply. Third, the interaction of multiple stressors to the ecosystem must be understood if they are to inform effective policy decisions.

Science and adaptive management are not simply academic exercises; they are tools that provide managers and decision makers an approach for using public funds more effectively and increase the likelihood of success for a given project. Science by itself does not make or prioritize management decisions; it only informs actions and proposals. "Using the best science is only part of what is needed to resolve the competing interests…" that clamor over the Delta (NRC 2012).

The next sections describe what the Council means when it comes to best available science and adaptive management in the context of the coequal goals.

Best Available Science

Not all science is created equal nor deserves equal weight in decision making. Best available science provides the knowledge base for making sound decisions and is foundational for adaptive management. Best available science provides understanding for defining problems, developing conceptual models, identifying potential management actions, monitoring ecological and physical responses, and analyzing responses relative to the actions taken. Adaptive management both uses best available science and contributes to the creation of the best available science.

Best available science is specific to the decision being made and the time frame available for making that decision. There is no expectation of delaying decisions to wait for improved scientific understanding. Action may be taken on the basis of incomplete science if the information used is the best available at the time.

Best available science is developed through a process that meets the criteria of (1) relevance, (2) inclusiveness, (3) objectivity, (4) transparency and openness, (5) timeliness, and (6) peer review (NRC 2004). Best available science is consistent with the scientific process (Sullivan et al. 2006). Ultimately, best available science requires scientists using the best information and data to assist management and policy decisions. The processes and information used should be clearly documented and effectively communicated to foster improved understanding and decision making.

Under the Delta Plan, covered actions are required to demonstrate the use of best available science in their decision making (see G P1). Guidelines and criteria for identifying or developing best available science are provided in Appendix A.

Adaptive Management

Adaptive management is defined in the Delta Reform Act as:

> *a framework and flexible decision making process for ongoing knowledge acquisition, monitoring, and evaluation leading to continuous improvements in management planning and implementation of a project to achieve specified objectives (Water Code section 85052).*

Adaptive management is useful in that it provides flexibility and feedback to manage natural resources in the face of often considerable uncertainty. This approach requires careful science-based planning followed by measurement to determine whether a given action actually achieves intended goals. If goals are not achieved, informed adjustments can be made. This is especially important in the context of the Delta because, in some instances, competing and uncertain explanations arise, and decision making cannot be delayed until causes are better understood (Healey 2008). The Council has adopted a three-phase adaptive management framework for the purposes of developing, implementing, and updating the Delta Plan, described later in this chapter, and also for use by ecosystem restoration and water management covered actions, as set forth in G P1 with additional detail in Appendix A.

A Delta Science Plan

Multiple frameworks for science in the Delta have been proposed, but a comprehensive science plan that specifies how scientific research, monitoring, analysis, and data management will be coordinated among entities has yet to be developed. Currently, science efforts in the Delta are performed by multiple entities with varying missions and mandates and without an overarching plan. The National Research Council (NRC) found that “only a synthetic, integrated, analytical approach to understanding the effects of suites of environmental factors (stressors) on the ecosystem and its components is likely to provide important insights that can lead to enhancement of the Delta and its species” (NRC 2012). Therefore, a

comprehensive science plan for the Delta is needed to organize and integrate ongoing scientific research, monitoring, and learning about the Delta as it changes over time.

SCIENCE IN THE DELTA – ADVANCES IN UNDERSTANDING

The following is a partial list of scientific advances that have changed understanding of the Delta and California's water supply over the last decade.

Effects of Climate Change on People and the Environment

- Increased frequency of (1) extreme water heights that cause floods, (2) water temperatures lethal to salmon and delta smelt, and (3) flooding in the Yolo Bypass, which will be much more common by the latter half of this century (Cloern et al. 2011).
- Trends in snowfall versus rainfall precipitation in the western United States show that temperatures have warmed during winter and early spring storms, and, consequently, the fraction of precipitation that falls as snow has declined while the fraction that falls as rain has increased. This shift from snowfall to rainfall will reduce natural water storage and is likely to increase risks of winter and spring flooding (Knowles et al. 2006).
- By mid-century the Colorado River Reservoir System will not be able to meet all of the demands placed on it, including water supply for Southern California and the inland Southwest, because reservoir levels will be reduced by over one-third and releases reduced by as much as 17 percent. Reductions in precipitation for the Colorado River Basin will threaten the ability to meet mandated water allocations (Barnett et al. 2004).

Water Supply Reliability

- The rate of groundwater depletion in the Central Valley was quantified using satellite imaging; approximately 2.5 million acre-feet/yr of groundwater was lost during the period from October 2003 to March 2010 (Famiglietti et al. 2011).
- Precipitation and streamflow are proportionally more variable from year to year in California than in any other part of the United States (Dettinger et al. 2011).

Ecosystem Restoration

- Several open-water (pelagic) fish species have undergone steep declines known as the Pelagic Organism Decline (POD) (Sommer et al. 2007). The Interagency Ecological Program investigation of these declines led to new insights about the effects of multiple stressors on these species and the Delta ecosystem (summarized in Baxter et al. 2010). Improved knowledge about the POD also led to regulatory changes for water exports and pollutant discharges.
- In 86% of approximately 3,000 assessed streams across the United States, streamflow magnitudes (especially flow maxima and minima) were altered. In comparison to other evaluated stressors, streamflow alterations were found to have the greatest significance for explaining ecological impairment (Carlisle et al. 2011).
- Altered flow regimes by human activities influence the ecological impact of drought anomalies and increase the susceptibility of ecosystems to biological invasion. Extreme climatic events act together with environmental disturbances to enable the establishment of invasive species (Winder et al. 2011).
- Ratios of nutrients in Delta waters have been hypothesized to be a primary driver in the composition of aquatic food webs in the Bay-Delta (Glibert et al. 2011).

Water Quality

- Ammonium concentrations may be having a significant impact on phytoplankton composition and open-water food webs because of suppression of diatom blooms in the Bay-Delta (Dugdale et al. 2007).
- Pyrethroid pesticides largely derived from urban and suburban runoff are regularly found at levels that are toxic to aquatic invertebrates (Weston et al. 2005, Weston and Lydy 2010).

Risk Reduction

- With permanently flooded conditions and managed water depths, short-term sediment accretion rates as high as 7 to 9 cm/yr can be obtained to help reverse subsidence on Delta islands (Miller et al. 2008).
- Atmospheric rivers (narrow corridors of concentrated moisture in the atmosphere) contribute 33 to 50 percent of the total average amount of rainfall for California, and have been the source of many floods along the West Coast of the United States. California's water resources and floods come from the same storms to an extent that makes integrated flood and water resources management all the more important (Dettinger et al. 2011).

DP-168

A Delta Science Plan will guide efficient use of resources for balancing investments in addressing short-term science needs and those that build understanding over the long run. This plan will address effective governance for science in the Delta, strategies for addressing uncertainty and conflicting scientific information, the prioritization of research, near-term science needs, financial needs to support science, and more. Such a plan is essential to support the adaptive management of ecosystem restoration and water management decisions in the Delta.

Additional detail regarding the proposed Delta Science Plan is provided in recommendation G R1 in this chapter.

The Delta Plan

The Delta Reform Act established the Council and directed it to develop an overarching, long-term management plan for the Delta. Figure 2-1 shows the roles assigned to the Council under the Act. The Act specifically requires that this plan for the Delta include a science-based, formal adaptive management strategy for ongoing ecosystem restoration and water management decisions.

This section presents a three-phase adaptive management framework (Plan, Do, and Evaluate and Respond), describes specific considerations that went into the development of the Delta Plan, and provides the overarching framework for how the Council (in collaboration with others) will implement and continuously amend the Delta Plan to achieve the coequal goals.

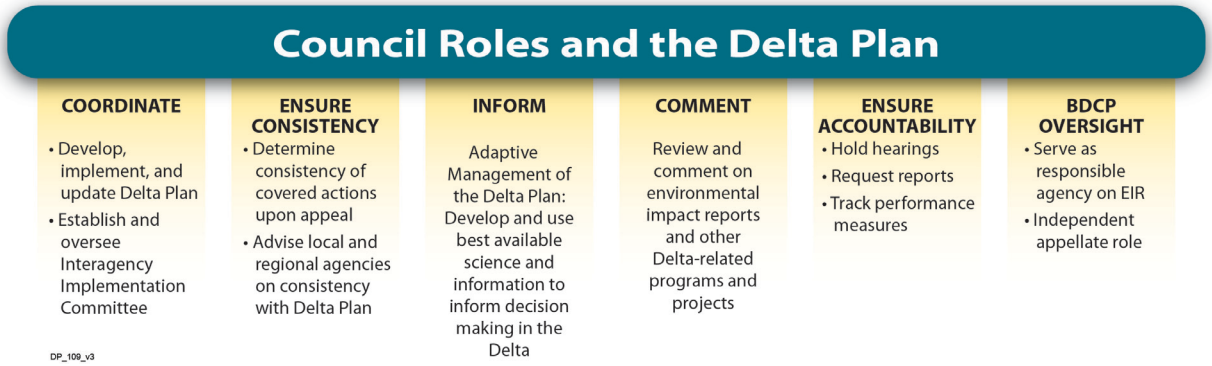

Figure 2-1
Council Roles and the Delta Plan

The Council's Three-phase Adaptive Management Framework

Several existing frameworks for adaptive management provide the basis for the Delta Plan's own adaptive management approach.[1] Although there are differences among various frameworks, they generally consist of three broad phases: Plan, Do, and Evaluate and Respond. Throughout all three phases of the adaptive management process, decisions are made by managers, policy makers, and/or technical experts. In developing an adaptive management plan, the best available science should be used to inform all phases of the adaptive management process.

In addition to requiring adaptive management for certain proposed covered actions, the Council, in coordination with others, will use adaptive management to develop, implement, and update the Delta Plan. The Council will rely in large part on the Delta Science Program to determine the relevance, value,

[1] Christensen et al. 1996, Stanford and Poole 1996, CALFED Bay-Delta Program 2000, Habron 2003, Abal et al. 2005, Healey et al. 2008, Kaplan and Norton 2008, Bay Delta Conservation Plan Independent Science Advisors on Adaptive Management 2009, Williams et al. 2009.

and reliability of the best available science and to organize that information for its use in the Council's decisions. The Council has the final responsibility for determining the best available science used in support of its actions, including when a choice among competing interpretations of available science must be made.

The three phases of the Council's adaptive management framework (Plan, Do, and Evaluate and Respond) are shown in Figure 2-2, and are further broken down into nine steps, which are described in detail in Appendix A.

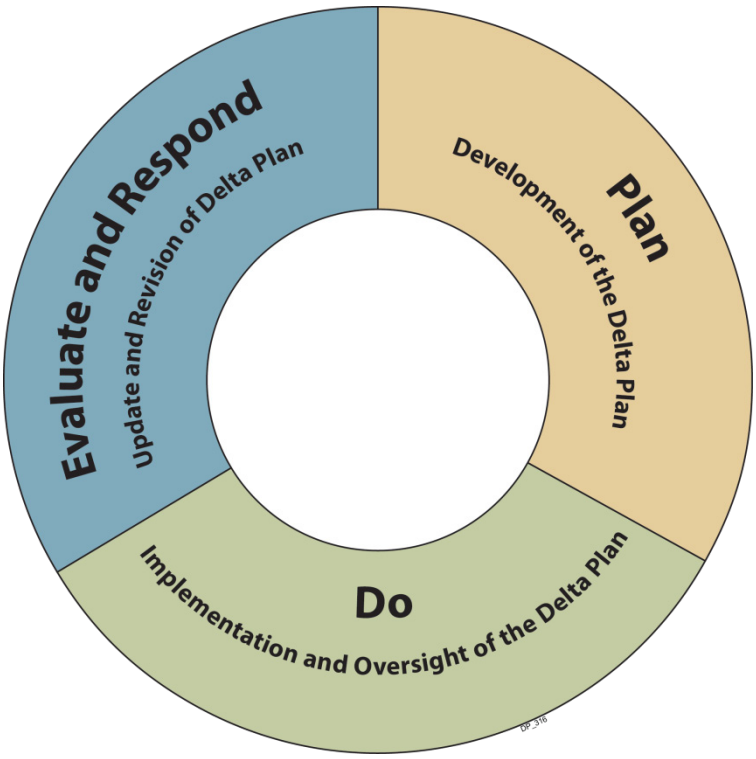

Figure 2-2
The Delta Stewardship Council's Three-phase Adaptive Management Framework

Plan: Development of the Delta Plan

The first phase of adaptive management is "Plan." The Plan phase requires clear definition of the problem, establishment of objectives, how to achieve those objectives, and actions for implementation. Performance measures are included to evaluate whether the actions are successfully meeting their intended objectives. As described in Chapter 1, the Council was established in response to an ongoing crisis in the Delta. Water supply reliability and the health of the Delta ecosystem are both at risk, and the status quo—including the patchwork governance of State, local, and federal agencies—is not making acceptable progress toward reversing disturbing trends in a balanced and sustainable manner.

The Delta Plan is intended to be foundational and adaptive. It is foundational in that the Council has built on previous efforts, including CALFED, the Delta Vision, the California Water Plan, planning efforts of the State Water Resources Control Board (SWRCB), the Delta Protection Commission (DPC), and others. The framework established in this Delta Plan is intended to advance the coequal goals of water supply reliability and ecosystem health and to employ adaptive management to improve the plan over time.

This Delta Plan officially supersedes and replaces the Interim Delta Plan adopted by the Council on August 27, 2010.

Structure of the Delta Plan

The Delta Plan contains five core policy chapters (Chapters 3 through 7) and a chapter on Funding Principles to Support the Coequal Goals (Chapter 8). The narrative sections of each policy chapter provide subject matter context and rationale for the selection and implementation of core strategies. These core strategies are then broken down into actions: the policies and recommendations. The policies in the Delta Plan are regulatory in nature, and compliance is required for those who propose covered actions. In each policy chapter, the Policies and Recommendations section is followed by a section identifying both science needs and key issues for future evaluation by the Council.

Finally, each policy chapter concludes with a set of performance measures. The Delta Reform Act requires that the Delta Plan include performance measures to evaluate whether it is achieving its objectives over time. Information learned from performance measures will be an important part of how the Council determines when and how to update the Delta Plan as part of the Evaluate and Respond phase of the adaptive management process. See the sidebar on Delta Plan Performance Measures later in this chapter.

Considerations in the Development of the Delta Plan

The Delta Reform Act set forth certain requirements and guidance for the development of the Delta Plan. The Act required the development of several State agency plans to inform the Delta Plan planning process and set forth statutory guidelines for the consideration or inclusion of certain plans, some of which were not yet completed at the date of Delta Plan publication and will be considered in future plan updates.

- **Delta Reform Act objectives.** The Act lists numerous objectives and in some sections provides detailed guidance for what the Delta Plan shall include. (See Table 2-2.)
- **State agency proposals.** Specific agencies are named in the Delta Reform Act as being responsible for submitting reports or recommendations to the Council for consideration for inclusion in the Delta Plan. The DPC, California State Parks, and the California Department of Food and Agriculture (CDFA) all submitted proposals that were considered in the development of this Delta Plan.
- **Consistency with federal law.** The Delta Reform Act requires that the Delta Plan be developed consistent with the federal Clean Water Act, Section 8 of the federal Reclamation Act of 1902, and the federal Coastal Zone Management Act of 1972 (CZMA), or an equivalent compliance mechanism. See the sidebar on federal participation for more information.
- **Incorporation of the Bay Delta Conservation Plan into the Delta Plan.** The BDCP is a major project considering large-scale improvements in water conveyance and large-scale ecosystem restoration in the Delta. When completed, it must be incorporated into the Delta Plan if it meets certain statutory requirements. Completion of the BDCP process and the number of projects now under consideration in that process would have large impacts on the Delta and would affect the coequal goals. (More detailed discussions of the BDCP are provided in Chapters 3 and 4.) The Delta Reform Act describes a separate, explicit process for incorporating the BDCP into the Delta Plan (Water Code section 85320), and the Council has adopted administrative procedures governing appeals to the Council related to BDCP incorporation (see Appendix B). If the BDCP is incorporated into the Delta Plan, it becomes part of the Delta Plan and therefore part of the basis for future consistency determinations.
- **Incorporation of other plans into the Delta Plan.** The Council may incorporate other plans or programs in whole or in part into the Delta Plan to the extent that they promote the coequal goals.

Table 2-2
Delta Plan Requirements by Water Code Section

Water Code Section	Requirement
85211	The Delta Plan shall include performance measurements that will enable the council to track progress in meeting the objectives of the Delta Plan. The performance measurements shall include, but need not be limited to, quantitative or otherwise measurable assessments of the status and trends in all of the following:
85211(a)	- The health of the Delta's estuary and wetland ecosystem for supporting viable populations of aquatic and terrestrial species, habitats, and processes, including viable populations of Delta fisheries and other aquatic organisms.
85211(b)	- The reliability of California water supply imported from the Sacramento River or the San Joaquin River watershed.
85300(a)	The Delta Plan shall include subgoals and strategies to assist in guiding state and local agency actions related to the Delta.
85302(e)	The following subgoals and strategies for restoring a healthy ecosystem shall be included in the Delta Plan:
85302(e)(1)	- Restore large areas of interconnected habitats within the Delta and its watershed by 2100.
85302(e)(2)	- Establish migratory corridors for fish, birds, and other animals along selected Delta river channels.
85302(e)(3)	- Promote self-sustaining, diverse populations of native and valued species by reducing the risk of take and harm from invasive species.
85302(e)(4)	- Restore Delta flows and channels to support a healthy estuary and other ecosystems.
85302(e)(5)	- Improve water quality to meet drinking water, agriculture, and ecosystem long-term goals.
85302(e)(6)	- Restore habitat necessary to avoid a net loss of migratory bird habitat and, where feasible, increase migratory bird habitat to promote viable populations of migratory birds.
85300(a)	The Delta Plan may also identify specific actions that state or local agencies may take to implement the subgoals and strategies.
85302(a)	Implementation of the Delta Plan shall further the restoration of the Delta ecosystem and a reliable water supply.
85302(b)	The Delta Plan may include recommended ecosystem projects outside the Delta that will contribute to achievement of the coequal goals.
85302(c)	The Delta Plan shall include measures that promote all of the following characteristics of a healthy Delta ecosystem:
85302(c)(1)	- Viable populations of native resident and migratory species.
85302(c)(2)	- Functional corridors for migratory species.
85302(c)(3)	- Diverse and biologically appropriate habitats and ecosystem processes.
85302(c)(4)	- Reduced threats and stresses on the Delta ecosystem.
85302(c)(5)	- Conditions conducive to meeting or exceeding the goals in existing species recovery plans and state and federal goals with respect to doubling salmon populations.
85302(d)	The Delta Plan shall include measures to promote a more reliable water supply that address all of the following:
85302(d)(1)	- Meeting the needs for reasonable and beneficial uses of water.
85302(d)(2)	- Sustaining the economic vitality of the state.
85302(d)(3)	- Improving water quality to protect human health and the environment.

Table 2-2
Delta Plan Requirements by Water Code Section

Water Code Section	Requirement
85302(h)	The Delta Plan shall include recommendations regarding state agency management of lands in the Delta.
85303	The Delta Plan shall promote statewide water conservation, water use efficiency, and sustainable use of water.
85304	The Delta Plan shall promote options for new and improved infrastructure relating to the water conveyance in the Delta, storage systems, and for the operation of both to achieve the coequal goals.
85305(a)	The Delta Plan shall attempt to reduce risks to people, property, and state interests in the Delta by promoting effective emergency preparedness, appropriate land uses, and strategic levee investments.
85305(b)	The council may incorporate into the Delta Plan the emergency preparedness and response strategies for the Delta developed by the California Emergency Management Agency pursuant to Section 12994.5.
85306	The council, in consultation with the Central Valley Flood Protection Board, shall recommend in the Delta Plan priorities for state investments in levee operation, maintenance, and improvements in the Delta, including both levees that are a part of the State Plan of Flood Control and nonproject levees.
85307(a)	The Delta Plan may identify actions to be taken outside of the Delta, if those actions are determined to significantly reduce flood risks in the Delta.
85307(b)	The Delta Plan may include local plans of flood protection.
85307(c)	The council, in consultation with the Department of Transportation, may address in the Delta Plan the effects of climate change and sea level rise on the three state highways that cross the Delta.
85307(d)	The council, in consultation with the State Energy Resources Conservation and Development Commission and the Public Utilities Commission, may incorporate into the Delta Plan additional actions to address the needs of Delta energy development, energy storage, and energy distribution.
85308	The Delta Plan shall meet all of the following requirements:
85308(a)	- Be based on the best available scientific information and the independent science advice provided by the Delta Independent Science Board.
85308(b)	- Include quantified or otherwise measurable targets associated with achieving the objectives of the Delta Plan.
85308(c)	- Where appropriate, utilize monitoring, data collection, and analysis of actions sufficient to determine progress toward meeting the quantified targets.
85308(d)	- Describe the methods by which the council shall measure progress toward achieving the coequal goals.
85308(e)	- Where appropriate, recommend integration of scientific and monitoring results into ongoing Delta water management.
85308(f)	- Include a science-based, transparent, and formal adaptive management strategy for ongoing ecosystem restoration and water management decisions.

Do: Implementation and Oversight of the Delta Plan

The second phase of adaptive management is “Do.” The “doing,” or implementation, of the Delta Plan will occur over time (through 2100) through the coordinated efforts of many State, local, and federal agencies, in cooperation with nongovernmental organizations and private parties, and Council oversight and exercise of appellate authorities.

Federal participation in implementing the Delta Plan and the coequal goals is described in detail in the sidebar Federal Participation in Implementing the Delta Plan.

The Council is responsible for overseeing the Delta Plan's implementation. Given the numerous government agencies that frequently have conflicting or overlapping jurisdictional and programmatic interest in Delta matters (Table 2-1), there is a compelling need for the Council to fulfill the role as integrator of Delta policy and coordinator of actions. This integration and coordination will occur through convening a formal interagency implementation committee, providing ongoing informal staff-to-staff agency coordination, providing comments and advice from the Council to other agencies on proposed or ongoing plans and programs, holding public hearings, developing science to support the Delta Plan, and using the Council's appellate authority over consistency of significant actions in the Delta with the Delta Plan.

Delta Plan Interagency Implementation Committee

Perhaps the most significant tool the Council will have for implementing the Delta Plan and ensuring accountability is a formal method for active agency coordination. The Delta Reform Act directs the Council to establish and oversee a committee of agencies responsible for implementing the Delta Plan. Notably, the law states that "each agency shall coordinate its actions pursuant to the Delta Plan with the Council and other relevant agencies" (Water Code section 85204).

Governance challenges have long plagued management of the Delta and California's ability to achieve stated objectives for water supply and the Delta ecosystem. Ambiguous and sometimes conflicting authorities and responsibilities among agencies thwart real progress (NRC 2012).

FEDERAL PARTICIPATION IN IMPLEMENTING THE DELTA PLAN

The Delta Reform Act recognizes the federal government's critical role in achieving the coequal goals through the Delta Plan's comprehensive, Delta-wide planning and implementation effort. This effort goes beyond federal participation in the more narrowly focused BDCP. This recognition builds upon the history of federal-State cooperative governance efforts in the Delta made necessary by the multitude of federal and State agencies working on interconnected, cross-jurisdictional issues in and related to the Delta, including water project operations, water quality regulation, levee maintenance, habitat restoration, and endangered species regulation.

Federal Law Now Incorporates the Coequal Goals

The federal Energy and Water Development Appropriations Act of 2012 (Title II of the Consolidated Appropriations Act of 2012 (PL 112-074)) contains, in pertinent part, the following:

> *The Federal policy for addressing California's water supply and environmental issues related to the Bay-Delta shall be consistent with State law, including the coequal goals of providing a more reliable water supply for the State of California and protecting, restoring, and enhancing the Delta ecosystem…Nothing herein modifies existing requirements of Federal law.* (Section 205)

The Council's staff will work with federal agency representatives to explore opportunities for federal participation in Delta Plan implementation efforts to help those agencies comply with this new Congressional policy directive.

The current regulatory provisions of the Delta Plan, including the consistency review and appeals process, apply to only covered actions of State and local agencies. However, once the Delta Plan is adopted, the Delta Reform Act requires the Council to pursue a compliance mechanism that requires consistency of federal actions. The Delta Reform Act identifies the federal Coastal Zone Management Act of 1972 (CZMA), or "an equivalent compliance mechanism," as the preferred means to accomplish this objective. Under the CZMA, states are authorized to review certain activities of federal agencies, including activities directly conducted by federal agencies and activities permitted or licensed by these agencies, for consistency with a state's federally approved coastal management program. This review authority applies to any activity that affects any land or water use or natural resource of the state coastal zone.

In this regard, the Council staff has met, and will continue to meet, with federal agency representatives to identify the appropriate process to submit the Delta Plan to the Secretary of Commerce for approval under CZMA (and with representatives of the California Coastal Commission and the San Francisco Bay Conservation and Development Commission (BCDC), which administer California's coastal management program).

DP-181

The Council, therefore, will coordinate implementation of the Delta Plan through the establishment and leadership of an interagency implementation committee to do the following:

- Monitor progress of priority actions and agency activities to implement the Delta Plan;
- Report regularly on implementation plans and actions;
- Identify opportunities for integration and leveraging of funding;
- Identify funding needs and support development of a finance plan to implement the Delta Plan;
- Assist in the ongoing development and tracking of Delta Plan performance measures;
- Coordinate regulatory actions on significant projects to implement the Delta Plan, as appropriate; and
- Discuss common issues and resolve interagency conflicts.

The interagency implementation committee, which shall convene at least twice each year and more often as needed, will be overseen by the Council and will be organized around the implementation of the Delta Plan. The implementation committee will include federal, local, and State agency representatives as dictated by the specific matter or subject area in the Delta Plan. At a minimum, the implementation committee will consist of the Council's Executive Officer, the Delta Science Program lead scientist, and executive officers or directors from the California Department of Water Resources (DWR); Department of Fish and Game (DFG); SWRCB and regional water quality control boards; the San Francisco Bay Conservation and Development Commission (BCDC); the California Water Commission; the Delta Conservancy; the DPC; the Delta Watermaster; the CDFA; the Natural Resources Agency; the Business, Transportation and Housing Agency; and the California Environmental Protection Agency. Federal agencies such as National Oceanic and Atmospheric Administration (NOAA) Fisheries, the U.S. Fish and Wildlife Service, the Bureau of Reclamation, Natural Resources Conservation Service, the U.S. Geological Survey, U.S. Army Corps of Engineers, the U.S. Environmental Protection Agency, and others, as appropriate, will be invited to participate and provide status reports on various projects and programs related to Delta Plan implementation.

The meetings of the implementation committee will be open to the public, and the agenda will be noticed in advance. The committee will create ad hoc workgroups as appropriate to facilitate focus on specific issues. Stakeholder representatives will be encouraged to participate in the various workgroups. The work of both the formal implementation committee and the workgroups may be supplemented with meetings or hearings conducted by the Council.

The Delta Protection Commission's Role in Delta Plan Implementation

The Delta Protection Act states that the DPC is the appropriate agency to identify and provide recommendations to the Council on methods of preserving the Delta as an evolving place. The DPC developed and submitted a set of recommendations to the Council, many of which were incorporated in this Delta Plan (DPC 2012). The Delta Reform Act outlines a process for the DPC to review and provide comments and recommendations to the Council on any significant project or proposed project within the scope of the Delta Plan that may affect the unique values of the Delta (Public Resources Code section 29773(a)). The Council's adopted procedures include a process whereby the Council will notify the DPC of covered action appeals.

Additional Council Authorities in Implementing the Delta Plan

The Delta Reform Act enumerated a range of specific authorities for the Council related to the implementation of the Delta Plan (as shown on Figure 2-1). A full list of authorities can be found in

Water Code section 85210 and in various sections of the Delta Reform Act. In implementing the Delta Plan, the Council has the authority to:

- **Comment on environmental impact reports.** The Council has a role in commenting on any State agency environmental impact reports as appropriate to the mission of the Council.
- **Comment on policies related to the coequal goals and implementation of the Delta Plan.** As appropriate, the Council may comment formally on any proposed policies or regulations that will impact the achievement of the coequal goals and the implementation of the Delta Plan.
- **Advise local governments.** The Council has a role in advising local and regional planning agencies regarding the consistency of their planning documents with the Delta Plan. As described in Chapter 5, the Council will review sustainable community strategies and regional transportation plans to prevent conflicts with the Delta Plan and to coordinate metropolitan development with actions in the Delta.
- **Request reports from State, federal, and local agencies.** The Council has the authority to request reports from agencies on issues related to the implementation of the Delta Plan.
- **Hold hearings.** The Council has the authority to hold hearings in all parts of the state and to subpoena witnesses.
- **Develop, coordinate, and promote the use of science through the Delta Science Program.** The Council has a role in providing the best available unbiased scientific information to inform water and environmental decision making in the Delta by funding research, synthesizing and communicating scientific information to policymakers and decision makers, promoting independent peer review, and coordinating with Delta agencies to promote science-based adaptive management.
- **Make consistency determinations upon appeal.** The Legislature intended that State and local actions that would have a significant impact on the coequal goals or a government-sponsored flood control program be consistent with the Delta Plan. The Council has the authority to implement the Delta Plan in part through the enforcement of consistency of covered actions with the Delta Plan upon appeal. The Delta Reform Act also gave the Council a specific appellate role with respect to the BDCP and its future incorporation into the Delta Plan. The Council's appellate roles, the definition of a covered action, and the consistency determination process and appeals process are described in detail in the section "Covered Actions and Delta Plan Consistency" later in this chapter.

Monitoring Progress toward Achieving the Coequal Goals

The Council will utilize existing monitoring efforts (such as the efforts of the Interagency Ecological Program, California Water Quality Monitoring Council, and California Statewide Groundwater Elevation Monitoring) and new monitoring efforts to inform progress toward achieving the performance measures in the Delta Plan. The Council will monitor the progress of programs and projects toward achieving the administrative, output, and outcome performance measures in the current Delta Plan and those developed in the future. Working with others, in particular the interagency implementation committee, the Council will use coordinated information about relevant status and trends and progress toward meeting the coequal goals to inform revisions to the Delta Plan. The Council's monitoring activities will be reported on the Council website.

Evaluate and Respond: Updating and Amending the Delta Plan

The third phase of Delta Plan adaptive management is "Evaluate and Respond." According to the Delta Reform Act, the Council must review the Delta Plan at least once every 5 years and can revise it as the

Council deems appropriate. This authority is consistent with the Council's obligation to base the Delta Plan on the best available scientific information and to use an adaptive management approach in updating the Plan as new information becomes available.

When updating the Delta Plan, the Council will consider information learned from other adaptive management activities in the Delta, evaluation of Delta Plan policies and recommendations, information learned from performance measures, other completed plans related to the Delta, and information learned from coordination, hearings, and oversight. The Council will rely in large part on the Delta Science Program for determining the relevance, value, and reliability of the best available science and organizing that information for its use in the Council's decisions. The Council has the final responsibility for determining the best available science used in support of its actions, including when a choice among competing interpretations of available science must be made.

Reporting on Delta Plan Performance Measures

This Delta Plan contains preliminary performance measures developed to monitor performance of Delta Plan policies and recommendations. (See sidebar, Performance Measures in the Delta Plan, for more detailed information.) Upon adoption of the Delta Plan, staff will take the lead, working with scientific, agency, and stakeholder experts to continue to refine the Delta Plan's performance measures. Delta Plan performance measures will be periodically reviewed by independent expert review panels and will be sent to the Delta ISB for further review and comment. The resulting updated performance measures will be developed no later than December 31, 2014, for consideration by the Council for incorporation into the Delta Plan. The Council will issue periodic public reports on the status of performance measures.

Data collection related to the Delta and water management in California is already occurring, although more is needed. The Council, through the interagency implementation committee and working with stakeholders, will report regularly on Delta Plan performance measures and the Delta Plan's progress in advancing the coequal goals. These reports will be made available to the public.

PERFORMANCE MEASURES IN THE DELTA PLAN

The performance measures included in this Delta Plan are primarily administrative measures focused on implementation of near-term actions (generally, actions contained within policies and recommendations of the Delta Plan) that support the coequal goals. This initial set of performance measures will be expanded and refined after adoption of the Delta Plan and will be considered for inclusion in subsequent updates of the Delta Plan.

Delta Plan performance measures have been placed into three general classes:

- Administrative performance measures describe decisions made by policy makers and managers to finalize plans or approve resources (funds, personnel, projects) for implementation of a program or group of related programs.
- Output (also known as "driver") performance measures evaluate the factors that may be influencing outcomes and include on-the-ground implementation of management actions, such as acres of habitat restored or acre-feet of water released, as well as natural phenomena outside of management control (such as a flood, earthquake, or ocean conditions).
- Outcome performance measures evaluate responses to management actions or natural outputs.

Administrative performance measures are included in Appendix C. Output and outcome performance measures, where appropriate, are included at the end of individual chapters.

Development of informative and meaningful performance measures is a challenging task that will continue after the adoption of the Delta Plan. Performance measures need to be designed to capture important trends and to address whether specific actions are producing expected results. Efforts to develop performance measures in complex and large-scale systems like the Delta are commonly multiyear endeavors. The Council will improve all performance measures, but will focus on outcome measures through a multiyear effort, using successful approaches for developing performance measures employed by similar efforts elsewhere (such as the Kissimmee River Restoration, The State of San Francisco Bay, and Healthy Waterways Southeast Queensland, Australia) as positive examples (see Appendix A for more information).

DP-301

Communication and the Delta Plan

Keeping the public and decision makers informed as future Delta Plan changes are proposed and considered is a vital step. The Council is committed to open communication of current understanding gained through the evaluation of performance measures, monitoring, science, and adaptive management. This communication will be continuous as the Council receives and produces information that will be used to adapt its strategy toward meeting the coequal goals and updating the Delta Plan. The Council's website and meetings will remain the central hub for communicating information about progress toward meeting the coequal goals and the objectives of the Delta Plan. Information learned from the analysis, synthesis, and evaluation of how well the policies and recommendations in the Delta Plan are meeting their intended goals will be gathered and communicated through a number of media and forums that may include:

- The Council's meetings and workshops, website, social media, and newsletter
- Staff reports on the status and trends of the Delta Plan performance measures
- Reports, presentations, and correspondence presented to the Council
- Interagency Implementation Committee meetings and products
- The Delta Science Program website *Science News*, the online journal *San Francisco Estuary & Watershed Science*, brown bag seminars, and Biennial Bay-Delta Science Conference
- Delta ISB meetings and products

Covered Actions and Delta Plan Consistency

The Delta Reform Act directs the Council to develop a legally enforceable long-term management plan for the Delta (this Delta Plan) and includes a mechanism for enforcement of Delta Plan policies over State and local actions identified as covered actions (Water Code sections 85001(c) and 85022). The Council has taken a hybrid approach to developing the Delta Plan by including both regulatory policies and nonregulatory recommendations. This section presents a discussion of the process and general requirements for certifying consistency with the Delta Plan through compliance with its regulatory policies, and includes examples of covered actions and exemptions.

Delta Plan regulatory policies are not intended and shall not be construed as authorizing the Council or any entity acting pursuant to this section, to exercise their power in a manner that will take or damage private property for public use, without the payment of just compensation. These policies are not intended to affect the rights of any owner of property under the Constitution of the State of California or the United States. None of the Delta Plan policies increases the State's flood liability.

Covered Actions Must Comply with Delta Plan Policies

The Delta Reform Act requires State and local actions that fit the legal definition of a covered action to be consistent with the policies included in the Delta Plan. The mechanism for determining consistency is the filing of a certification of consistency. Not all actions that occur in whole or in part in the Delta are covered actions. Only certain activities qualify as covered actions, and the Delta Reform Act establishes specific criteria and exclusions, discussed in this chapter. Furthermore:

- The State or local agency that carries out, approves, or funds a proposed action determines whether that proposed plan, program, or project is a covered action (subject to judicial review of whether the determination was reasonable and consistent with the law).

- The State or local agency that carries out, approves, or funds a covered action ("proponents") needs to certify consistency with the policies included in the Delta Plan.
- In the case of all other actions (those that do not meet the criteria of being a covered action or are otherwise explicitly excluded), the Delta Plan's policies, where applicable, are recommendations.

What Is a Covered Action?

For a State or local agency to determine whether its proposed plans, programs, or projects are covered actions under the Delta Plan and therefore subject to the regulatory provisions in the plan, it must start with the Delta Reform Act, which defines a covered action as (Water Code section 85057.5(a)):

> *…a plan, program, or project as defined pursuant to Section 21065 of the Public Resources Code that meets all of the following conditions:*
>
> 1. *Will occur, in whole or in part, within the boundaries of the Delta or Suisun Marsh;*
> 2. *Will be carried out, approved, or funded by the state or a local public agency;*
> 3. *Is covered by one or more provisions of the Delta Plan;*
> 4. *Will have a significant impact on the achievement of one or both of the coequal goals or the implementation of government-sponsored flood control programs to reduce risks to people, property, and state interests in the Delta.*

Figure 2-3 shows the steps to follow for identifying whether a proposed plan, project, or program is a covered action.

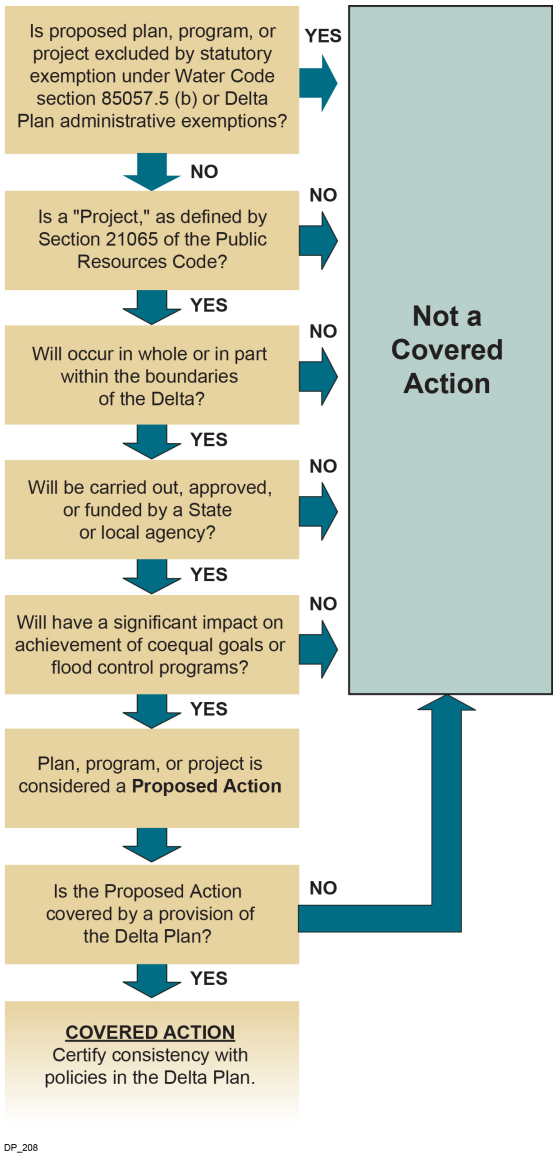

Figure 2-3
Decision Tree for State and Local Agencies on Possible Covered Actions

Screening Criteria for Covered Actions

As used in this Delta Plan, the statutory criteria for covered actions under the Delta Plan are collectively referred to as "screening criteria." Before using the screening criteria, a project proponent should first determine whether its proposed plan, program, or project is exempt from covered action status under either the Council's administrative exemptions or the Delta Reform Act's statutory exemptions, discussed below. Early consultation with Council staff is encouraged and can assist in this determination.

1. **Is a "Project," as defined by Section 21065 of the Public Resources Code.** A proponent's first step in determining whether a plan, program, or project is a covered action is to identify whether it meets the definition of a project as defined in Public Resources Code section 21065. That particular provision is the

WHAT DOES CEQA CONSIDER A "PROJECT"?

Public Resources Code section 21065 (which is incorporated by reference in the Delta Reform Act) defines the term "project" in the following manner:

21065. "Project" means an activity which may cause either a direct physical change in the environment, or a reasonably foreseeable indirect physical change in the environment, and which is any of the following:

(a) An activity directly undertaken by any public agency.

(b) An activity undertaken by a person which is supported, in whole or in part, through contracts, grants, subsidies, loans, or other forms of assistance from one or more public agencies.

(c) An activity that involves the issuance to a person of a lease, permit, license, certificate, or other entitlement for use by one or more public agencies.

DP-182

section of the California Environmental Quality Act (CEQA) that defines the term "project" for purposes of potential review under CEQA.[2] If the plan, program, or project does indeed meet the definition of a project under CEQA, the next step in determining a covered action is to review the four additional screening criteria in the definition of covered action, *all* of which must be met by a proposed plan, program, or project for it to qualify as a covered action (see sidebar What Does CEQA Consider a "Project"?).

2. **Will occur in whole, or in part, within the boundaries of the Delta or Suisun Marsh.** To qualify as a covered action, a project must include one or more activities that take place at least partly within the Delta or Suisun Marsh. This means, for example, that the diversion and use of water in the Delta watershed that is entirely upstream of the statutory Delta or Suisun Marsh would not satisfy this criterion. By contrast, this criteria *would* be met if water intended for use upstream were transferred through the statutory Delta or Suisun Marsh (pursuant, for example, to a water transfer longer than 1 year in duration).

3. **Will be carried out, approved, or funded by the State or a local public agency.** If these screening criteria are met, it is recommended that the "significant impact" criteria be analyzed next.

4. **Will have a significant impact on the achievement of one or both of the coequal goals or the implementation of a government-sponsored flood control program to reduce risks to people, property, and State interests in the Delta.** In addition, a proposed project must have a "significant impact" as defined under Water Code section 85057.5(a)(4) to qualify as a covered action. For this purpose, significant impact means a change in baseline conditions that is directly or indirectly caused by a project and that on its own or when considered "cumulatively" in connection with the effects of past projects, other current projects, and probable future projects, will have a substantial impact on the achievement of one or both of the coequal goals or the implementation of government-sponsored flood control programs to reduce risks to people, property, and State interests in the Delta. The substantial impact can be positive (for example, an ecosystem restoration action that would provide benefits to endangered fish species), negative (for example, a water management action that would result in the pollution of Delta waters or increase the risk of introducing harmful nonnative species), or both positive and negative (for example, a flood protection action that would remove vegetation on levees in an effort to strengthen them, but in so doing, would also reduce riparian habitat critical to recovery of native fish species). The coequal goals and government-sponsored flood control programs are further defined in Chapters 3, 4, and 7.

[2] It is important to note that CEQA's various statutory and categorical exemptions—which are considered only after the threshold determination of a CEQA "project" is made—are not similarly incorporated by cross-reference in the definition of covered action. Therefore, the Delta Plan must expressly incorporate a CEQA exemption for it to apply to the Delta Plan.

If the above four screening criteria are met, then for purposes of the Delta Plan, the plan, program, or project is referred to as a "proposed action." While a proposed action meets the first four screening criteria, the action has not yet been reviewed by the State or local agency to determine whether it meets the fifth screening criteria: is the proposed action covered by one or more Delta Plan policies? If the proposed action is covered by at least one Delta Plan regulatory policy, then the proposed action is a "covered action." If the proposed action is not covered by any Delta Plan regulatory policy, it is not a covered action.

5. **Is covered by one or more provisions of the Delta Plan.** This means that the proposed action must be covered by one or more regulatory policies contained in Chapters 3 through 7 of the Delta Plan. Each of those regulatory policies specifies the types of proposed actions that they cover. If the proposed action is covered by one or more provisions of the Delta Plan—the final criteria—the proposed action is therefore a covered action.

Statutory Exemptions

Certain actions are statutorily excluded from the definition of covered action and are exempt from the Council's regulatory authority (Water Code section 85057.5(b)). A complete list is included in Appendix D. These exemptions include:

- A regulatory action of a State agency (such as the adoption of a water quality control plan by the SWRCB, or the issuance of a California Endangered Species Act take permit by DFG)
- Routine maintenance and operation of the State Water Project or the Central Valley Project
- Routine maintenance and operation of any facility located, in whole or in part, in the Delta, that is owned or operated by a local public agency (such as routine maintenance of levees by a reclamation district)

Although a regulatory action by another State agency is not a covered action, the underlying action regulated by that agency can be a covered action (provided it otherwise meets the definition). The Council has concurrent jurisdiction over covered actions when that action is also regulated by another State agency. For example, the issuance of a California Endangered Species Act take permit by DFG is a regulatory action of a State agency, and therefore is not a covered action. However, the underlying action requiring the take permit could be a covered action and, if it is, it must be consistent with the Delta Plan's policies. Therefore, even when a covered action is regulated by another agency (or agencies), the covered action still must be consistent with the Delta Plan. In the situation where a covered action is governed by multiple agencies and laws, the action must comply with all relevant legal requirements.

Administrative Exemptions

The Council has determined that the following types of projects are not covered actions because they will not have a significant impact under Water Code section 85057.5(a)(4):

- "Ministerial" projects exempted from CEQA, pursuant to Public Resources Code section 21080 (b)(1)
- "Emergency" projects exempted from CEQA, pursuant to Public Resources Code section 21080(b)(2)-(4)
- Temporary water transfers of up to 1 year in duration. This exemption shall expire on January 1, 2015, unless the Council acts to extend the exemption prior to that date. The Council contemplates that any extension would be based upon DWR and the SWRCB's work with stakeholders to identify and implement transfer measures (see WR R15).

- Other projects that are exempt under CEQA statutes or guidelines, unless there are unusual circumstances indicating that the project may have a significant impact under Water Code section 85057.5 (a) (4). Examples of unusual circumstances could arise in connection with, among other things:
  - Local government general plan amendments made for consistency with the Delta Protection Commission's *Land Use and Resource Management Plan*; or
  - Small-scale habitat restoration projects proposed in important restoration areas, but which are inconsistent with the Delta Plan's policy related to appropriate habitat restoration for a given land elevation.
- Leases approved by a special district formed under the Harbors and Navigation Code if all of the following apply:
  a. The uses proposed by the lease are authorized by the applicable general plan and zoning ordinances of the city where the special district is located.
  b. The uses proposed by the lease are approved by the city where the special district is located, and the city complies with Water Code section 85225 et seq. (filing of consistency certification for covered actions), if applicable, prior to approval of the lease by the special district.
  c. The special district complies with CEQA prior to approving the lease.
- Routine dredging activities that are necessary for maintenance of facilities operated by special districts formed under the Harbors and Navigation Code

The Council will consider, as part of its ongoing adaptive management of the Delta Plan, whether these exemptions remain appropriate and/or whether the Delta Plan should be amended to include other types of projects.

Who Determines Whether a Proposed Plan, Program, or Project Is a Covered Action?

A State or local agency that proposes to carry out, approve, or fund a plan, program, or project is the entity that must determine whether that plan, program, or project is a covered action. That determination must be reasonable, made in good faith, and consistent with the Delta Reform Act and relevant provisions of this Plan. If requested, Council staff will meet with an agency's staff during early consultation to review consistency with the Delta Plan and to offer advice as to whether the proposed plan, program, or project appears to be a covered action, provided that the ultimate determination in this regard must be made by the agency. If an agency determines that a proposed plan, program, or project is not a covered action, that determination is not subject to Council regulatory review, but is subject to judicial review as to whether it was reasonable, made in good faith, and is consistent with the Delta Reform Act and relevant provisions of this Plan.

Certifications of Consistency

Once a State or local agency has determined that their plan, program, or project is a covered action under the Delta Plan, they are required to submit a written certification to the Council, with detailed findings, demonstrating that the covered action is consistent with the Delta Plan (Water Code section 85225 et seq.). Furthermore:

- The first policy in the Delta Plan, G P1, describes requirements to be included in the certification of consistency for all covered actions and is included in this chapter.

- The certification of consistency must be submitted to the Council prior to initiating implementation of the covered action.
- The certification of consistency should not be submitted to the Council until the covered action has been fully described and the impacts associated with the covered action have been identified; this coincides with the completion of the CEQA process.
- Should the covered action project change substantially, the agency will be required to submit a new certification of consistency to the Council.

The Council has developed a discretionary checklist that agencies may use to facilitate the process, as well as certification forms and related materials, available on the Council website.

Bay Delta Conservation Plan Covered Activity Consistency Certification

The Delta Reform Act describes a specific process for the potential incorporation of BDCP into the Delta Plan. If BDCP is incorporated, an agency proposing a qualifying "covered activity" under BDCP that also meets the statutory definition of a covered action must file a short form certification of consistency with findings indicating only that the covered action is consistent with the BDCP. Consistency for these purposes shall be presumed if the certification filed by the agency includes a statement to that effect from DFG.

Covered Action Consistency Appeals

In contrast to how many other governmental plans are implemented, the Council does *not* exercise direct review and approval authority over covered actions to determine their consistency with the regulatory policies in the Delta Plan. Instead, State or local agencies self-certify Delta Plan consistency, and the Council serves as an appellate body for those determinations.

Any person, including any member of the Council or its Executive Officer, who claims that a covered action is inconsistent with the Delta Plan and, as a result of that inconsistency, the covered action will have a significant adverse impact on the achievement of one or both of the coequal goals or implementation of government-sponsored flood control program, may file an appeal with regard to a certification of consistency submitted to Council.

The Council has appellate authority to determine the consistency of covered actions with the Delta Plan if they are challenged. The Council is required to apply the standard of substantial evidence when reviewing covered action appeals. State or local agencies are required to submit detailed findings upon filing their consistency determination, described previously. These findings and the record will provide the basis for the Council's decision making.

Per statute, an appeal must be filed within 30 days; if a valid appeal is filed, the Council is responsible for subsequent evaluation and determination—as provided in statute and the Council's Administrative Procedures Governing Appeals—of whether the covered action is consistent with the Delta Plan's policies. More than one policy in the Delta Plan may apply to a covered action. If no person appeals the certification of consistency, the State or local public agency may proceed to implement the covered action.

In the event of an appeal of a covered action, the Council may consult with the DPC consistent with Public Resources Code section 29773.

Upon receiving an appeal, the Council has 60 days to hear the appeal and an additional 60 days to make its decision and issue specific written findings. If the covered action is found to be inconsistent, the project may not proceed until it is revised so that it is consistent with the Delta Plan.

The appeals process is described in statute and further defined in the appeals procedures adopted by the Council and attached for reference purposes as Appendix B.

Policies and Recommendations

State and local agencies approve many important plans, programs, and projects annually that are in or otherwise affect the Delta. Interagency coordination is often limited and, despite the Delta's special status, there are no overarching guidelines or coordinated best management practices to ensure that all significant actions utilize best available science or adaptive management in particular. The Delta Reform Act, in describing a process for coordinating actions under the Delta Plan, requires that State or local government actions are consistent with the Delta Plan and supported by detailed findings. Policy G P1 describes compliance requirements for covered actions that are to be included in the project proponent's written findings.

Problem Statement

Independent and disparate actions by individual agencies can lead to conflict and reduce successful achievement of the coequal goals. Lack of uniform use of best available science and adaptive management for water supply and ecosystem projects can lead to unintended consequences, reduced likelihood of project success, and increased likelihood of adverse environmental impacts. In addition, management actions can be delayed when uncertainty exists, while adaptive management allows for flexible decision making despite uncertainty.

In some cases, project proponents do not carefully plan for the resources and costs of monitoring and tracking, and full adaptive management does not occur. Failure of significant Delta-related actions to comply with existing law can thwart the successful achievement of the coequal goals.

Policies

G P1 Detailed Findings to Establish Consistency with the Delta Plan

a) This policy specifies what must be addressed in a certification of consistency filed by a State or local public agency with regard to a covered action. This policy only applies after a "proposed action" has been determined by a State or local public agency to be a covered action because it among other things is covered by one or more of the policies contained in Chapters 3 through 7. Inconsistency with this policy may be the basis for an appeal.

b) Certifications of Consistency must include detailed findings that address each of the following requirements:

- Covered actions must be consistent with the coequal goals, as well as with each of the policies contained in Chapters 3 through 7 implicated by the covered action. The Delta Stewardship Council acknowledges that in some cases, based upon the nature of the covered action, full consistency with all relevant policies may not be feasible. In those cases, the agency that files the certification of consistency may determine that the covered action is consistent with the Delta Plan. That determination must include a clear identification of areas where consistency is not feasible, an explanation of the reasons why it is not feasible, and an explanation of how the covered action nevertheless, on whole, is consistent with the coequal goals. That determination is subject to review by the Delta Stewardship Council on appeal.

- Covered actions not exempt from CEQA must include applicable feasible mitigation measures identified in the Delta Plan's Program EIR (unless the measure(s) are within the exclusive jurisdiction of an agency other than the proposing agency), or

substitute mitigation measures that the proposing agency finds are equally or more effective.

- As relevant to the purpose and nature of the project, all covered actions must document use of best available science (as described in Appendix A).
- Ecosystem restoration and water management covered actions must include adequate provisions, appropriate to the scope of the covered action, to assure continued implementation of adaptive management. This requirement shall be satisfied through:
  - An adaptive management plan that describes the approach to be taken consistent with the adaptive management framework in Appendix A, and
  - Documentation of access to adequate resources and delineated authority by the entity responsible for the implementation of the proposed adaptive management process.
- If the agency that files the certification of consistency will carry out the covered action, the certification of consistency must also include a certification from that agency that the covered action complies with all applicable laws pertaining to water resources, biological resources, flood risk, and land use and planning. If the agency that files the certification of consistency will not carry out the covered action (but will approve or fund the action), the certification of consistency must include a certification from that agency that the covered action complies with all applicable laws of the type listed above over which that agency has enforcement authority or with which that agency can require compliance.

Problem Statement

Currently, science efforts related to the Delta are performed by multiple entities with multiple agendas and without an overarching plan for coordinating data management and information sharing among entities. Increasingly, resource management decisions are made in the courtroom as conflicting science thwarts decision making and delays action. Multiple frameworks for science in the Delta have been proposed, but a comprehensive science plan that organizes and integrates ongoing scientific research, monitoring, analysis, and data management among entities has yet to be fully formulated.

Recommendations

G R1 Development of a Delta Science Plan

The Delta Stewardship Council's Delta Science Program should develop a Delta Science Plan by December 31, 2013. The Delta Science Program should work with the Interagency Ecological Program, Bay Delta Conservation Plan, California Department of Fish and Game and other agencies to develop the Delta Science Plan. To ensure that best science is used to develop the Delta Science Plan, the Delta Independent Science Board should review the draft Delta Science Plan.

The Delta Science Plan should address the following:

- A collaborative institutional and organizational structure for conducting science in the Delta
- Data management, synthesis, scientific exchange, and communication strategies to support adaptive management and improve the accessibility of information
- Strategies for addressing uncertainty and conflicting scientific information

- Prioritization of research and balancing of the short-term immediate science needs with science that enhances comprehensive understanding of the Delta system over the long term
- Identification of existing and future needs for refining and developing numerical and simulation models along with enhancing existing Delta conceptual models (e.g., the Interagency Ecological Program (IEP) Pelagic Organism Decline (POD) and the Delta Regional Ecosystem Restoration Implementation Plan (DRERIP) models)
- An integrated approach for monitoring that incorporates existing and future monitoring efforts
- An assessment of financial needs and funding sources to support science

Timeline for Implementing Policies and Recommendations

Figure 2-4 lays out a timeline for implementing the policies and recommendations described in the previous section. The timeline emphasizes near-term and intermediate-term actions.

TIMELINE CHAPTER 2: The Delta Plan

	ACTION (REFERENCE #)	LEAD AGENCY(IES)	NEAR TERM 2012–2017	INTERMEDIATE TERM 2017–2025
POLICIES	Detailed findings to establish consistency with the Delta Plan (G P1)	Varies	●	●
RECOMMENDATIONS	Development of a Delta Science Plan (G R1)	Council	●	
COUNCIL ACTIONS	Establish Delta Plan Interagency Implementation Committee	Council	●	●

Agency Key:

Council: Delta Stewardship Council

DP_341

Figure 2-4
Timeline for Implementing Policies and Recommendations

References

Abal, E. G., S. E. Bunn, and W. C. Dennison, eds. 2005. Healthy Waterways Healthy Catchments: Making the Connection in South East Queensland, Australia. Moreton Bay Waterways and Catchments Partnership, Brisbane. p. 240.

Barnett, T., R. Malone, W. Pennell, D. Stammer, B. Semtner, and W. Washington. 2004. The effects of climate change on water resources in the west: Introduction and overview. *Climatic Change* 62:1-11.

Bay Delta Conservation Plan Independent Science Advisors on Adaptive Management. 2009. Bay Delta Conservation Plan Independent Science Advisor's Report on Adaptive Management. Page 14. http://www.bdcpweb.com/Libraries/Background_Documents/BDCP_Adaptive_Management_ISA_report_Final.sflb.ashx. Accessed May 2011.

CALFED Bay-Delta Program. 2000. Ecosystem Restoration Program Plan: Strategic Plan for Ecosystem Restoration. CALFED Bay-Delta Program: Sacramento, California. 75 pp.

Carlisle, D. M., D. M. Wolock, and M. R. Meador. 2011. Alteration of streamflow magnitudes and potential ecological consequences: a multiregional assessment. Frontiers in Ecology and the Environment 9(5): 264-270.

Christensen, N. L., A. M. Bartuska, J. H. Brown, S. Carpenter, C. D'Antonio, R. Francis, J. R. Franklin, J. A. MacMahon, R. R. Noss, D. J. Parsons, C. H. Peterson, M. G. Turner, and R. G. Woodmansee. 1996. The report of the Ecological Society of America committee on the scientific basis for ecosystem management. Ecological Applications 6:665-691.

Cloern, J. E., N. Knowles, L. R. Brown, D. Cayan, M. D. Dettinger, T. L. Morgan, D. H. Schoellhamer, M. T. Stacey, M. van der Wegen, R. W. Wagner, and A. D. Jassby. 2011. Projected evolution of California's San Francisco Bay-Delta-River system in a century of climate change. PLoS ONE 6:e24465.

DPC (Delta Protection Commission). 2012. Proposal to Protect, Enhance, and Sustain the Unique Cultural, Historical, Recreational, Agricultural, and Economic Values of the Sacramento-San Joaquin Delta as an Evolving Place. January 26.

Delta Vision (Delta Vision Blue Ribbon Task Force). 2008. *Delta Vision Strategic Plan*. October 17. http://deltavision.ca.gov/strategicplanningprocess/staffdraft/delta_vision_strategic_plan_standard_resolution.pdf.

Dettinger, M. D., F. M. Ralph, T. Das, P. J. Neiman, and D. R. Cayan. 2011. Atmospheric Rivers, Floods and the Water Resources of California. Water 3:445-478.

Dugdale, R. C., F. P. Wilkerson, V. E. Hogue, and A. Marchi. 2007. The role of ammonium and nitrate in spring bloom development in San Francisco Bay. Estuarine, Coastal, and Shelf Science 73:17-29.

Famiglietti, J. S., M. Lo, S. L. Ho, J. Bethune, K. J. Anderson, T. H. Syed, S. C. Swenson, C. R. de Linage, and M. Rodell. 2011. Satellites measure recent rates of groundwater depletion in California's Central Valley. Geophysical Research Letters 38, L03403, doi:10.1029/2010GL046442.

Glibert, P. M., D. Fullerton, J. M. Burkholder, J. C. Cornwell, and T. M. Kana. 2011. Ecological stoichiometry, biogeochemical cycling, invasive species, and aquatic food webs: San Francisco Estuary and comparative systems. Reviews in Fisheries Science 19:358-417.

Habron, G. 2003. Role of adaptive management for watershed councils. Environmental Management 31: 29-41.

Healey, M. C., M. D. Dettinger, and R. B. Norgaard, eds. 2008. The State of Bay-Delta Science, 2008. CALFED Science Program: Sacramento, California, 174 pp. Abstract. Sacramento, California.

Kaplan, R. S., and D. P. Norton. 2008. Mastering the management system. Harvard Business Review January: 62-57.

Knowles, N., M. D. Dettinger, and D. R. Cayan. 2006. Trends in snowfall versus rainfall in the Western United States. Journal of Climate 19:4545-4559.

Lund, J. R., E. Hanak, W. E. Fleenor, W. A. Bennett, R. E. Howitt, J. F. Mount, and P. B. Moyle. 2010. Comparing Futures for the Sacramento-San Joaquin Delta. University of California Press: Berkeley, CA. p. 231.

Miller, R. L., M. Fram, R. Fujii, and G. Wheeler. 2008. Subsidence reversal in a re-established wetland in the Sacramento-San Joaquin Delta, California, USA. San Francisco Estuary and Watershed Science 6.

National Research Council, Committee on Defining the Best Scientific Information Available for Fisheries Management. 2004. *Improving the use of "Best Scientific Information Available" Standard in Fisheries Management.* National Academy Press, Washington, D.C. http://www.nap.edu/catalog.php?record_id=11045#toc. Accessed July 2010.

NRC (National Research Council of the National Academies). 2012. Sustainable Water and Environmental Management in the California Bay-Delta. Washington D.C. http://www.nap.edu/catalog.php?record_id=13394.

Sommer, T., C. Armor, R. Baxter, R. Breuer, L. Brown, M. Chotkowski, S. Culberson, F. Feyrer, M. Gingras, B. Herbold, W. Kimmerer, A. Mueller-Solger, M. Nobriga, and K. Souza. 2007. The collapse of pelagic fishes in the Upper San Francisco Estuary. Fisheries 32:270–277.

Stanford, J. A., and G. C. Poole. 1996. A protocol for ecosystem management. Ecological Applications 6:741-744.

Sullivan, P. J., J. M. Acheson, P. L. Angermeier, T. Faast, J. Flemma, C. M. Jones, E. E. Knudsen, T. J. Minello, D. H. Secor, R. Wunderlich, and B. A. Zanetell. 2006. *Defining and implementing best available science for fisheries and environmental science, policy, and management*. American Fisheries Society, Bethesda, Maryland, and Estuarine Research Federation, Port Republic, Maryland. Available from http://www.fisheries.org/afs/docs/policy_science.pdf. Accessed July 2010.

Weston, D. P., R. J. Holmes, J. You, and M. J. Lydy. 2005. Aquatic toxicity due to residential use of pyrethroid insecticides. Environmental Science and Technology 39: 9778–9784.

Weston, D. P., and M. J. Lydy. 2010. Urban and agricultural sources of pyrethroid insecticides to the Sacramento–San Joaquin Delta of California. Environmental Science and Technology 44: 1833-1840.

Williams, B. K., R. C. Szaro, and C. D. Shapiro. 2009. Adaptive Management: The U.S. Department of the Interior Technical Guide. Adaptive Management Working Group, U.S. Department of the Interior, Washington, D.C. p. 72.

Winder, M., A. D. Jassby, and R. Mac Nally. 2011. Synergies between climate anomalies and hydrological modifications facilitate estuarine biotic invasions. Ecology Letters: DOI: 10.1111/j.1461-0248.2011.01635.x.