

Integrated Management of Delta Stressors

Institutional and Legal Options

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Summary

This report examines institutional and legal options for a more integrated and comprehensive approach to managing multiple sources of ecosystem stress in the Sacramento-San Joaquin Delta. Five broad types of stressors, each caused by human uses of the Delta's lands and waters, have contributed to the decline of the Delta's native fish populations: discharge of pollutants, fish management, flow regime changes, invasive species, and physical habitat alteration. Despite some recent progress, the current institutional landscape for regulation and management of these stressors is still highly fragmented. This limits the ecological effectiveness of management actions, raises costs, and poses questions about the fairness of the allocation of regulatory burdens on different users of the Delta's land and water resources.

We consider options for more integrated approaches to key ecosystem management functions: planning and management, regulatory oversight, environmental permitting, and the conduct of solution-oriented science and adaptive management. A modest but powerful set of institutional changes to existing structures can help to achieve better environmental outcomes while containing management costs that are likely to exceed several hundred million dollars annually:

- **Consistent planning.** Comprehensive reviews of various planning efforts to determine their compatibility with the state's overall Delta Plan.
- **Integrated and accountable management.** Proactive use of the new Delta Plan Interagency Implementation Committee to coordinate implementation of work plans, hold agencies accountable, and integrate adaptive management.
- **More comprehensive and integrated regulation.** Regulatory coverage of more stressors, reduced duplication, and expedited environmental permitting through a new office, the Delta Ecosystem Regulatory Coordinator.
- **Common pool science.** Creation of a Delta science joint powers authority involving regulators and regulated parties that would foster shared understanding, build knowledge, and inform adaptive management efforts.

Although legislative support could encourage these reforms, most of these changes can be made without new legislation. With this game plan for a more environmentally effective and fiscally responsible approach, policymakers can make a stronger case to stakeholders and the broader public for the necessary financial support for a healthier Delta ecosystem.

Companion reports

This report presents results from an analysis of the institutional and legal options for more effective ecosystem management in the Sacramento-San Joaquin Delta. It is part of a wide-ranging study on the management of multiple ecosystem stressors in the Delta. For a summary of overall study findings, see *Stress Relief: Prescriptions for a Healthier Delta Ecosystem* (Hanak et al. 2013a). Several companion reports address related topics in greater depth: (1) *Aquatic Ecosystem Stressors in the Sacramento-San Joaquin Delta* (Mount et al. 2012) summarizes the science of Delta ecosystem stressors for a policymaking audience; (2) *Costs of Ecosystem Management Actions for the Sacramento-San Joaquin Delta* (Medellín-Azuara et al. 2013) provides cost estimates for a suite of management actions addressing various sources of ecosystem stress; (3) *Scientist and Stakeholder Views on the Delta Ecosystem* (Hanak et al. 2013b) presents the results of surveys of scientific experts and engaged stakeholders and policymakers on Delta stressors and management actions; and (4) *Where the Wild Things Aren't: Making the Delta a Better Place for Native Species* (Moyle et al. 2012) describes a realistic long-term vision for achieving a healthier ecosystem. All of these reports are available on PPIC's website at www.ppic.org.

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Abbreviations

BDCP	Bay Delta Conservation Plan
CALFED	A joint state-federal program for Delta water and environmental management
CDFA	California Department of Food and Agriculture
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CVFPB	Central Valley Flood Protection Board
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
DBW	Department of Boating and Waterways
DERC	Delta Ecosystem Regulatory Coordinator
DFG	Department of Fish and Game (now Department of Fish and Wildlife)
DFW	Department of Fish and Wildlife
DISB	Delta Independent Science Board
DPIIC	Delta Plan Interagency Implementing Committee
DPR	Department of Pesticide Regulation
DRECP	Desert Renewable Energy Conservation Plan
DSC	Delta Stewardship Council
DSP	Delta Science Program
DTSC	Department of Toxic Substance Control
DWR	Department of Water Resources
EIR	Environmental Impact Report
ESA	Endangered Species Act (federal)
FERC	Federal Energy Regulatory Commission
HCP	Habitat Conservation Plan
IEP	Interagency Ecological Program
IWM	Integrated Water Management
JPA	Joint powers authority

MOU	Memorandum of understanding
NCCP	Natural Communities Conservation Plan
NEPA	National Environmental Policy Act
NISC	National Invasive Species Council
NMFS	National Marine Fisheries Service (also known as NOAA Fisheries)
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollution Discharge Emission System
NRC	National Research Council
OCAP	Operational Criteria and Plan
RCD	Resource Conservation District
ROD	Record of Decision
RRTT	Rapid Response Team for Transmission
RWQCB	Regional Water Quality Control Board
SCCWRP	Southern California Coastal Water Research Program
SFEI	San Francisco Estuary Institute
SWP	State Water Project
SWRCB	State Water Resources Control Board
TMDL	Total Maximum Daily Load
USACE	U.S. Army Corps of Engineers
USBR	U.S. Bureau of Reclamation
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VGP	Vessel General Permit
WDR	Waste discharge requirement

Introduction

Recent policy debates on the Sacramento-San Joaquin Delta have focused on how to manage the many sources of stress within this troubled aquatic ecosystem more effectively and fairly. But these problems are not new. In its 1986 opinion in the *Delta Water Cases* (“the Racanelli decision”), the California Court of Appeal concluded that the State Water Resources Control Board (SWRCB) violated both water rights and water quality laws by focusing on only two stressors—the Central Valley Project (CVP) and State Water Project (SWP), which export water through the pumps in the South Delta. The court determined that a “global perspective is essential to fulfill the Board’s water quality planning obligations” and held that “the Board cannot ignore *other actions* which could be taken to achieve Delta water quality, such as remedial actions to curtail excess diversions and pollution by other water users” (*United States v. State Water Resources Control Board* 1986, emphasis added).

There are many causes of the decline in the Delta’s aquatic ecosystem,¹ and most Californians bear some responsibility as land and water users, consumers of local fish, and purchasers of imported goods shipped to California by sea:

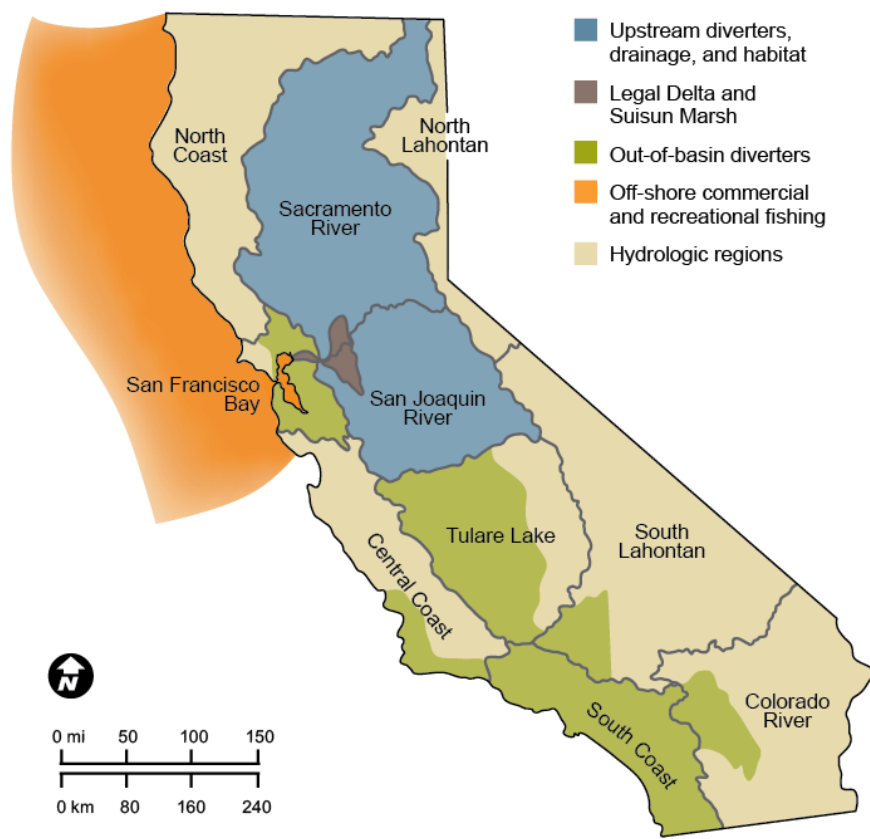
- More than 95 percent of the Delta’s original 700,000 acres of tidal wetlands have been replaced by rock-rimmed agricultural islands, many of which lie well below sea level (Whipple et al. 2012).
- Water flows into and through the Delta have been profoundly altered from their natural, seasonally variable patterns by infrastructure built for water supply and flood control, including upstream dams and diversions and large export pumps in the south Delta (Hanak et al. 2011). From 1995 to 2005, upstream diversions removed an average of 38 percent of annual runoff in the greater watershed (46.6 million acre-feet), and in-Delta and export diversions removed another 14 percent (Lund et al. 2007). Most of California’s residents and irrigated farmland rely at least in part on water from this watershed (Figure 1).
- Wastewater and runoff from approximately 1.7 million households and 4 million acres of farmland within the Sacramento and San Joaquin River hydrologic regions and the Delta itself have polluted the flows remaining in the system, degrading water quality for aquatic life and human uses (Figure 1).²
- Upstream dams have cut off most natural salmon and steelhead spawning areas, and levees have shrunk the availability of riparian and seasonal floodplain habitat. Hatcheries, established to maintain salmon and steelhead fisheries after dams were built, have unintentionally harmed wild populations of these fish (Williams 2006; Lindley et al. 2009; Carlson and Satterthwaite 2011).
- Alien species have been introduced intentionally for fishing or through ship ballast water, aquarium releases, and ponds and nurseries, making the Delta and San Francisco Bay one of the most invaded estuaries in the world (Cohen and Carlton 1998). Some aliens thrive in this highly altered ecosystem, competing with natives for food, preying upon them, and degrading their habitat.

¹ We use the term “Delta” when referring to the statutory Delta and Suisun Marsh on the Delta’s western edge (Water Code § 85058) and the terms “Delta watershed” or “greater watershed” when referring to the Sacramento River and San Joaquin River hydrologic regions that drain into the Delta (*id.* § 85060).

² Population and irrigated acreage estimates are for 2005, from the California Water Plan Update (Department of Water Resources 2009).

FIGURE 1

Almost all Californians use Delta resources and share responsibility for its ecosystem woes



NOTES: Out-of-basin diverters include those receiving Delta exports as well as parts of the San Francisco Bay and Tulare Lake hydrologic regions receiving water from the Mokelumne, Tuolumne, and San Joaquin Rivers. Some water users in the San Joaquin River hydrologic region also receive Delta exports.

Yet, more than 25 years after the *Racanelli* decision, responsibility to comply with Delta water quality standards and endangered species mandates continues to fall almost exclusively on the CVP and SWP and on the agricultural and urban users who rely on water from the two projects. The failure of water planners and regulators to take the broader perspective mandated in that case has frustrated efforts to provide more comprehensive and integrated management for the Delta ecosystem and has fostered concerns that the regulation of some stressors to the exclusion of others is both ineffective and unfair. As Lester Snow, former Director of the California Department of Water Resources (DWR) and Secretary of Natural Resources, noted in criticizing the U.S. Fish and Wildlife Service (USFWS) 2008 biological opinion for delta smelt that set new mitigation requirements for the CVP and SWP operations:

We know there are many stressors causing havoc in the Delta—including toxic pollutants, invasive species, climate impacts, power plant operations, illegal diversions, and overall loss of habitat and food. Today's action by the federal government looks only to the water projects rather than having a complete view of all causes for Delta fish decline.... Until more holistic approaches are taken to address all these environmental stressors, the delta ecosystem will continue to not improve (Department of Water Resources 2008).

Indeed, a U.S. District Court subsequently invalidated that biological opinion based on its finding that the federal fisheries protection agencies—USFWS and the National Marine Fisheries Service (NMFS)—focused

inordinately on CVP and SWP water exports and did not adequately consider the cumulative and synergistic effects of other stressors on the delta smelt (Box 1).

Box 1: The legal risks of fragmented analysis and regulation

In the *Consolidated Delta Smelt Cases* (2010), the U.S. District Court struck down the 2008 biological opinion for delta smelt following a challenge by CVP and SWP contractors. The plaintiffs alleged *inter alia* that the USFWS had inadequately considered the effects of a multiplicity of stressors—including discharges, invasive species, and habitat losses—on delta smelt populations and therefore unlawfully placed the sole burden of protecting the species on the two projects.

The court found that the scientific evidence that formed the basis of the biological opinion demonstrated that CVP and SWP operations were indeed a significant factor in the population decline of delta smelt. But the court also found that the USFWS did not adequately explain why it was necessary to limit CVP and SWP diversions as much as called for in the biological opinion in light of the other stressors that affect this fish:

It is undisputed that numerous stressors, including ammonia and other toxics, food limitation, predation, the introduction of non-native species and other factors, all have adverse impacts to delta smelt. Yet, the BiOp concludes that Project Operations are ‘a *primary factor* influencing delta smelt abiotic and biotic habitat suitability, health, and mortality.’ FWS rationalizes this conclusion, at least in part, by attributing the impacts of many of the ‘other stressors’ to the Projects. This attribution has not been justified, nor is it logical or explained by any science. Given that the impacts of regulating Project Operations are so consequential [to water supply, agricultural production, and employment], such unsupported attributions (a result in search of a rationale) are unconscionable (*Consolidated Delta Smelt Cases* 2010).

This decision is problematic because USFWS did in fact consider the relationship between CVP and SWP operations and other stressors on Delta smelt populations:

[W]hile many of the other stressors that have been identified as adversely affecting delta smelt were not caused by CVP and SWP operations, the likelihood and extent to which they adversely affect delta smelt is highly influenced by how the CVP/SWP are operated in the context of annual and seasonal hydrologic conditions. While research indicates that there is no single primary driver of delta smelt population dynamics, hydrodynamic conditions driven or influenced by CVP/SWP operations in turn influence the dynamics of delta smelt interaction with these other stressors (U.S. Fish and Wildlife Service 2008).

Nevertheless, the *Consolidated Delta Smelt Cases* decision serves as a cautionary tale to all agencies with regulatory authority over one or more aspects of the Delta ecosystem. As scientists learn more about the interactions, synergies, and cumulative effects of the multiple stressors that beset the system, it is likely that there will be more challenges to regulatory decisions that isolate one or a few stressors and place an inordinate burden on them to the exclusion of others that—both as a matter of sound science and regulatory fairness—should be included in the solution.

Interagency consultation and coordination among regulators offers significant advantages. The agencies can share information and expertise and extend the reach of their regulatory powers to address the panoply of problems that plague the Delta ecosystem by taking advantage of the unique authority of others in the cohort. More importantly, they can approach systemic problems in a more integrative and holistic manner and therefore in a way that minimizes judicial concerns about narrowness and inequity in allocating the burdens of environmental regulation.

Although the SWRCB and other regulators have begun to consider other actions that degrade the waters and vitality of the Delta ecosystem, two significant impediments to comprehensive and integrated management remain: (1) inadequate scientific understanding of the contributions of, and interactions among, the various

stressors; and (2) fragmented planning for, and regulation of, the diverse actions that individually and collectively contribute to the problem. We address the science of multiple stressors in several companion reports (Mount et al. 2012; Moyle et al. 2012; Hanak et al. 2013a and 2013b). Here, we analyze the role of existing laws and institutions in creating or exacerbating the fragmented and sometimes inconsistent administration of stressors on the Delta ecosystem. We then suggest how these institutions might become better aligned for more effective ecosystem management. We focus on improved integration and implementation of the important functions of planning and management, regulatory oversight and permitting, and science and adaptive management.

A Taxonomy of Delta Ecosystem Stressors

For ease of discussion, we have grouped the stressors on the Delta ecosystem into five categories with similar processes or consequences. From a scientific perspective, this approach oversimplifies a complex biophysical system. Yet, this same complexity—along with numerous scientific uncertainties—has impeded policy discussions needed to comprehensively address and regulate the many stressors that plague the Delta ecosystem. The classification used here strikes a balance between capturing the complexity of Delta stressors and organizing them in a manner that will facilitate this policy discussion.³

In alphabetical order, the five general categories of stressors on the Delta ecosystem are:

- **Discharges.** Land and water use activities that directly alter water quality in the greater Delta watershed by discharging various contaminants that pollute the water, degrade habitat, disrupt food webs, or cause direct harm to populations of native species. This category includes point and nonpoint sources of conventional pollutants, nutrients, toxics, endocrine disruptors, and other substances that cause or contribute to water pollution. Although most discharges come from current industrial, municipal, agricultural, and forestry activities, this category also includes “legacy” sources such as abandoned mines and mothballed ships.
- **Fish management.** Policies and activities that adversely affect populations of native fish species through commercial and sport harvest, hatcheries, and other direct management actions such as fish screens.
- **Flow regime change.** Alterations in flow characteristics due to water management facilities and operations, including volume, timing, hydraulics, sediment load, and temperatures. This category includes upstream dams and diversions throughout the greater Delta watershed, in-Delta diversions, and exports.
- **Invasive species.** Alien plants or animals that harm or displace native species by disrupting food webs, altering ecosystem functions, introducing disease, or increasing predation.⁴

³ This taxonomy is presented in more detail in a companion report (Mount et al. 2012). As noted there, the list excludes two external sources of stress that will interact with local stressors and influence the feasibility of management actions: climate change and ocean conditions. Climate change will affect the ecosystem through warmer temperatures, accelerated sea level rise, and changing runoff patterns. Variability in ocean conditions directly affects native fishes that migrate through the Delta (salmon, steelhead, and sturgeon) as well as the regional climate and weather through such processes as the El Niño-Southern Oscillation and the Pacific Decadal Oscillation.

⁴ We limit the “invasives” category to alien species of plants and animals that harm native species or the ecosystem. Most of the established alien species in the Delta have minor impacts on the ecosystem. A few, however, have caused major disruptions to ecological conditions. These species can be grouped into two categories: ecosystem engineers and food-web disruptors. These include macrophytes, such as water hyacinth and Brazilian waterweed, which impair navigation and provide cover for predator species and alien mollusks, such as the Asian clam and zebra mussel, which clog water supply intakes and canals and alter the aquatic habitat and food chain of native fish species. Some nonnative fish species, such as striped bass and largemouth bass, were introduced as sport fish. From a management perspective, they are more aptly considered with fisheries actions, another stressor category.

- **Physical habitat alteration.** Land use activities that alter or eliminate physical habitat necessary to support native species, including upland, floodplain, riparian, open water/channel, and tidal marsh. This category includes levees, channelization, diking and draining of wetlands, and the narrowing or reduction of riparian zones, shallows, and tidal and fluvial marshes.⁵

None of these categories is entirely independent of the others, and significant interactions can amplify or suppress the negative effects each has on native populations. For example, water supply operations that reduce flow may intensify the effects of agricultural and urban discharges that, in turn, promote conditions favorable to invasive species that alter food webs and ecosystem functions. In each case, human activities either initiate a stressor or magnify its effects. Viewing stressors in this way allows for a broad analysis of the causes of ecosystem stress and a prioritization of actions to mitigate their effects. Such classification also facilitates assessment of how different stressors are currently managed and regulated and what steps might be taken to develop a more coherent approach.

Fragmented Planning, Management, and Regulation

Understanding the role of various stressors on the Delta ecosystem and identifying effective technical solutions pose a variety of scientific challenges. Translating this science into policy may be even more difficult, because the physical complexities of the system are compounded by an institutional structure that divides agency jurisdiction, creates unnecessary risks of duplication and inconsistency, and fails to account for the interactions and cumulative effects of different stressors.

The following (incomplete) list illustrates the layers, fragmentation, and in some cases gaps in the planning, management, and regulatory agencies with jurisdiction over the Delta ecosystem:

- **Water exports.** The major Delta exporters, the CVP and SWP, are owned by two sovereign governments. They are managed by the U.S. Bureau of Reclamation (USBR) and the California Department of Water Resources pursuant to a Coordinated Operations Agreement. The projects are governed by water rights permits that the SWRCB oversees as well as biological opinions and incidental take permits issued by two separate federal agencies (the USFWS for fish that spend their entire lives in inland waters, such as delta smelt and longfin smelt, and the NMFS for anadromous fish, such as salmon, steelhead trout, and sturgeon) and by take permits from the state Department of Fish and Wildlife (for all listed native fish species).⁶ The projects deliver water to more than 300 contractors or subcontractors (mostly local governments), which in turn supply project water (often through intermediate agencies) to individual farms, cities, and businesses. The long-term and short-term contracts and subcontracts that support water delivery to export users contain myriad complex clauses and conditions and create legal expectations for water delivery as well as contractor expectations for involvement in system management.
- **Upstream and in-Delta diversions.** The major upstream diverters and in-basin water users include other units or operations of the CVP and SWP and a diverse array of cities, municipal water supply agencies, irrigation districts, individual farmers, and industrial users. The water rights of these users

⁵ Whipple et al. (2012) provide a detailed examination of the extent of habitat alteration that has taken place since the Delta was dredged and drained to support human settlement in the late 19th and early 20th centuries.

⁶ Native fish species that are listed as endangered, threatened, as a species of concern, or on a watchlist under the federal Endangered Species Act and/or the California Endangered Species Act include: delta smelt, longfin smelt, southern green sturgeon, Sacramento splittail, Sacramento perch, river lamprey, Central Valley steelhead trout, and several runs of Chinook salmon (Bay Delta Conservation Plan 2013a).

run the gamut of California surface water rights law, including riparians, pre-1914 appropriators, permittees, licensees, and a few prescriptive right holders.⁷ Many also use groundwater, which is not generally regulated in California despite its hydrologic connection to these surface water sources (Hanak et al. 2011). Although the federal Endangered Species Act (ESA) and the California Endangered Species Act (CESA) cover the diversions of these water users, the regulatory burdens of the endangered species acts have fallen almost exclusively on the CVP and SWP.

- **Hydropower.** The Delta watershed also produces substantial electricity from approximately 150 hydroelectric power plants, including multipurpose dams owned by the federal, state, and local water supply projects and dedicated hydropower dams owned by private utilities. Most nonfederal power-producing dams are also subject to licenses from the Federal Energy Regulatory Commission (FERC), which set minimum release requirements and flow standards to protect water quality, fish and wildlife, recreation, and other instream uses. Although these standards preempt state water rights law for the duration of the FERC license, the federal license must include any conditions on project operations established by the SWRCB and other state agencies—including minimum stream flow standards—as part of the state certification requirements of section 401 of the federal Clean Water Act (*Public Utility District No. 1 of Jefferson County v. Washington Department of Ecology* 1994).
- **Pollution discharges.** Several thousand municipal, industrial, and agricultural sources discharge pollutants into the Delta watershed. Point source discharges (e.g., from industrial sources and municipal sewage treatment plants) are governed by federal NPDES (National Pollution Discharge Elimination System) permits and state Waste Discharge Requirements (WDRs) issued by the Central Valley or San Francisco Bay Regional Water Quality Control Boards (RWQCBs). In contrast, with limited exceptions, agricultural sources—including hundreds of irrigation return flow discharges into the system—are statutorily exempt from NPDES regulation and historically have been exempted from specific WDR discharge limits by waivers from the regional boards.⁸
- **Pesticide and herbicide discharges.** In addition, the SWRCB and the Central Valley RWQCB regulate the discharge of pesticides and herbicides into the surface waters of the system through a general NPDES/WDR permit. The U.S. Environmental Protection Agency (USEPA) and two state agencies—the Department of Pesticide Regulation (DPR) and the Department of Toxic Substances Control (DTSC)—regulate land and aerial application of pesticides and herbicides.
- **Basin planning and flow standards.** The Central Valley RWQCB has promulgated a basin plan to protect ambient water quality in the Sacramento and San Joaquin River basins. Meanwhile, the SWRCB is responsible for setting flow standards for the Delta and its tributary rivers, and it sets salinity and other water quality standards for the Bay-Delta estuary. The SWRCB's plans consider the linkage between water quality objectives and water diversions, but the Central Valley RWQCB's basin plan does not.
- **Flood control and water supply infrastructure.** The U.S. Army Corps of Engineers (USACE) has authority over maintenance and operations of levees that are part of federally-authorized flood

⁷ For a description of the various types of water rights in California, see Littleworth and Garner (2007). Although California law exempts riparians and pre-1914 appropriators from the SWRCB's permit and license jurisdiction, all water rights are subject to the reasonable use and public trust doctrines (Hanak et al. 2011).

⁸ The exceptions are for the discharge of selenium from irrigated lands along the lower San Joaquin River and for irrigation runoff and return flows from more than one million acres in the eastern San Joaquin River watershed. We discuss the details of these WDRs later in this report.

control projects (roughly 1,600 miles within the Central Valley, including roughly 400 miles within the statutory Delta). Within the Central Valley, it has delegated this authority to the Central Valley Flood Protection Board (CVFPB), which in turn has delegated authority to local reclamation districts in most cases. Another 700 miles of Delta levees are “non-project levees,” owned and managed by local reclamation districts. Construction and modification of levees, flood control, and water supply infrastructure that discharges dredged and fill material into waters of the United States (including wetlands) require a permit from the USACE under section 404 of the Clean Water Act (CWA). Both USACE and the Central Valley Flood Protection Board must also verify that these actions do not reduce flood protection levels. This type of construction and repair also are subject to local land use and zoning laws, usually are subject to environmental review under the National Environmental Policy Act (NEPA) and/or the California Environmental Quality Act (CEQA), and may require additional permits from city, county, or local government agencies.

- **Habitat restoration.** Actions to restore wetlands or aquatic habitat must receive a section 404 permit from the USACE. They also may require approval by the CVFPB, a WDR issued by the RWQCB, a streambed alteration agreement from the California Department of Fish and Wildlife (DFW), and land use permits from the city or county (or cities and counties) in which the restoration occurs.
- **Fisheries management.** Oversight of fisheries actions is divided among several state and federal agencies. DFW issues fishing licenses for individual sport fishing and for commercial harvest in both inland waters and within the California coastal zone, subject to numeric limits set by the state Fish and Game Commission. DFW, along with USFWS, also manages California’s fish hatcheries. DFW has jurisdiction over the introduction and management of nonnative aquatic species. Commercial and recreational harvests are governed by NMFS through the Pacific Regional Fishery Management Council.
- **Endangered species.** As noted above, the USFWS and NMFS also enforce the federal ESA and issue biological opinions that govern the operation of the CVP and SWP to ensure that impoundments and diversions of water do not jeopardize the continued existence of endangered and threatened species or adversely modify their critical habitat. These agencies also have jurisdiction to prohibit the “taking” of federally protected species by federal and non-federal entities (as well as granting incidental take permits in return for the implementation of a habitat conservation plan). DFW has similar authority to enforce CESA and to require that the operators of all dams release sufficient water “to keep in good condition” fish that inhabit the river below the dam pursuant to section 5937 of the California Fish and Game Code. Together, these three agencies exercise significant regulatory authority over California water right holders, water users, and land users.
- **Invasive species.** Many of the Delta’s invasive species were imported into the ecosystem in ballast water or on the hulls of ships. Until recently, these sources were largely unregulated. USEPA now requires commercial vessels to conform to the requirements of a “vessel general permit” (VGP) issued under section 402 of the Clean Water Act (U.S. Environmental Protection Agency 2008). Other significant sources of invasive species include intentional introductions for horticulture and recreational fishing (e.g., striped bass) and introductions from home aquariums and recreational boats. A recent state plan to manage aquatic invasive species identified at least 14 state agencies and numerous federal agencies that would need to be involved (Department of Fish and Game 2008; Hanak et al. 2011).⁹

⁹ For instance, the state Department of Boating and Waterways (DBW) administers programs to control invasive weeds in the Delta, and the state Department of Food and Agriculture seeks to prevent the entry and spread of potentially invasive insect and plant pests in California.

- **Legacy pollutants.** The principal legacy pollutants are mercury, acids, heavy metals, and other toxic substances released from abandoned mines. Although USEPA has designated some of these mines as federal Superfund sites, most discharges from abandoned mines remain unregulated. Mercury is a pollutant of special concern as a neurotoxin that accumulates in fish and predatory waterfowl and threatens human health and safety. It may be economically prohibitive to impose effective source controls on the more than 5,000 abandoned mines that discharge pollutants into the system and the vast mercury-laden sediments from these mines. Yet such legacy sources are significant in discussions about multiple stressors, because regulatory agencies commonly cite mercury as a reason not to restore habitat, to the detriment of the species they are charged with recovering (Hanak et al. 2011).

Numerous agencies at different levels of government provide regulatory oversight pertaining to each of these stressors, and many other agencies and individuals manage the related resources. This fragmentation makes it difficult to address individual stressors effectively and nearly impossible to develop integrated approaches that consider interactions among stressors at appropriate geographic scales. The consequences of fragmented regulation and management include:

- **Missed opportunities for watershed-based approaches.** The three agencies that administer the federal and state ESAs typically issue “incidental take authority” and “take permits” (which authorize project managers to kill or harm listed species up to specified numeric limits) for individual species on a project-by-project basis. These agencies have made progress in coordinating guidance, and habitat conservation plans now encourage multispecies approaches. As described below, the CVP and SWP (with assistance from the fisheries agencies and other parties) are now developing such a plan—known as the Bay Delta Conservation Plan (BDCP)—for a multispecies permit for exports.¹⁰ But even with such a permit for exports, ESA compliance within the watershed will remain fragmented, with many smaller projects by other regulated entities (land users, flood control, water and wastewater utilities) running separate mitigation programs.
- **Oversight gaps.** Numerous federal and state agencies have a hand in invasive species prevention and control, but no entity is charged with coordinating these efforts. The lack of comprehensive regulation of some stressors also creates concerns of fairness in the assignment of regulatory burdens.
- **Conflicting mandates.** The USACE proposes to remove vegetation on levees in the interests of flood control, whereas the fisheries agencies have promoted this vegetation to provide shaded habitat along river edges (U.S. Army Corps of Engineers 2009; Department of Water Resources and Department of Fish and Game 2010).
- **Costly delays.** Many permits and approvals are required to demonstrate that projects are not causing environmental harm. Even projects in which the primary intent is to help the environment are encountering obstacles. For instance, to restore habitat on a small island in the North Delta—a project on which there is broad agreement—the managers may need to obtain ten permits, consult on ten statutes, and ensure consistency with nine programs under 18 state, federal, and local agencies.¹¹ Each approval requires a separate process, which raises costs and increases the odds that agencies will require inconsistent terms for approval.

¹⁰ In addition to covering 11 fish species, this permit would cover 46 species of other animals and plants (Bay Delta Conservation Plan 2013a).

¹¹ This project is discussed later in this report. See Table 1 for a list of permits and other approvals that may be required.

- **Less reliable science.** Most of the entities listed above—and many others—are involved in largely separate scientific activities related to the ecosystem. Although some coordination occurs under the Interagency Ecological Program (IEP), which unites nine federal and state agencies for the monitoring and evaluation related to the take permits for export projects, integrated approaches to key activities such as large-scale modeling have proven elusive. In its review of multiple stressors, the National Research Council (2012) cited the lack of an integrated approach to science in the Delta as a primary reason for the failure to understand and manage stressors effectively. Lack of a common basis for hypothesis testing has also encouraged the development of parallel efforts by regulated parties.

Finally, fragmentation has not only hindered the ability to deal with tradeoffs in ecosystem management (such as those in the levee vegetation example above) but has also made it difficult to provide regulatory incentives to jointly manage stressors. Yet joint stressor management is likely to yield sizable environmental benefits and should also reduce overall costs.

Recent Efforts toward More Integrated Management and Oversight

In the past fifteen years, three major multiparty efforts have sought to facilitate more cohesive and comprehensive planning and regulation for the Delta ecosystem. Two of these—the CALFED Bay-Delta Program and the BDCP negotiations—illustrate the difficulties of addressing the multiple stressors problem. The third such effort—the Delta Stewardship Council created by the Delta Reform Act of 2009—offers the greatest promise and is the focus of the next chapter.

The CALFED Bay-Delta Program

CALFED grew out of the Delta ecosystem crisis in the early 1990s, when the USEPA exercised its authority under section 303(c) of the Clean Water Act to veto California’s Delta water quality standards, thereby inducing the state to develop more protective water quality criteria. CALFED brought together the principal federal and state agencies with planning, operational, and regulatory responsibility in the Delta and provided a forum for extensive stakeholder input on solutions. CALFED undertook a more comprehensive analysis of the multiple stressors on the Delta ecosystem than any other single entity or group of agencies had done before, and it created a long-term program to guide future planning and management of the water projects and land use decisions that affect the ecosystem (Hanak et al. 2011; Little Hoover Commission 2005; Layzer 2008).

The program ultimately failed, however, for several reasons. The final CALFED Record of Decision (ROD), published in 2000, authorized a sharp increase in SWP exports; and the Delta’s pelagic species, including the delta smelt, declined precipitously in the early 2000s, followed by reductions in salmon and steelhead populations later in the decade. With changes in administrations in both Washington, D.C. and Sacramento, CALFED lost both political support and funding. The parties who had preferred consensus decisionmaking and accommodation of interests during the CALFED negotiations then returned to the courts to resolve their differences on ecosystem management, with environmentalists and upstream water users challenging the rise in exports, and exporters challenging endangered species restrictions and water quality requirements (Hanak et al. 2011). In addition, and most germane to this report, CALFED failed because it did not create a governance structure or mechanisms through which the participating agencies could incorporate current science into their policy decisions and coordinate their planning, management, and regulatory actions. The goals of better integrated and more comprehensive planning and management within the Delta ecosystem thus remained elusive (Little Hoover Commission 2005).

The Bay Delta Conservation Plan

BDCP negotiations began in 2006 as CALFED was starting to unravel. The purpose of the negotiations is to create a 50-year Habitat Conservation Plan (HCP) under federal law and a Natural Communities Conservation Plan (NCCP) under state law to enable improvements to the water supply capabilities of the CVP and SWP.¹²

The stated goal of the BDCP negotiations is to create “a comprehensive conservation strategy for the Delta designed to restore and protect ecosystem health, water supply, and water quality within a stable regulatory framework” (Bay Delta Conservation Plan Steering Committee 2012). Indeed, the draft plan describes a structure that would be a dramatic improvement on the traditional piecemeal and fragmented approaches to planning, management, and regulation in the Delta ecosystem:

Unlike past regulatory approaches that have relied almost exclusively on iterative adjustments to the operations of the [CVP and SWP] . . . the BDCP proposes fundamental, systemic, long-term physical changes to the Delta, including substantial alterations to water conveyance infrastructure and water management regimes, extensive restoration of habitat features, as well as measures specifically designed to offset ecological stressors. These ecosystem-wide changes are intended to enhance ecological productivity (structure and function) as well as advance the conservation of species and the natural communities that depend upon them (Bay Delta Conservation Plan 2013b).

The draft plan also explains that, although the “initial focus of the BDCP was to address the conservation of Delta fish species that are currently at very low population levels . . . the conservation strategy evolved to include measures to address a broad range of species and natural communities” (*ibid.*). The draft conservation strategy includes actions designed to “reduce the effects of environmental stressors on these biological resources at various ecological scales, including landscape-scale actions to address physical and chemical processes and food webs, natural community actions that address the ecological functions and processes of specific natural communities that contribute to the overall ecological health, and species-specific actions that address population size and structure as well as the distribution of individual covered species” (*ibid.*).

The BDCP thus includes the type of integrated planning that is essential for future management and regulation of the Delta ecosystem. Through its proposed implementation planning, the BDCP may also serve as a forum to help incorporate current science into adaptive management of both CVP/SWP operations and the ecological functions that are features of the plan. The draft plan states that the BDCP Implementation Office will coordinate its actions with the other agencies with jurisdiction over the Delta, including the SWRCB, USFWS, NMFS, DFW, USEPA, USACE, and the Delta Stewardship Council (Bay Delta Conservation Plan 2013c). It also proposes to create a Permit Oversight Group, comprised of the federal and state fish and wildlife agencies (USFWS, NMFS, and DFW). The purpose of the group is to “coordinate agency review of the actions being implemented under the [BDCP] and assessments of compliance with the provisions of the Plan, its Implementing Agreement, and associated regulatory authorizations.” (*ibid.*). The agencies also “will retain responsibility for monitoring compliance with the BDCP, approving certain implementation actions, and enforcing the provisions of their respective regulatory authorizations” (*ibid.*).

The BDCP is a vast improvement on the CALFED program, and it has the potential to be a constructive forum for better management of some stressors on the system and for resolution of conflicts between some regulatory agencies that will be involved in implementing the BDCP. However, the purpose and scope of the

¹² The HCP/NCCP approach, introduced in the early 1990s, seeks to facilitate a more comprehensive, ecosystem-based approach to environmental mitigation of protected species under the federal and state Endangered Species Acts. In contrast to the “incidental take” permits issued on a species by species basis under Section 7 of the ESA, the HCP/NCCP approach provides a long-term permit for “incidental take” in exchange for more protective measures, typically addressing multiple species at once.

BDCP are sufficiently limited that it is not well-suited to the larger and more important tasks of providing integrated planning, supervision of consistency in implementation and management, and more cohesive regulation of the multiple stressors of the Delta ecosystem as a whole. Indeed, BDCP governance and implementation (including scientific work) must be placed within the larger Delta Plan process led by the Delta Stewardship Council to allow for the substantial actions and stressors involved in the BDCP to be managed more comprehensively with the other stressors and aspects of the Delta ecosystem.

Proposals for More Integrated and Comprehensive Approaches

California's existing water and land management institutions have fallen short of their essential duties in the Delta ecosystem: to understand the multiple sources of stress on the ecosystem; to integrate current science into their administrative responses in a manner that accounts for cumulative effects and synergies among stressors; to coordinate and integrate their decisions with those of other agencies to avoid significant gaps and inconsistencies; and to devise a decisionmaking structure that fosters comprehensive planning, management, regulation, and scientific work. The following chapters present our recommendations for addressing these deficiencies.

Consistent Planning and Accountable Management

The California Legislature created the Delta Stewardship Council (DSC) in the Sacramento-San Joaquin Delta Reform Act of 2009. The council—composed of seven members appointed for staggered terms by the governor and legislature—has broad authority to craft and implement a “Delta Plan” that addresses most stressors that harm the Delta ecosystem. The law directs the DSC to develop a plan to restore Delta flows to support a healthy estuary; to improve water quality to meet drinking water, agriculture, and ecosystem goals; to restore and protect fish habitat and migratory corridors; to promote statewide water conservation, water use efficiency, and sustainable use of water; and to promote options for new and improved storage and conveyance infrastructure to help achieve the coequal goals of “providing a more reliable water supply for California and protecting, restoring, and enhancing the Delta ecosystem” (California Water Code §§ 85020-85023, 85054).¹³ The Delta Plan is intended to take a long view—one hundred years into the future—and is scheduled to be updated every five years.

The legislation that created the DSC also provided for the implementation and monitoring of the Delta Plan. The Delta Reform Act grants the council jurisdiction to determine whether individual projects within the Delta are consistent with the Delta Plan. It also requires “performance measurements that will enable the council to track progress in meeting the objectives of the Delta Plan.” These must include measurable assessments of the status and trends in (1) 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,” and (2) the “reliability of California water supply imported from the Sacramento River or the San Joaquin River watershed” (*ibid.* § 85211).

The DSC describes its responsibilities as articulating a comprehensive Delta Plan and ensuring that individual actors and regulators adhere to that plan. As it explains, the 2009 legislation was a “distinct departure from CALFED and the *status quo* of disparate agencies struggling to tackle complex modern resource problems,” and the Council’s statutory responsibilities are “fundamentally different from past approaches to managing the Delta.” The DSC considers that its most important roles are to: “(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” (Delta Stewardship Council 2012; emphasis added).

The Delta Plan: A Comprehensive Approach

With the publication of its final draft Delta Plan on November 30, 2012, the DSC is now in the late stages of its initial planning work. Consistent with the statutory mandates, the draft Delta Plan takes a comprehensive look at the problems of the ecosystem and establishes a series of policies to guide both the DSC’s future work and the actions of other agencies and individuals that may affect the ecosystem. According to the DSC, the “Plan relies on a mix of legally enforceable policies and essential recommendations to prioritize actions and

¹³ Congress has declared that 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” (Energy and Water Development Appropriations Act of 2012, § 205). We discuss this law and other federal agency consistency requirements later in this report.

strategies for improved water management, ecosystem restoration, and levee maintenance. It also restricts actions that may cause harm, and provides regulatory guidance for all significant plans, projects, and programs in the Delta” (Delta Stewardship Council 2012).¹⁴

The draft Delta Plan proposes broad actions to address significant ecosystem stressors. The DSC recognizes that these actions—which include dam operations and water diversions, point and nonpoint discharges of pollutants, fish harvest, levee construction, channelization, and other changes to riparian lands—are the product of thousands of individual land and water management decisions. It also acknowledges that the responsibility to govern these actions is assigned to a variety of federal, state, and local governmental agencies, including the SWRCB, the RWQCBs, and USEPA for flow reduction and alteration and the discharge of pollutants; DFW, USFWS, and NMFS for fisheries actions; and the USACE and city and county governments for levee construction and other land use decisions that may alter riparian habitat.

The DSC has taken full advantage of the breadth of its statutory planning jurisdiction. The draft Delta Plan proposes a wide range of recommendations for more efficient and more environmentally protective water use throughout California. For example, it declares that it is the policy of the state:

to reduce reliance on the Delta in meeting future water supply needs and that each region that depends on water from the Delta watershed shall improve its regional self-reliance. Success in achieving the statewide policy of reduced reliance on the Delta and improving regional self-reliance will be demonstrated through a significant reduction in the amount of water used, or in the percentage of water used, from the Delta watershed (*ibid.*)

The Plan then establishes a specific set of criteria to govern the impoundment and diversion of water throughout the Delta ecosystem:

Water shall not be exported from, transferred through or used in the Delta if (1) one or more water suppliers that would receive water as a result of the export, transfer or use have failed to adequately contribute to reduced reliance on the Delta and improved regional self-reliance consistent with the three requirements stated below; (2) that failure has significantly caused the need for the export, transfer or use; and (3) the export, transfer or use would have a significant adverse environmental impact in the Delta (*ibid.*)

The draft Delta Plan articulates similar standards for land and water use in the Delta, including geographic limits on new residential construction, levee setback requirements to promote floodplains and riparian zones, habitat restoration goals, and criteria to promote wildlife-friendly farming. It also sets forth “14 regulatory policies and 71 recommendations that start the process of addressing the current and predicted ecological, flood management, water quality, and water supply reliability challenges” (*ibid.*). These policies and recommendations apply to planning and regulatory decisions made by other state and federal agencies with jurisdiction over the greater Delta watershed and export regions, and range from directives to the SWRCB and the RWQCBs on the establishment of standards governing flows and pollutant discharges to recommendations about how the USACE should exercise its jurisdiction under section 404 of the Clean Water Act.¹⁵

¹⁴ The DSC also has appropriately emphasized the need to base planning, management, and regulatory decisions on the best available science that informs analysis and understanding of the complexities and nuance of the Delta ecosystem: “First, science provides the basis of nearly all current understanding of the Delta’s status. 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” (Delta Stewardship Council 2012).

¹⁵ For example, the DSC would have the SWRCB complete its “Strategic Work Plan for Protection of Groundwater Resources” by December 21, 2012, and its “Updated Delta Flow Objectives” by June 2, 2014. The Council also would require the SWRCB to complete its “Policy for Nutrients for Inland Surface Waters” by January 1, 2014, and direct the San Francisco Bay and Central Valley RWQCBs to adopt nutrient objectives for the Delta and Suisun Marsh by January 1, 2018. Moreover, the Council encourages the federal, state, and local BDCP negotiators to have an

These recommendations reflect the council’s commitment to comprehensive and integrated management of the diverse sources of stress on, and beneficial uses of, the Delta ecosystem. The DSC offers detailed analyses of all of the stressors, along with specific policy actions and recommendations to reduce them, mitigate their unavoidable adverse effects, or at least learn more about them to inform future action.

The Council’s “Consistency Certification” Authority

As noted above, the Delta Reform Act gives the DSC jurisdiction to determine whether individual activities within the Delta are consistent with the Delta Plan. State and local agencies that propose to carry out, approve, or fund an action that “will have a significant impact on achievement of one or both of the coequal goals or the implementation of government-sponsored flood control programs” (Water Code § 85057.5(a)(4)) must certify that the proposed action is consistent with the Delta Plan (*ibid.* § 85225). This requirement applies to a broad array of local agency actions and nonregulatory actions by state agencies within the statutory Delta and Suisun Marsh (*ibid.* § 85057.5(a)(1)),¹⁶ including land use decisions, construction, water development, changes in water use and drainage, and the alteration of wetlands and riparian zones.

The Council does not have unilateral authority to review these certifications. Rather, if any person files an appeal of a state or local agency certification, the council must review the matter if the DSC determines that it is within the scope of its jurisdiction as described in the preceding paragraph (Water Code §§ 85225.10(a) and 885225.20).¹⁷ If the Council grants review, it must make specific written findings either denying the appeal or remanding the matter to the state or local public agency for reconsideration (*ibid.* § 85225.25). The Council can deny certification even though the proposed actions may be permitted under other state, federal, or local laws, thereby potentially blocking those actions from being carried out until amended (Delta Stewardship Council 2012). Although individual actions may be beneficial and lawful when considered in isolation, the Council can refuse to certify them in cases where they have negative effects on the Delta as a whole.

The DSC’s certification power is limited in several important ways. First, it is unclear whether an agency can proceed with or approve an action that the council has refused to certify (Water Code § 85225.25). Second, as noted, the DSC’s consistency certification authority is restricted both geographically and jurisdictionally, covering only local actions and state nonregulatory actions occurring within the “Statutory Delta” and Suisun Marsh (*ibid.* § 85057.5(a)(1)). For all other relevant actions—including state regulatory actions within the Delta, all federal actions, and everything taking place outside the statutory Delta and Suisun Marsh—the DSC can comment and provide recommendations, but it has no binding consistency certification authority.¹⁸ The limitations on the DSC’s certification jurisdiction reflect objections by various parties to additional oversight of their actions. (Indeed, DSC’s authority within the Delta is causing consternation among local governments there, which object to DSC oversight of their land use decisions.) However, there is great value in having an expert agency assess whether actions are consistent with the state’s comprehensive plan for the

HCP/NCCP completed by December 31, 2014; and, “considering the ecosystem value of remaining riparian and shaded riverine aquatic habitat along Delta levees,” suggests that the USACE “should agree with the Department of Fish and Game and the Department of Water Resources on a variance that exempts Delta levees from the [USACE’s] levee vegetation policy where appropriate” (Delta Stewardship Council 2012).

¹⁶ The Delta Reform Act defines the Delta to include the “Statutory Delta” defined in Water Code § 12220, as well as Suisun Marsh (Water Code § 85058). It defines the Delta watershed as “the Sacramento River Hydrologic Region and the San Joaquin River Hydrologic Region as described in [DWR] Bulletin No. 160-05 (Water Code § 85060). Figure 1 in this report depicts these areas.

¹⁷ Water Code § 85225.10(a) provides: “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.”

¹⁸ On state regulatory decisions, see Water Code § 85057.5(b)(1)), and on federal agency decisions see Water Code § 85225.

Delta ecosystem. As described in a later section, we recommend that the legislature clarify DSC's consistency certification authority within the Delta and we make several suggestions for expanding DSC's consistency review in an advisory capacity on relevant actions beyond its binding certification jurisdiction.

The Council's Consultation Role: To Foster Coordinated and Consistent Actions

The DSC also plans to use tools other than certification to help ensure compliance with the Delta Plan and to foster more coordinated agency action. First, pursuant to authority granted in the Delta Reform Act (Water Code § 85204), the DSC will convene a "Delta Plan Interagency Implementation Committee" (DPIIC) comprised of the representatives of the federal, state, and local agencies with management or regulatory authority over the lands, waters, and resources of the Delta ecosystem. This committee will meet at least twice annually to fulfill the legislature's directive that "each agency shall coordinate its actions pursuant to the Delta Plan with the Council and other relevant agencies" (*ibid.*).¹⁹

Second, the council will review the Bay Delta Conservation Plan when it is complete and decide whether it should be incorporated into the Delta Plan (*ibid.* § 85320). Before making this decision, it must consult with the Delta Independent Science Board, DFW, and DWR. DFW's role is especially important. The Delta Reform Act states that the council cannot incorporate BDCP into the Delta Plan unless the DFW determines that it is consistent with the Natural Communities Conservation Act (Fish and Game Code §§ 2800-2835) and meets the other requirements of the Delta Reform Act (Water Code § 85320).²⁰

Third, the DSC will "review and provide timely advice to local and regional planning agencies regarding the consistency of local and regional planning documents, including sustainable communities strategies and alternative [transportation] planning strategies... with the Delta Plan" (Water Code § 85212). This consultation is not limited to the council's formal consistency review of local government actions within the Delta. Rather, the DSC may give advice to all such agencies to help them shape their own regional plans to conform to the Delta Plan.

Finally, the council will seek to work closely with federal agencies having jurisdiction over the Delta ecosystem to coordinate federal, state, and local actions and to ensure federal compliance with the Delta Plan (Delta Stewardship Council 2012). The legal obligations of federal agencies to comply with the Delta Plan are discussed in a later section of this report.

Each of these interagency consultation strategies is a valuable part of the DSC's comprehensive planning authority. The council's coordination with federal, state, and local agencies that exercise regulatory jurisdiction over the Delta ecosystem is important for informing the other agencies of the implications of their proposed actions for the goals established in the Delta Plan. Early consultation also helps to ensure that

¹⁹ The DSC describes the committee goals thus: (i) monitor progress of priority actions and agency activities to implement the Delta Plan; (ii) report regularly on implementation plans and actions; (iii) identify opportunities for integration and leveraging of funding; (iv) identify funding needs and support development of a finance plan to implement the Delta Plan; (v) assist in the ongoing development and tracking of Delta Plan performance measures; (vi) coordinate regulatory actions on significant projects to implement the Delta Plan, as appropriate; and (vii) discuss common issues and resolve interagency conflicts (Delta Stewardship Council 2012).

²⁰ There is some dispute over the exact roles of the DSC and DFW in deciding whether to incorporate the BDCP into the Delta Plan. The Delta Reform Act states that the council *shall* incorporate the BDCP into the Delta Plan if: (1) the BDCP has been approved as an HCP under the federal ESA; and (2) the DFW approves the BDCP as an NCCP and determines that it meets the other requirements of the Delta Reform Act itself (Water Code § 85320(e)). The statute also provides, however, that DFW's "determination that the BDCP has met the requirements of [the Delta Reform Act] may be appealed to the council" (*id.*). The council therefore effectively has final authority to decide whether to incorporate the BDCP into the Delta Plan.

other agencies' decisions are consistent with the Plan. This in turn reduces the potential for conflict over the DSC's consistency authority.

Incorporation of the BDCP into the Delta Plan would demonstrate that the activities authorized by this important habitat conservation plan—including new constraints on CVP and SWP water supply operations and possible construction of a new conveyance system for moving Sacramento River water to the south Delta pumps—are consistent with the coequal management goals and with the other elements of the Delta Plan. Conversely, a decision *not* to incorporate the BDCP would signal fundamental problems with the HCP and the activities it authorizes. The council or DFW might conclude, for example, that the BDCP focuses too narrowly on water supply in isolation from the needs of the Delta ecosystem. The council's review of the BDCP is an example of its much-needed role as the comprehensive and integrative planning agency.

Finally, although it has not received much public attention, the DPIIC may be the most important interagency consultation and cooperation strategy created by the Delta Reform Act (Water Code § 85280). This committee is comprised of the principal planning and regulatory agencies, the combined jurisdiction of which covers the full spectrum of the lands, waters, and other resources of the Delta ecosystem, and it will meet at least twice annually.²¹ As described in greater detail below, the DPIIC meetings will allow each agency to brief the DSC on its upcoming actions. These meetings should also serve as a forum for harmonizing the various plans that guide management of the Delta ecosystem.

Recommendations to Strengthen Integrated Delta Planning and Management

To strengthen ongoing coordination and integration efforts, we recommend several changes in the DSC's authority. The first three are proposals to address ambiguities or gaps in DSC's certification authority. The fourth would enhance the role of the Delta Plan Interagency Implementation Committee by requiring participating state and federal agencies to present their near-term and long-term work plans on how they intend to use their authorities to carry out the Delta Plan.

Clarify DSC's Consistency Certification Authority

Past efforts to protect the Delta ecosystem have foundered partly because of the fragmented nature of planning and regulation throughout the system. As noted above, dozens of different agencies operating at different levels of government have their own individual statutory mandates and programmatic goals. A fundamental purpose of the Delta Reform Act was to increase the coherence of this planning and regulatory system by granting the DSC some power to ensure that the various agencies with jurisdiction over aspects of the Delta actually implement their authorities consistently with the overall Delta Plan. However, the Act ambiguously defines a critical aspect of the council's consistency review powers—*viz.*, whether a state or local agency can proceed with an action that the DSC refuses to certify.

²¹ The council has stated that, 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 [Delta Protection Commission]; the Delta Watermaster; the [California Department of Food and Agriculture] CDFA; the Natural Resources Agency; the Business, Transportation and Housing Agency; and the California Environmental Protection Agency. Federal agencies such as National Marine Fisheries Service (NMFS), the U.S. Fish and Wildlife Service, the Bureau of Reclamation, Natural Resources Conservation Service, the U.S. Geological Survey, the 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." (Delta Stewardship Council 2012).

The council interprets the Delta Reform Act as prohibiting such actions: “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” (Delta Stewardship Council 2012). In contrast, the statute states:

After a hearing on an appealed action, the council shall make specific written findings either denying the appeal or remanding the matter to the state or local public agency for reconsideration of the covered action based on the finding that the certification of consistency is not supported by substantial evidence in the record . . . Upon remand, the state or local agency may determine whether to proceed with the covered action. *If the agency decides to proceed with the action or with the action as modified to respond to the findings of the council, the agency shall, prior to proceeding with the action, file a revised certification of consistency that addresses each of the findings made by the council and file that revised certification with the council* (Water Code § 85225.25; emphasis added).

The Act thus can be read as requiring that state and local agencies need only take the DSC’s reasons denying certification into account, revise the proposed action in response to the council’s comments, issue a revised certification of consistency, and then proceed with the revised action.

Although this question of statutory interpretation could be left to the courts to resolve, it would be better for the legislature to clarify that state and local agencies cannot take actions within the Delta that the DSC has found to be inconsistent with the Delta Plan. This would require agencies that want to proceed with their proposed actions to revise them in response to the council’s inconsistency findings, submit the revised proposal to the council, and withhold the action until the council issued a new consistency determination.²²

The DSC’s consistency review of state and local governmental actions within the Delta is essential to its implementation of the Delta Plan. The cities, counties, joint powers agencies, water districts, and other local agencies with jurisdiction over activities in the Delta are diverse and generally lack cohesion. Moreover, their pursuit of one land or water use objective may be in tension with the coequal goals of the Delta Reform Act. The same is true for the many state agencies operating in the Delta. As the DSC has recognized, “[g]overnance 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” (Delta Stewardship Council 2012). The Delta Plan and the consistency certification process are the critical unifying strategies to ensure that the coequal goals are achieved and to “[p]rotect and enhance the unique cultural, recreational, and agricultural values of the California Delta as an evolving place” (Water Code § 85020(b)). There should be no uncertainty on this essential point of statutory interpretation.

Extend DSC’s Consistency Review beyond the Legal Delta

Although DSC’s analysis and planning functions extend to all activities that potentially affect the Delta ecosystem, the geographic restrictions on its consistency certification authority omit activities that occur upstream of the Delta but within the Sacramento and San Joaquin River watershed, as well as activities outside the Delta watershed that may adversely affect the Delta ecosystem. The former category includes changes in land use, new water development, reservoir operations, the addition of pollutants, fisheries management, timber harvesting, and alteration of wetlands and riparian zones. The latter includes all water management decisions by export agencies in the Bay Area, the Friant-Kern Canal service area in the Tulare Basin, and the geographic region served by the Metropolitan Water District of Southern California that may

²² The DSC’s consistency and inconsistency determinations are subject to judicial review. Thus, if the agency is unable or unwilling to revise its proposed action to conform to the council’s consistency requirements, both the agency and the proponent of the action could file a petition for writ of mandate to compel the DSC to certify the proposed action. The courts likely would give significant deference to the DSC’s determination in such cases.

place additional demands on the waters that originate in the Sacramento and San Joaquin River and Delta system (see Figure 1 above).

The legislature limited the geographic scope of the DSC’s consistency certification authority largely at the behest of upstream landowners and water users and out-of-basin water users who did not want their actions subject to consistency review by the council.²³ Yet, this restriction undermines the legislature’s goal of fostering integrated and comprehensive planning and regulation because it withholds from the council the best means of monitoring and supervising *all* activities that may jeopardize achievement of the Delta Plan.

Under existing law, the DSC can articulate a comprehensive and integrated plan for the Delta. But many of the essential features of the Plan—from better management of upstream tributaries to the requirement that urban water management plans²⁴ demonstrate why future demands cannot be served by local sources, conservation, or improvements in efficiency—will be little more than hortatory calls for improved water policy. We therefore recommend that the DSC exercise its authority to supervise implementation of the Delta Plan by retaining the option to review land and water use plans and other actions by local governments and state agencies upstream of the Delta and outside the Sacramento-San Joaquin River watershed to the extent that the plans or actions may affect the lands and waters of the Delta ecosystem.

The DSC could implement this proposal without new legislation. The Delta Reform Act provides that the council “shall review and provide timely advice to local and regional planning agencies regarding the consistency of local and regional planning documents ... with the Delta Plan” (Water Code § 85212). The statute also requires the DSC to include in the Delta Plan “performance measurements that will enable the council to track progress in meeting the objectives of the Delta Plan” (Water Code § 85211). Reviews of state and local actions upstream of the Delta and outside the watershed for consistency would assist the DSC’s fulfillment of its supervisory responsibilities.

As with the DSC’s existing consistency certification authority over state and local actions within the Delta, the purpose of the council’s review would be to determine whether these diverse plans and actions are consistent with the Delta Plan. The DSC’s consistency *review* of plans and actions upstream of the Delta and outside the Sacramento-San Joaquin River watershed would differ from its consistency certification authority of actions within the Delta in four critical respects:

1. State and local agencies would not be required to certify that their plans and other actions upstream of the Delta and outside the watershed are consistent with the Delta Plan. Rather, submission of the plans and other decisions to the DSC would be voluntary, although the council could review any such actions on its own initiative.
2. The plans and actions would not have to await the DSC’s review and consistency opinion. Rather, the promulgating agency could implement its decision immediately in accordance with the laws that govern its planning decisions and other actions.
3. The DSC’s review would be advisory, limited to a declaration of consistency or non-consistency with the Delta Plan (a “consistency opinion”—in contrast to the “consistency determination” made for

²³ State regulators, as well as permittees and licensees, also urged the legislature to exempt state regulatory decisions from the DSC’s consistency certification jurisdiction. We discuss this aspect of the council’s review authority in the next section.

²⁴ Urban Water Management Plans are long-term planning documents required of all urban utilities serving at least 3,000 customers or delivering at least 10,000 acre-feet per year. They must be prepared on a five-year cycle, in years ending in 5 and 0 (Water Code §§ 10610-10656).

actions within DSC's regulatory jurisdiction). The council would not have authority to block or to impose conditions on inconsistent actions.

4. As the number and complexity of some of these plans could overwhelm the DSC's limited resources, review would be at the option of the council. There would be no private right to appeal.

These changes would improve the existing law governing the DSC's consistency authority by vesting in the council greater authority to accomplish its principal mission—to create an integrated and comprehensive plan to protect the Delta and to ensure that the many actions that may affect the Delta are consistent with that plan both individually and jointly. Although the council's consistency opinions would not themselves have any legal consequences, they would represent the formal opinion of the agency charged with carrying out the legislature's coequal goals. The consistency opinions would provide guidance to the various local governments and state agencies on how they should amend their plans and make future decisions that better account both for the decisions of other agencies and the integrative goals of the Delta Plan. They would also help to inform elected officials, state and federal regulators, and the public whether the individual and cumulative actions that affect the Delta ecosystem are promoting or frustrating implementation of the Delta Plan.

The DSC's consistency opinions would also be useful to the courts upon judicial review of the individual plans and decisions as they would provide the expert analysis of the principal agency that the legislature has charged with crafting an integrated and comprehensive plan for the Delta and supervising its implementation. Indeed, the courts are likely to give significant respect and deference to the council's expert opinions. State and local decisionmakers therefore may have an incentive to seek the DSC's opinion on the consistency of their proposed actions with the Delta Plan, even though they would neither be legally obligated to do so nor bound to follow the council's recommendations. A DSC consistency opinion would help to affirm the agency's decision. In contrast, an opinion by the council that a state or local action would be harmful to the Delta Plan would undermine the agency's defense of the action in court.

Although extension of the DSC's consistency *certification* authority to all actions within the Sacramento-San Joaquin River watershed and in export regions might be an even more effective means of ensuring that the myriad plans and actions are consistent with the Delta Plan, we do not believe it is necessary or appropriate to expand the council's powers in this way. If the DSC were required to make a consistency approval determination on all (or even many) of the plans and actions that occur in upstream and export areas, the potential for administrative delay would be significant. In addition, following DSC's approval of the final Delta Plan later this year, the council will begin the process of reviewing in-Delta plans and actions for consistency. This will require considerable time and financial resources, and we are wary of adding comprehensive consistency certification obligations to the council's consistency certification docket. Finally, there is probably not sufficient political support for expansion of the DSC's consistency certification jurisdiction. The more limited advisory role that we propose here would not require any changes to existing planning and action decisions. It therefore should be acceptable to land and water users, planners, and water managers in upstream and export areas, all of whom have a stake in better coordinated and integrated administration of the Delta ecosystem consistent with the coequal goals of the Delta Reform Act.

For these reasons, we recommend that the DSC assert authority to review state and local planning decisions and other actions upstream of the Delta and in export regions and to issue opinions on the consistency of these actions with the Delta Plan. This nonbinding consistency review would enable the council to bridge the gap between its comprehensive planning authority and its unduly circumscribed jurisdiction to ensure that

the Delta Plan is implemented in an integrated and legally consistent manner by the diverse agencies and other government entities that actually control land and water use within the Delta ecosystem.

Extend DSC's Consistency Review to State Regulatory Decisions

The Delta Reform Act also excludes decisions by state regulatory agencies from the DSC's consistency certification jurisdiction (Water Code § 85057.5(b)(1)). The council has stated, however, that, although it may not review state regulatory decisions themselves, it does have authority to review the underlying action that is subject to state regulation. In the example given by the council, "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" (Delta Stewardship Council 2012).

We agree with the DSC that it should exercise consistency certification authority over activities subject to state regulation, even though it has no jurisdiction over the regulatory decision itself. Numerous regulated activities—from water rights, to the discharge of pollutants, to the filling of wetlands—may be individually permitted, but their cumulative and synergistic effects on the Delta ecosystem will not be considered unless there is a meaningful forum in which these interactions can be addressed. As the council has observed, "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" (*ibid.*).

For the reasons outlined in the preceding section, we would go one step further and extend the DSC's consistency *review* to the state regulatory decisions themselves. This consistency review would apply to agencies' promulgation of rules and policy statements, as well as to regulatory and permitting decisions for individual projects. As with our proposal for DSC consistency review of state and local actions upstream of the Delta and in export areas, state regulators would not be required to certify that their policies and individual actions are consistent with the Delta Plan. Rather, they could voluntarily submit their rules and decisions to the DSC for its opinion and recommendations; or the council could review certain rules and decisions on its own initiative. Moreover, the council's consistency review of state regulatory decisions would be advisory only, and the action subject to the regulatory decision could proceed pending the council's consistency review.

Extension of the DSC's consistency review authority to include state regulatory decisions is not simply a formality. By reviewing the regulatory decision itself (rather than the underlying proposed action) the council would be better positioned to consider how the terms and conditions imposed by the regulator affect the Delta ecosystem. This also would allow both the regulated party and the regulatory agency to explain why the action and regulatory decision are consistent with the Delta Plan and to respond to the DSC's recommendations on how the action and regulatory decision could be modified to achieve consistency.

The DSC currently has authority to decide whether to incorporate the Bay Delta Conservation Plan into the Delta Plan (Water Code § 85320) and "may incorporate other completed plans related to the Delta into the Delta Plan to the extent that the other plans promote the coequal goals" (*ibid.* § 85350). The quality and value of the council's comprehensive and integrative planning would be enhanced if it also has the ability to determine whether other policy statements such as the SWRCB's flow criteria, water quality plans, TMDLs, urban and agricultural water management plans, groundwater management plans, flood control plans,

upstream NCCPs, and other similar documents are consistent with the Delta Plan, regardless of whether the council finds it appropriate to incorporate any individual document into the Delta Plan.

Extend DSC's Consistency Review to Federal Decisions

Although the Delta Reform Act directs the DSC to consult with federal agencies in developing the Delta Plan (Water Code § 85300(b)), it omits all federal actions from the council's consistency review. As the DSC observes in the draft Delta Plan, however, the federal government will have a "critical role in achieving the coequal goals through the Delta Plan's comprehensive, Delta-wide planning and implementation effort" that "goes beyond federal participation in the more narrowly focused BDCP" (Delta Stewardship Council 2012). Given the vast influence of federal management decisions on the Delta ecosystem—including operation of the CVP, management and oversight of flood control, restoration of the San Joaquin River, provision of drainage services on the west side of the San Joaquin Valley, and management of timber harvesting in national forests in the upstream areas of the watershed—federal consistency with the Delta Plan is essential for its success.

Following adoption of the Delta Plan, the DSC intends to "pursue a compliance mechanism that requires consistency of federal actions" using the Coastal Zone Management Act (CZMA) (16 U.S.C. §§ 1451-1466) or "an equivalent compliance mechanism" (*ibid.*).²⁵ The council has stated that it also "will work with federal agency representatives to explore opportunities for federal participation in Delta Plan implementation efforts" (Delta Stewardship Council 2012).

Although the CZMA is the most comprehensive and potentially effective means of ensuring federal consistency with the Delta Plan, there are two significant impediments to applying the Act to bind federal agencies to the requirements of the plan.

Section 307(c)(1)(A) of the CZMA provides:

Each Federal agency activity within or outside the coastal zone that affects any land or water use or natural resource of the coastal zone shall be carried out in a manner which is consistent to the maximum extent practicable with the enforceable policies of approved State management programs (16 U.S.C. § 1456(c)(1)(A)).

The Act defines the "coastal zone" as "the coastal waters (including the lands therein and thereunder) and the adjacent shorelands (including the waters therein and thereunder), strongly influenced by each other and in proximity to the shorelines of the several coastal states, and includes islands, transitional and intertidal areas, salt marshes, wetlands, and beaches" (*ibid.* § 1453(1)). This definition includes the San Francisco Bay, the Carquinez Strait, Suisun Marsh, and the Delta.

If the Secretary of Commerce, acting through the National Oceanic and Atmospheric Administration (NOAA), approves the Delta Plan as part of California's Coastal Management Plan, then three federal consistency requirements would apply:

1. "Each Federal agency activity within or outside the coastal zone that affects any land or water use or natural resource of the coastal zone shall be carried out in a manner which is consistent to the maximum extent practicable with the enforceable policies of approved State management programs"

²⁵ The Delta Reform Act directs the council to "develop and implement a strategy to appropriately engage participation of the federal agencies with responsibilities in the Delta. This strategy shall include engaging these federal agencies to develop the Delta Plan consistent with the federal Coastal Zone Management Act of 1972 (16 U.S.C. § 1451 et seq.), the federal Clean Water Act (33 U.S.C. § 1251 et seq.), and Section 8 of the federal Reclamation Act of 1902" (Water Code § 85082).

(*ibid.* § 1456(c)(1)(A)). The reference in this subsection to activities “outside the coastal zone” that affect land, water use, or natural resources brings all federal actions upstream of the Delta and in water export regions within its consistency requirements.²⁶

2. Each federal agency that undertakes a development project within the coastal zone “shall insure that the project is, to the maximum extent practicable, consistent with the enforceable policies of approved state management programs” (*ibid.* § 1456(c)(2)).
3. Applicants for a federal license or permit “to conduct an activity, in or outside of the coastal zone, affecting any land or water use or natural resource of the coastal zone of that state shall provide... a certification that the proposed activity complies with the enforceable policies of the state’s approved program and that such activity will be conducted in a manner consistent with the program” (*ibid.* § 1456(c)(3)(A)). The Act then prohibits the federal agency from granting the permit or license until the state or its designated agency “has concurred with the applicant’s certification” (*ibid.*).²⁷ NOAA may preempt or override the state’s objections, however, if it finds that “the activity is consistent with the objectives of [the CZMA] or is otherwise necessary in the interest of national security” (*ibid.*).

If NOAA approves the Delta Plan as part of California’s Coastal Management Plan, these statutory directives would provide much of the federal consistency that is required to carry out the Delta Plan effectively. Indeed, Congress intended the CZMA to eliminate exactly the type of fragmented policy implementation that has plagued the Delta in the past (Thompson 2012).

Although the CZMA federal consistency requirements offer great promise, we are concerned about two potential obstacles. First, before approving the Delta Plan, NOAA must consider the views of all other federal agencies with jurisdiction over the lands, waters, and resources that may be affected by the federal consistency requirements (16 U.S.C. § 1456(b)). This means that NOAA would have to consult with an array of agencies in at least three other cabinet-level departments, including the USEPA, USACE, USFWS, USBR, the U.S. Forest Service, the Coast Guard, and possibly the National Park Service and the Natural Resource Conservation Service. Consensus among these agencies on the question of whether it would be good federal policy to approve the Delta Plan and thereby trigger federal consistency obligations may be difficult to achieve.

Second, if NOAA does approve the Delta Plan, federal agencies would be required to seek consistency with the goals of the Plan, but would not necessarily be bound by the requirements of the Plan. As described above, the subsections of the CZMA that govern federal programmatic decisions require consistency only “to the maximum extent practicable” (*id.* § 1456(c)(1) & (2)). The subsection that applies to applicants for federal permits and licenses requires the applicant to certify that its plans are consistent with state law and empowers the state to object to the consistency determination; but it then grants NOAA authority to override the state’s objections if NOAA finds that “the activity is consistent with the objectives of [the CZMA] or is otherwise necessary in the interest of national security” (*ibid.* § 1456(c)(3)). Disputes between any federal agency and the state must be submitted to mediation by the Department of Commerce (*ibid.* § 1456(h)).

²⁶ The CZMA requires each federal agency to provide its consistency determination to the state no later “than 90 days before final approval of the Federal activity unless both the Federal agency and the State agency agree to a different schedule” (16 U.S.C. 1456(c)(1)(A)).

²⁷ The state has six months from the date of receipt of the permit or license applicant’s consistency certification to notify NOAA whether it concurs in the consistency certification. Otherwise, “the state’s concurrence with the certification shall be conclusively presumed” (16 U.S.C. § 1456(c)(3)(A)).

Although we would expect that NOAA and the other federal agencies with jurisdiction over the Delta ecosystem will evaluate the DSC's request to approve the Delta Plan as part of the California Coastal Management Plan with good faith and in a spirit of cooperative federalism, there is no guarantee that NOAA will ultimately approve the Plan. And if it does, the statutory caveats to the federal consistency requirement render it uncertain whether in any individual case the DSC could actually ensure federal agency consistency with the Delta Plan through the CZMA process. At a minimum, resolution of conflicts between the directives of the Delta Plan and federal programmatic and regulatory prerogatives would entail lengthy mediation and judicial review.

Accordingly, while we support the DSC's stated intention to seek NOAA's approval of the Delta Plan under the CZMA, we do not believe that this should be the council's only means of reviewing federal agency decisions for consistency. We therefore recommend that the DSC exercise consistency review of federal regulatory and nonregulatory decisions that may affect the lands and resources of the Delta ecosystem. Federal agencies would not be required to have their actions certified for consistency, unless so directed by the CZMA or some other federal statute. As with our preceding two proposals, the DSC's consistency review would be advisory. The council would not have authority to veto or to impose terms and conditions on federal actions—unless and until it acquires such authority pursuant to the terms of the CZMA or another federal statute.

In addition to the CZMA, several federal laws require federal agencies with jurisdiction in the Delta ecosystem to comply with California law. The most general—and potentially powerful—of these is section 205 of the Energy and Water Development Appropriations Act of 2012. (See Box 2 for brief descriptions of several other federal laws that also are relevant.) Section 205 explicitly adopts the state's coequal goals for the Delta as part of federal policy:

“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.”²⁸

Although this statute expressly requires consistency between California law and federal policies in the Delta ecosystem, we do not believe that it grants the DSC authority either to require federal agencies to certify that their proposed actions are consistent with the Delta Plan or to place binding conditions on federal actions. The last sentence of section 205 states: “[n]othing herein modifies existing requirements of Federal law.” In light of this caveat, it is unlikely that Congress intended that its federal policy consistency directive supersede the more detailed consistency processes of the CZMA described above. Therefore, for the Delta Plan to be binding on federal agencies, the DSC must obtain approval from NOAA to incorporate the plan into California's Coastal Management Plan.

Nevertheless, section 205 reinforces the integrative and unifying purposes of the Delta Plan by requiring all federal agencies to design and implement their programmatic and regulatory decisions in harmony with California law and promote the coequal goals of the Delta Reform Act. This can be best achieved if federal agencies consult and coordinate with the DSC, participate in the regular meetings of the Delta Plan Interagency Implementation Committee described in the next section, and attempt to conform their decisions with the policies of the Delta Plan.

²⁸ The Act also directs the Secretary of the Interior, the Secretary of Commerce, the Army Corps of Engineers, and the Environmental Protection Agency Administrator to “jointly coordinate the efforts of the relevant agencies and work with the State of California and other stakeholders to complete and issue the Bay Delta Conservation Plan Final Environmental Impact Statement no later than February 15, 2013.”

Box 2: Other federal consistency mandates

In addition to the CZMA and the Energy and Water Development Appropriations Act, several other federal laws require that federal actions be consistent with state law.

Section 313 of the Clean Water Act, 33 U.S.C. § 1323: This law declares that “[a]ll federal agencies having jurisdiction over any property or facility, or engaged in any activity resulting, or which may result, in the discharge or runoff of pollutants ... shall be subject to, and comply with, all Federal, State, interstate, and local requirements, administrative authority, and process and sanctions respecting the control and abatement of water pollution in the same manner, and to the same extent as any nongovernmental entity.” This directive authorizes the state—acting through the SWRCB and the RWQCBs—to apply water quality standards, TMDLs, NPDES permits, and waste discharge requirements to federal agencies such as USBR and USFS. The DSC could use this directive to require that federal agency actions be consistent with the Delta Plan and comply with consistency review and other reporting requirements.

Section 8 of the Reclamation Act and the Central Valley Project Improvement Act (CVPIA): The Supreme Court has interpreted section 8 of the Reclamation Act, 43 U.S.C. § 383, to require USBR to comply with California law in operating the CVP, unless the application of state law would be inconsistent with specific congressional directives governing the project (California v. United States 1978). In section 3406(b) of the Central Valley Project Improvement Act of 1992, Congress went further and directed the Bureau to operate the CVP “to meet all obligations under state... law, including but not limited to... all decisions of the California State Water Resources Control Board establishing conditions on applicable licenses and permits for the project” (Central Valley Project Improvement Act 1992). These statutes authorize the SWRCB to regulate the CVP through its permit and license jurisdiction and to apply California water rights and water quality laws to the project, including the obligation to operate the project in compliance with Delta water quality standards. The board also may apply the requirements of the Delta Plan to the CVP through its permit jurisdiction.

Section 401(a) of the Clean Water Act, 33 U.S.C. § 1341(a): This statute requires applicants for a federal license or permit to conduct any activity that may result in a discharge into the waters of the United States to provide the licensing or permitting agency with a “certification from the State” that the discharge will comply *inter alia* with effluent limitations and water quality standards. Section 401(d) then provides that state certification “shall become a condition” on the federal license or permit. The U.S. Supreme Court has held that this statute grants the SWRCB authority to require FERC licensees to comply with California water quality standards and minimum stream flow requirements as part of the Board’s certification of compliance with federal and state water quality laws (*Public Utilities District No. 1 v. Washington Department of Ecology* 1994). Section 401 also authorizes the state to place conditions on section 404 permits issued by the USACE (U.S. Environmental Protection Agency 2010). The DSC will be able to use this state certification authority to require FERC licensees and section 404 permittees to comply with the requirements of the Delta Plan as a binding condition of their federal permits and licenses.

Require Work Plans for DPIIC Members

As described above, the Delta Protection Act established a Delta Plan Interagency Implementation Committee consisting of the principal state and federal planning and regulatory agencies with jurisdiction over the waters, lands, and other resources of the Delta ecosystem. This committee has the potential to re-create one of the most useful features of the late CALFED Bay-Delta Program—regular meetings of the

principal planning and regulatory agencies whose combined jurisdiction covers the full spectrum of the lands, waters, and other resources in the Delta ecosystem.

These meetings provide the best forum for harmonizing the various plans that guide management of the Delta ecosystem—including the Delta Plan, the SWRCB’s Bay-Delta Water Quality Control Plan, the Central Valley and San Francisco Bay RWQCB’s Basin Plans, USACE’s Water Control Plans, the CVP and SWP Operations Criteria and Plan, the biological opinions for the CVP and SWP FERC licenses, and other regional and local plans that may be relevant to a particular topic under consideration. They also allow for each agency, on a semiannual basis, to brief the council and the other agencies on their upcoming actions. The committee thus may serve as a forum for early integration and resolution of potential conflicts or inconsistencies among the proposed actions of the various agencies. Finally, as the name “Delta Plan Interagency Implementation Committee” connotes, the committee may seek to devise common and cohesive strategies to implement and to promote the Delta Plan.

The information shared and developed by the DPIIC will thereby enable participating agencies to better coordinate their work and inform the DSC of the variety of proposed agency activities that may affect implementation of the Delta Plan. We recommend that the DSC strengthen this process by requiring the participating agencies to present their near-term and long-term work plans to the DPIIC on an annual or biennial basis. Less formal preparatory meetings and documents could further the integration of agency Delta management actions at semiannual meetings.

Formal presentation of these work plans would achieve several goals: (1) individual agencies would have to explain how their actions contribute to the Delta Plan’s goals; (2) each agency would have to explain in detail how it plans to coordinate its actions with the other agencies and integrate other agencies’ decisions into its own actions; and (3) presentation of individual agency work plans in a forum supervised by the DSC would increase public awareness of the web of decisions that potentially affect the Delta ecosystem. A requirement that agencies specify how their actions will contribute to the Delta Plan also would make it easier to hold them accountable for what they say they will do. Presenting both long-term and near-term plans would facilitate coordination over both time horizons.

To facilitate the use of science in management and to highlight adaptive aspects of multiagency management, the semiannual meetings would include presentations on syntheses of scientific findings and issues regarding management and policies and scientifically-based ideas for adapting management to both improve accomplishment of the coequal goals and improve understanding of the Delta ecosystem.

Summing Up

The changes that we have recommended to the DSC’s consistency certification authority and nonbinding consistency reviews are modest, as is the requirement of annual or biennial work plans. However, expansion of the council’s consistency reviews to include state and local planning decisions and programmatic actions in upstream and export areas, state regulatory decisions, and federal decisions would place significant new burdens on DSC staff. The council may be able to support this work partly by reallocating personnel and resources from preparation of the Delta Plan to a new office of supervision and implementation. But additional funding will also be required.

These changes—as well as the provision of financial resources to support them—are necessary to ensure that the Delta Plan does not simply become another in a long series of plans created to improve conditions in the

Delta, adopted amidst great expectations, and then largely ignored or superseded by economic and demographic pressure and loss of political support.

The Delta Stewardship Council is *the* agency that the legislature has entrusted with crafting a long-term plan that will restore and protect the Delta ecosystem consistent with the coequal goals set forth in the Delta Reform Act. The council is now close to completing the first stage of this process—adoption of the first Delta Plan. Yet, the implementation stage will be both more important and perhaps more difficult. The DSC must have the ability to supervise and integrate other state and federal agencies' plans and monitor the many actions affecting the lands, waters, and resources of the ecosystem to ensure that they are consistent with the comprehensive and integrative goals and directives of the Delta Plan. The proposals that we recommend here would simply extend the council's consistency review procedures to match the comprehensiveness of the Delta Plan itself. DSC consistency reviews and certifications will need to have both legal and moral force, as well as support from state executive leadership, if the Delta Plan and the DSC are to become the overarching strategic authority for local, state, and federal actions in the Delta as intended in the 2009 legislation.

Regulating Delta Stressors

Effective governance of the Delta ecosystem requires both integrated planning and integrated regulation. To ensure effective protection of the ecosystem, the regulatory system must meet three related objectives. First, regulations must be sufficiently comprehensive to cover all significant stressors. Second, agencies with overlapping jurisdiction must coordinate their regulatory actions. Third, regulators must identify the linkages and tradeoffs among different stressors and actions and make reasoned decisions regarding unavoidable tradeoffs that are supported by the best available science.

Unless the regulatory system addresses all primary stressors, unregulated and underregulated stressors can undermine efforts to improve the health of the ecosystem. Incomplete regulation can also lead to inequities in regulatory burdens, with some regulated entities bearing a disproportionate share of the costs of protecting the Delta relative to their contribution to the Delta's ecological problems. Finally, as described in the introduction of this report, regulatory gaps can lead to judicial challenges to the legality of regulatory steps already undertaken.

The historical focus of state and federal regulatory agencies on water exports by the CVP and SWP illustrates this latter point. As noted above, the SWRCB's myopic focus on the CVP and SWP in the revised water quality plans that it issued as part of the Sacramento-San Joaquin Delta Plan led the California Court of Appeal to conclude in its 1986 *Racanelli* decision that the board had violated both water rights and water-quality law. According to the court, the board has an obligation to take a "global perspective" and address all actions within its jurisdiction (*United States v. State Water Resources Control Board* 1986). More recently, in the *Consolidated Delta Smelt Cases*, the U.S. District Court struck down the 2008 biological opinion of the USFWS in part on the ground that the agency failed to explain adequately why it was necessary to limit CVP and SWP diversions as much as the biological opinion called for in light of the other stressors that affect the delta smelt (*Consolidated Delta Smelt Cases* 2010).²⁹ This decision serves as a cautionary tale to all regulatory agencies of the importance of taking a comprehensive approach to the Delta. As scientists learn more about the interactions, synergies, and cumulative effects of the multiple stressors that beset the Delta system, more legal and political challenges are likely to regulatory decisions that burden the sources of one or a few stressors while excluding other stressors that, as a matter of science and regulatory fairness, should be part of the solution.

Regulatory agencies must also coordinate their activities. First, coordination maximizes the chances that regulations will be mutually supportive rather than conflictive. Second, coordination can help to reduce the costs of compliance with a maze of different and often discordant regulations. Third, by combining the expertise of multiple agencies, coordination can help to ensure well-considered and effective regulations.

Finally, ecosystem regulations should be integrated. If regulation is fragmented by stressor or regulatory sector, the government cannot prioritize regulatory actions to ensure that the most important steps are taken first from a system-wide or multiple-benefit perspective. Not all stressors are of equal importance, and integrated assessment can help to ensure that the government focuses on the stressors of greatest importance

²⁹ As noted above, the USFWS had considered the relationship between CVP/SWP operations and other stressors but concluded that the "likelihood and extent to which" the other stressors "adversely affect delta smelt is highly influenced by how the CVP/SWP are operated in the context of annual and seasonal hydrologic conditions" (U.S. Fish and Wildlife Service 2008). According to the district court, however, the USFWS failed to justify this "attribution." The court also concluded that the USFWS's assignment of responsibility was neither "logical [nor] explained by any science" (*Consolidated Delta Smelt Cases* 2010).

to manage the Delta effectively. Integrated regulation also allows agencies to consider interactions and tradeoffs among different regulations and goals. In some cases, proposed regulatory actions can potentially conflict, which may result in inadvertent tradeoffs among stressors. In other cases, agencies may be able to use promises of regulatory relief to promote environmentally beneficial actions that are not directly within their regulatory authority, which again requires an understanding of the tradeoffs and synergies among stressors and mitigating actions.

Potential conflicts among actions undertaken to protect fish species illustrate the importance of both coordination among agencies and integrated regulation. The Long-Term Operational Criteria and Plan (OCAP) biological assessment and opinions for the CVP and SWP create the potential for such interspecies conflicts. For example, installing barriers in the Delta to protect one species could harm other species. Similarly, increasing Delta outflow during the fall to benefit delta smelt could reduce the storage at Shasta reservoir needed to provide cold water for salmonids. Fortunately, meetings during the development of the biological opinions among the three federal and state regulatory agencies (USFWS, NMFS, and CDFG) were able to identify other options and reduce potential interspecies impacts (U.S. Fish and Wildlife Service and National Oceanic and Atmospheric Administration 2010).

While effective management of the Delta requires more comprehensive, coordinated, and integrated regulation, two cautions are in order. First, not all stressors are of the same importance, and neither legislatures nor administrative agencies should hesitate to begin tackling the most severe problems before they have developed a comprehensive, integrated system for addressing all other challenges facing the Delta. The steps that the federal and state governments have already taken to address problems stemming from CVP and SWP exports are a first important step. The delay in tackling a broader set of stressors on an integrated basis does not undermine the importance of these first steps, although it could ultimately undermine protection of the Delta ecosystem.

Second, while fragmented regulatory authority poses challenges, overlapping regulatory authority is not necessarily a problem. Indeed, the coordinated involvement of multiple agencies can sometimes bring additional expertise, authority, or accountability to a problem. The cooperative federalism scheme of the federal Clean Water Act (CWA) is an illustration: The SWRCB has primary responsibility for implementing the CWA, but USEPA adds financial and technical support and helps ensure that the SWRCB appropriately exercises its powers. As USEPA explains in its recent Action Plan for the Delta estuary, its “oversight of TMDL implementation can improve accountability and help align grant and program activities to ensure timely achievement of load limits and removal of impairments” (U.S. Environmental Protection Agency 2012). Federal agencies often have greater expertise and funding than equivalent state agencies when it comes to addressing a problem. And finally, given the inevitable inertia in tackling the difficult and politically complex issues of the Delta, overlapping authority increases the chances that at least one agency will take needed action.

However, problems arise when multiple regulatory agencies with overlapping authority pursue divergent or even conflicting goals. In addressing flood control, for example, almost 150 federal, state, and local agencies have responsibility for the San Francisco Bay area; more than 200 have authority in the San Joaquin River hydrologic region, and over 300 govern the Sacramento River hydrologic region. As the primary state and federal agencies involved in flood protection planning recently noted, “Overlapping—and sometimes conflicting—responsibilities and priorities among the many regulatory agencies complicates the task of protecting human life, property, economic interests, and the environment” (Department of Water Resources

and U.S. Army Corps of Engineers 2012). In developing an overall institutional “system” to manage the Delta, the goals should be to eliminate unnecessary duplication in agencies and regulatory processes, centralize responsibility as much as possible in lead agencies for each regulatory issue, and provide effective mechanisms for coordination and cooperation among agencies.

Ensuring Comprehensive Regulation

Although greater regulatory coordination is important, the most significant obstacle to effective Delta governance has been the failure to regulate some key stressors in the Delta system. Historically, regulators have focused on water exports by the CVP and SWP, pollution by point sources, and commercial fishery harvests. Far less regulatory attention has been paid to other water withdrawals from the system (including in-Delta diversions and much larger upstream diversions), agricultural and urban runoff, invasive species, encroachment on wetland habitat, and other important stressors.

Thus, the first step in ensuring integrated management of Delta stressors is to develop more comprehensive regulation of these latter stressors. In many cases, agencies already have the necessary legislative authority. The SWRCB, in particular, has much broader authority over Delta stressors than it has historically exercised, as discussed below. Promisingly, the board recently has taken initial steps to regulate both a broader set of water withdrawals and pollution sources, but it could do much more to address these stressors in the context of the Delta system.

Other Water Users

The SWRCB should begin by fully exercising its jurisdiction over water-right holders other than the CVP and SWP in a more comprehensive regulatory effort to improve conditions in the Delta ecosystem. The board has direct responsibility over post-1914 surface-water appropriations, which includes not only the CVP and SWP, but also upstream or in-Delta appropriators such as the City of Sacramento, the East Bay Municipal Utilities District, the Yuba County Water Agency, and hundreds of smaller appropriators. The board also holds broad authority under the reasonable-use mandate of Article X, section 2, of the California Constitution and the public trust doctrine to ensure that the individual and aggregate exercise of all other water rights, including riparian rights and groundwater rights, does not create unreasonable stress on water quality, fish and wildlife, and other ecological functions of the Delta (Hanak et al. 2011). Both the legislature and the courts have confirmed this authority over Delta-related water uses (Water Code § 85023; *State Water Resources Control Board Cases* 2006; *United States v. State Water Resources Control Board* 1986). This broader authority gives the board the power, where important to the protection of the Delta, to regulate such significant water-right holders as the City and County of San Francisco (which serves San Francisco and many other Bay Area communities) and the Merced, Modesto, and Turlock Irrigation Districts.

The SWRCB has already taken steps to broaden its regulation of Delta-related water uses. In 2010, the board took its first significant step toward exercising its reasonable-use and public-trust authority over Delta water uses by establishing flow criteria for the Delta and its tributary rivers (State Water Resources Control Board 2010). Although the criteria address only a single stressor (flow reduction and alteration) and do not have direct regulatory or adjudicatory effect, the board’s action signaled its willingness to look beyond the CVP and SWP and potentially require other upstream water projects to contribute additional water to support native fish. Indeed, the board recently announced that future phases of its flow-criteria program will involve “potential changes to water rights and other

requirements needed to implement changes to the Bay-Delta Plan” and “flow requirements for priority Delta tributaries” (State Water Resources Control Board 2012b, 2012c).

Agricultural and Other Sources of Polluted Runoff

Another significant historical gap in Delta regulation has been agricultural and other “nonpoint” sources of pollution—i.e., discharges of pollution other than through a canal, drainage pipe, or other physical point source, such as runoff from farms, ranches, logging, mining, construction sites, and cities. The San Francisco Bay and Central Valley regional water quality control boards have undertaken actions to prevent point-pollution from endangering the Delta ecosystem (San Francisco Bay Regional Water Quality Control Board 2011; Central Valley Regional Water Quality Control Board 2011a). For example, the Central Valley RWQCB recently issued a new discharge permit for the Sacramento Regional County Sanitation District that requires its wastewater plant to use advanced ammonia treatment (U.S. Environmental Protection Agency 2012).

In contrast, nonpoint pollution remains “the leading cause of water quality impairments in California” in general (State Water Resources Control Board 2005) and in the Delta estuary (U.S. Environmental Protection Agency 2012), with farms adding “pesticides, sediment, nutrients, salts (including selenium and boron), pathogens, and heavy metals from cultivated fields into surface waters” (State Water Resources Control Board 2012a). Under the CWA, however, discharges of pollutants from nonpoint sources are not subject to regulation through the NPDES permitting system. Indeed, section 502(14) of the CWA explicitly exempts “agricultural stormwater discharges and return flows from irrigated agriculture” from the definition of “point source” and thus NPDES regulation (33 U.S.C. § 1362(14)).

States are free to establish broader and stronger water-quality regulations, and the federal exemption for nonpoint sources does not apply to the Waste Discharge Requirement (WDR) permitting system under California’s Porter-Cologne Water Quality Control Act (*Tahoe-Sierra Preservation Council v. State Water Resources Control Board* 1989). Moreover, in theory, “WDRs may be used to control any type of discharge to ground or surface water” (Central Valley Regional Water Quality Control Board 2011a). However, the SWRCB and its regional boards have granted “conditional waivers” to most agricultural dischargers. These waivers exempt most irrigated farmland within the Delta watershed from the boards’ WDR permitting jurisdiction, limiting the state’s ability to control pesticides, herbicides, salts, trace elements, and other pollutants from Delta waters (State Water Resources Control Board 2012a). On the recommendation of the Central Valley RWQCB, the SWRCB also has granted a conditional waiver for timber harvesting within the entire Delta watershed (State Water Resources Control Board 2011).

The federal NPDES exemption and the state WDR waivers for irrigation runoff have hindered efforts to control agricultural pollution in the larger Delta system. Lacking direct permitting control, the regional boards generally rely on less direct and effective programs to try to address agricultural pollution. The most significant is the “Irrigated Lands Regulatory Program,” which requires farm operators in a large region of the Central Valley to form “water quality coalition groups,” conduct surface-water monitoring, and prepare regional plans to address nonpoint water-quality problems (Central Valley Regional Water Quality Control Board 2011b). Lacking regulatory teeth, the program not surprisingly has failed to reduce agricultural drainage to levels that meet the water-quality criteria in the Basin Plan (de Vlaming, Deanovic, and Fong 2008).

Despite the boards’ general failure to address agricultural pollution, they have demonstrated creativity in addressing instances of sufficiently-severe agricultural pollution. The Central Valley RWQCB, for example, has effectively linked ambient water-quality goals in the San Joaquin River with permit-based regulation of irrigation return flows on the west side of the San Joaquin Valley. In 2000, this board

issued a Total Maximum Daily Load (TMDL) for selenium in the Grasslands' wetlands and channels and then, a year later, issued a WDR for the discharge of agricultural discharge of selenium at Salt Slough, Mud Slough, and the San Joaquin River (Central Valley Regional Water Quality Control Board 2000, 2001).³⁰ The districts subject to the WDR are free to determine for themselves how to achieve the required reductions in drainage, and districts and individual farmers can trade discharge allowances within the regulated area (Young and Karkoski 2000). Through a combination of best management practices, tiered water pricing, and market incentives, the program has reduced selenium discharges into the San Joaquin River by 61 percent (Central Valley Regional Water Quality Control Board 2012a). The Grasslands TMDL and WDR demonstrate the ability of the SWRCB and its regional boards to control harmful return flows from irrigated agriculture in a comprehensive and creative manner.

The SWRCB and the Central Valley regional board are also considering a new "Long-Term Irrigated Lands Regulatory Program" that would both expand coverage to discharges of pollution to groundwater and issue seven to eight "general waste discharge requirements" for discharges within areas where agricultural discharges present a "high threat" to water quality (Central Valley Regional Water Quality Control Board 2011a, 2011b). The proposed program would primarily cover lands outside the Delta watershed in the Tulare Basin. But it would further expand the board's experience in using its WDR permitting authority to limit discharges of agricultural drainage, surface runoff, and return flows from identified groups of farms and demonstrate the efficacy of using WDR permitting to regulate discharges of agricultural pollution into the Delta.

In December 2012, the Central Valley RWQCB promulgated a WDR governing irrigation runoff and return flows from more than one million acres in the eastern San Joaquin River watershed. The WDR requires farm operators that generate agricultural discharges to obtain individual WDRs or to join a "third-party group" (comprised of other dischargers) that will be responsible for reducing aggregate drainage through the regional board's long-term Irrigated Lands Regulatory Program (Central Valley Regional Water Quality Control Board 2012b).

The Central Valley regional board should extend its direct regulation of pollution through WDRs to nonpoint sources of pollution other than agriculture. Here again, regional boards have demonstrated the ability and creativity to limit such pollution in other sensitive areas of the state. For example, the Lahontan RWQCB has created WDR programs in the Lake Tahoe Basin and other parts of the Lahontan region to regulate the discharge of stormwater, wastewater, dredged and fill material, and sediment from small commercial and multifamily construction projects, public works, and stream and lakebed alteration activities (Lahontan Regional Water Quality Control Board 1991, 2003). The WDRs require the construction of stormwater infiltration systems, prohibit erosion and down-gradient sedimentation, require the stabilization and revegetation of disturbed areas, and prescribe the placement of dredged or other earthen materials within certain stream zones and floodplains. To date, however, this approach has not been extended to cover nonpoint pollution in the Delta region.

Effective regulation of nonpoint pollution requires a better understanding of water quality impairment in the Delta and more effective TMDLs. According to USEPA, the state and regional boards currently lack an "... effective, efficient system for collecting and assessing water quality data. ... Some contaminants are monitored regularly, others occasionally or not at all." USEPA similarly reports that the state and regional boards "lack protocols for tracking TMDL implementation, providing regular updates on the status of

³⁰ The WDR includes the incidental benefit of reducing discharges of boron, molybdenum, and other salts and trace elements.

achieving load limits, or connecting water quality monitoring data with TMDL progress.” The boards also have lagged in identifying impairments to water quality standards in the Delta estuary (U.S. Environmental Protection Agency 2012).

Invasive Species

Effective control of invasive species in the Delta suffers from both the complexity of the task and the absence of a strong governmental policy or program. Given the many routes by which invasive species can enter the Delta and the difficulty of eliminating them once they become established, managing invasive species is inevitably difficult. To date, however, neither the federal nor state government has adopted a comprehensive, unified approach or provided the full regulatory authority needed to address invasive species.

Recognizing that many agencies can and must play a role in dealing with invasive species, President Bill Clinton created a National Invasive Species Council (NISC) in 1999 to enhance federal coordination and response. The NISC is to “provide national leadership” and ensure that federal agency actions are “coordinated, complementary, cost-efficient, and effective” (Executive Order No. 13112 1999). Pursuant to this executive order, the NISC has issued a national management plan every two years since 2001.

USEPA promulgated a “vessel general permit” (VGP) under section 402 of the Clean Water Act for commercial vessels that enter United States ports, bays, estuaries, and inland waters. Vessels receiving the permit must adhere to standards governing fueling, hull cleaning, and other exterior activities and comply with rules promulgated by the U.S. Coast Guard that require oceangoing cargo ships to treat ballast water with ultraviolet light, chemicals, or other methods before releasing it into United States waters. The general permit exempts recreational vessels, non-recreational vessels less than 79 feet in length, and all commercial fishing vessels, regardless of length (U.S. Environmental Protection Agency 2008).³¹

Although the VSP is a significant first step in controlling the future importation of some invasive species, the federal government has generally been rather slow in using its regulatory authority to prevent and control invasive species (General Accounting Office 2003).

California adopted its first Aquatic Invasive Species Management Plan in January 2008. The plan proposed 163 initial actions, including: 1) the creation of two new coordinating entities (one just for state agencies, and one for a broader range of agencies and interests); 2) a statewide assessment of the risks from four invasion vectors; and 3) funding for staff and monitoring programs (Department of Fish and Game 2008). To date, however, there has been little progress in achieving even these modest proposals.

Ensuring Coordination across Agencies

To manage Delta stressors effectively, governments must also ensure coordination among the agencies using that authority. The existence of multiple federal, state, and local agencies with both overlapping and fragmented authority and sometimes conflicting goals is a political reality. Even if it were politically possible, efforts to rationalize general authorities under various statutes to meet the specific needs of the Delta would likely only create coordination problems in other settings. A viable approach to better coordination consists of: (1) using the Delta Stewardship Council to promote coordination among regulatory

³¹ On March 28, 2013, USEPA issued a revised VGP that becomes effective on December 19, 2013 (U.S. Environmental Protection Agency 2013). The 2013 VGP will extend the ballast water discharge regulations to fish-hold effluent and will set numeric ballast water discharge limits for all categories of ballast water discharges covered by 2008 VGP. The new VGP also will require covered vessels to prove that their ballast water treatment systems are functioning properly.

agencies concerned with the Delta; (2) using formal coordination measures to ensure coordination and consistency; (3) promoting informal cooperation and collaboration among agencies with authority over similar stressors or activities; and (4) eliminating unnecessary regulation, or centralizing authority in one agency where feasible.

Coordination through the Delta Stewardship Council

Several of our recommendations regarding the Delta Stewardship Council would promote collaboration and cooperation among regulatory agencies concerned with the Delta ecosystem. A broad consistency requirement would help to ensure that agencies use their regulatory authority in ways that promote rather than undermine the state's overall Delta Plan. Along similar lines, the Delta Plan Interagency Implementation Committee provides an opportunity for agencies to discuss their individual action plans, find ways to coordinate regulatory actions for maximum synergetic effect, and identify and eliminate regulatory duplication or conflict. As noted earlier, we recommend that agencies present work plans to the DPIIC and explain how they expect to coordinate their actions with other agencies and to integrate the other agencies' plans into their own regulatory actions.

The DPIIC could further promote coordination and a more integrated regulation of Delta stressors among agencies through oversight in the following areas:

- **Consistency in the collection and reporting of key data:** To coordinate regulatory actions, agencies must be able to analyze and work from common data. Too often, agencies collect, analyze, and report data in different ways, making it more difficult to decide how to prioritize and coordinate actions. The DPIIC can help agencies develop common methods for collecting, analyzing, and reporting information, as well as common models for assessing regulatory decisions. The DPIIC can also help identify key gaps in existing data collection from a Delta-wide perspective, along with recommendations for how to fill the gaps.
- **Funding prioritization:** Legislatures have historically made regulatory funding decisions on an agency-by-agency basis to promote narrow, agency-specific goals. Through its coordination of agency action plans, the DPIIC can help formulate recommendations and administer centralized resources for funding regulatory programs from the perspective of both the overall Delta system and multiple stressors and benefits.
- **Consistency in legislative goals and requirements:** Different agencies may share responsibilities but be constrained by different legislative goals or requirements. The DPIIC could play a valuable role in identifying such inconsistencies and recommending needed statutory revisions to the California Legislature.

Formal Coordination Mechanisms

Several laws provide formal mechanisms for helping to ensure coordination among and consistency across regulatory agencies. Section 401 of the Clean Water Act (33 U.S.C. § 1341) is a particularly important formal coordination mechanism for the Delta. Section 401 provides that any applicant for a federal license or permit to conduct any activity that "may result in any discharge" of pollution into a waterway must obtain a certification from the relevant state authority that the activity will comply with applicable effluent limitations, water quality standards, and national standards of performance, as well as "any other appropriate requirement of State law." In California, the SWRCB has responsibility for issuing such certifications. Although the United States Supreme Court has made it clear that this authority is not

“unbounded,” states can include requirements designed to help achieve water quality standards set under the Clean Water Act, including minimum stream flow requirements (*Public Utility District No. 1 of Jefferson County v. Washington Department of Ecology* 1994). Activities that require certification under section 401 include not only traditional point sources of pollution, but also dams and other hydrologic modifications that affect downstream water quality and land use activities that lead to the discharge of pollution into waterways (*S.D. Warren Co. v. Maine Board of Environmental Protection* 2006).

The SWRCB could use section 401 to provide greater coordination in a variety of regulatory settings. For example, section 401 could help support a more comprehensive, regional approach to the regulation of non-federal hydroelectric dams that affect the Delta. The Federal Energy Regulatory Commission (FERC) historically has regulated dams individually when their licenses come up for renewal. Because relicensing proceedings can be spread out over years or even decades, there typically has been little consideration of the cumulative impacts of multiple dams or opportunities for regulating them jointly to minimize impacts on downstream water conditions. FERC cannot accelerate the review of an existing dam without the owner’s permission, and FERC is prohibited by statute from extending existing licenses beyond 50 years, two actions that would enable the agency to synchronize renewals. Moreover, FERC has historically focused on river and stream reaches immediately adjacent to the hydropower facilities, rather than on broader downstream or basin-wide impacts.

Section 401 provides the SWRCB with the opportunity to develop standards that consider the impacts of several hydroelectric facilities together and then incorporate them into the certifications of individual dams as they come up for relicensing. The statute thus may serve as a mechanism for coordinating standards for dams on tributary streams that, although licensed separately, affect the same downstream bodies of water. Although section 401 does not apply to federal dams and facilities and cannot be used retroactively to change standards established for dams that have been relicensed in the recent past (e.g., the Feather, Oroville, and American Dams), it could help to provide more integrated regulation of the many dams under FERC jurisdiction and yet to be relicensed.

The board also could use its section 401 authority to increase coordination of the regulation of land use activities in the Delta watershed that require wetlands permits from the U.S. Army Corps of Engineers or NPDES permits under the Clean Water Act. Currently, multiple agencies regulate such activities, with varying goals and with different degrees of effectiveness. Section 401 provides the board with the ability to coordinate the standards used in evaluating such activities. Indeed, the Lahontan RWQCB already has made extensive use of this certification authority in the Lake Tahoe Basin (Lahontan Regional Water Quality Control Board 2003).

The Coastal Zone Management Act is another potentially useful formal coordination mechanism. In those locations where states develop integrated coastal management plans, federal agencies and applicants for federal licenses or permits generally must act consistently with the plan. In particular, applicants for federal licenses or permits that affect land or water use in a coastal zone must certify to the federal regulatory agency that the applicant’s proposed activity both complies with and will be conducted “in a manner consistent with” any of the state’s management plans (16 U.S.C. § 1456(c)(3)(A)). As discussed earlier, the CZMA may provide a mechanism for assuring federal consistency with the Bay Delta Plan. Congress, however, might also consider using the CZMA as a model for new legislation to promote integrated regulation of Delta stressors. Like the CZMA, for example, Congress could prioritize funding and technical assistance for regulatory agencies that participate in coordinated processes (Thompson 2012).

Informal Coordination

Often, the best route to more integrated regulation will be for agencies to informally promote greater coordination through structured relationships, multiagency working groups, consultation, advice, and other mechanisms. Indeed, many agencies already have taken important steps to consult, coordinate, and collaborate with other agencies. Although such efforts can be time-consuming and resource-intensive, experience demonstrates that a variety of informal coordination activities are both possible and valuable.

For example, water quality regulation demonstrates largely effective coordination between federal and state agencies, where the federal agency allows the state to take the lead but plays a facilitative and oversight role. USEPA has long worked with the SWRCB to ensure more integrated and effective protection of the water quality in the San Francisco Estuary. According to USEPA, its “intent is to complement and, where possible, support the efforts” of the SWRCB and other agencies in California with responsibility for achieving the goals of the Clean Water Act (U.S. Environmental Protection Agency 2012). While the SWRCB has primary regulatory authority over water quality, USEPA provides significant financial support and technical assistance to the board. USEPA has worked closely with the board in identifying and evaluating the resources and authorities that the board can use under the CWA to help achieve water-quality standards in the Delta. USEPA also evaluates the effectiveness of the board’s programs and recommends improvements where appropriate. In this role, USEPA helps strengthen political resolve, often counter-balancing complaints from regulated entities that the board is going too far. USEPA’s July 2012 Action Plan for water quality in the Bay-Delta is an example of a coordinated effort to identify actions that both the federal and state governments can take to restore water quality (U.S. Environmental Protection Agency 2012).

A similar “cooperative federalism” approach could reduce fragmentation and promote coordination in other regulatory settings. For example, the federal government could potentially allow the state to take a more central role in the development and implementation of policies to protect imperiled aquatic species in the Delta under Section 6 of the Endangered Species Act—with federal agencies assisting the state with both funding and technical expertise and ensuring effective oversight (Box 3). Indeed, legislative discussions leading up to the enactment of the ESA in 1973 suggest that Congress may have anticipated that the implementation of the Clean Water Act and Endangered Species Act would follow very similar models, including primary state implementation and enforcement, subject to federal oversight (Arha and Thompson 2007; Ruhl 2007).

Box 3: A pathway to more integrated regulatory oversight under section 6 of the Endangered Species Act?

The federal Endangered Species Act (ESA) provides several mechanisms for coordinating regulatory actions with the states and giving the states a greater role in developing and implementing policies. One approach already being used in conjunction with the Delta is the habitat conservation plan (HCP), in which the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service can issue an incidental take permit in return for the development and implementation of an HCP that provides adequate protection to listed species. In 1991, California authorized the negotiation of “natural community conservation plans”—broad, regionally-based HCPs that can substitute for other regulatory protections under both the federal and the state ESAs. The Bay Delta Conservation Plan is seeking this type of ESA coverage for Delta exports.

Section 6 of the federal ESA also holds out the promise of greater coordination with and deference to state policy and regulation (Arha and Thompson 2007; Ruhl 2007). This section authorizes the Departments of the Interior and Commerce to enter into “cooperative agreements” in which states undertake the conservation of listed species within their jurisdiction. Before entering into such an agreement, the federal government must find that a state has an “adequate and active program for the conservation” of listed species, as well as the authority to “conserve resident species,” and has “established acceptable conservation programs, consistent with the purposes and policies” of the ESA for relevant species (16 U.S.C. § 1535(c)(1)). Section 6 also states that species covered by a cooperative agreement are not subject to the anti-take prohibitions of the ESA (16 U.S.C. § 1535(c)(2)). Section 6 thus would appear to allow states to take over the regulation of state, local, and private threats to federally listed species if the states adopt adequate conservation programs.

Decisions by two federal district courts in the early 1990s have limited the potential scope of section 6 by reading the section as only preempting the federal anti-take provisions where state law includes anti-take prohibitions at least as restrictive as section 9 (*Swan View Coalition, Inc. v. Turner* 1992; *United States v. Glenn-Colusa Irrigation District* 1992). Under these decisions, the federal government can continue to exercise its section 9 authority except where a state has the same or stronger proscriptions. The legislative history of the ESA, however, suggests that Congress may have intended section 6 to allow for more extensive state authority.

The USFWS has used section 6 in several cases to promote greater coordination with states in the implementation of the ESA. In 2002, for example, the USFWS entered into a cooperative agreement with the Arizona Game and Fish Department providing for “joint participation, communication, coordination, and collaboration” in the listing and reclassification of species, recovery plans, section 7 consultation, habitat conservation planning, and enforcement.

Endangered species regulation also provides an example of how agencies with overlapping jurisdiction can work together to avoid inconsistencies and ensure a consistent regulatory approach. Three different agencies (USFWS and NMFS for the federal government, and DFW for the state) protect endangered species in California, presenting both the risk and, in some past cases, the reality of fragmented and conflicting mandates. To avoid such fragmentation, all three agencies have recently worked carefully together on the oversight of listed Delta species. The agencies, for example, coordinated throughout the assessment and development of the OCAP biological opinion, meeting biweekly, jointly identifying modeling scenarios,

and coordinating their reviews and comments on the draft OCAP biological assessment. When a potential inconsistency arose in how the USFWS and NOAA interpreted the environmental baseline, the agencies met to ensure that their positions were consistent not only with each other but also with regulations under section 7 of the ESA. The agencies also coordinated with one another in implementing the OCAP opinions (U.S. Fish and Wildlife Service and National Oceanic and Atmospheric Administration 2010).

Despite fragmented authority, state and federal agencies have collaborated effectively to regulate pesticide contamination. The SWRCB and the regional boards have primary jurisdiction over water-quality regulation, and the California Department of Pesticide Regulation (DPR) implements programs to regulate pesticides. Working closely together, the boards and the DPR in 2011 issued important new regulations to prevent surface water contamination by pesticides in nonagricultural settings (U.S. Environmental Protection Agency 2012).

The state boards have also collaborated with a variety of federal and regional agencies (including the USBR, DWR, U.S. Geological Survey, USACE, DFW, the City of Stockton, and other local agencies) to address agricultural drainage and other water-quality problems in the San Joaquin River Basin and the South Delta. The boards have incorporated into the Bay-Delta Water Quality Plan and the Basin Plan many agreements reached with these agencies, including best management practices, drainage reduction limitations, wetlands restoration projects, dredge and fill restrictions, salinity barriers, and other land and water use improvements (State Water Resources Control Board 2006; Central Valley Regional Water Quality Control Board 2011a).

Flood management illustrates how large or dominant agencies can help promote coordinated regulation by providing guidance to myriad separate agencies. As noted earlier, flood control is another area plagued by fragmentation, with almost 150 flood agencies sharing authority over the San Francisco Bay hydrologic region and even more agencies sharing flood management responsibilities in the San Joaquin and Sacramento regions. Different agencies often have responsibility for planning, constructing, financing, maintaining, and running flood-control infrastructure and programs. To help promote more consistent approaches across this sea of agencies, DWR and USACE recently collaborated to produce a draft report, entitled *California's Flood Future*, to guide the actions of the hundreds of local, state, and federal agencies with responsibility for flood management (Department of Water Resources and U.S. Army Corps of Engineers 2012).

In addition to providing general guidance, this report also calls for two forms of structural change. First, it recommends establishing “regional working groups to foster efficient permitting, planning, and implementation of flood management projects.” To promote greater regional cooperation, the report calls on state and federal agencies to prioritize funding to entities participating in these working groups and the projects that result from their discussions. Second, the report calls for California flood-control agencies to engage in Integrated Water Management (IWM). As an early step toward IWM, the DWR and USACE have begun to structure their flood management programs to advance multiple benefits. As the agencies note, such programs have the additional benefit of being able to access funding sources that might be unavailable to single-benefit projects.

California's Flood Future also highlights the limits of purely informal coordination. As the draft report emphasizes, more integrated water management within flood management faces a variety of obstacles, including inadequate and inconsistent data, inflexible requirements and standards, and inconsistent legislative goals. The state and federal governments must reduce or eliminate these obstacles to achieve the potential benefits derived from a more integrated regulation of Delta stressors. As discussed earlier, the DSC through its DPIIC can help address some obstacles; other obstacles might require legislative action.

Eliminating Redundancies and Fragmentation

In some cases, an agency's geographic jurisdiction and substantive authority create unnecessary duplication and the potential for conflict, without countervailing benefits. While the coordination mechanisms discussed above can help to overcome such redundancies and fragmentation, they inevitably cost time and other resources and are frequently not as effective as changing the underlying jurisdiction and authority at the source of the problem. It is often difficult, however, to redefine an agency's regulatory jurisdiction. Where statutes establish the jurisdiction or authority, legislative action is frequently needed. Virtually all changes will encounter political opposition from stakeholders who benefit from the status quo. And finally, the question of whether to change the authority or jurisdiction of an agency will often transcend the Delta, implicating broader statewide or national issues. Yet in some cases, state or federal governments may decide that it is worth directly addressing redundancies and fragmentation by reassigning authority or changing jurisdictional boundaries.

One of the most discussed redundancies is the existence of two federal agencies (USFWS and NMFS) under separate federal cabinet posts (Interior and Commerce, respectively), both of which have the authority to implement the ESA. When federal projects such as the CVP affect species managed by NMFS and USFWS, both agencies must review and assess the project's potential impact. This paired review is often seen as inefficient and requires significant time for coordination. Historically, NMFS was part of the USFWS until President Richard Nixon separated them in 1970 under an executive reorganization plan. Fishing interests, however, generally oppose transferring NMFS back to Interior, which is viewed as more conservation-oriented than Commerce, and many alternative structures raise issues of their own (Government Accountability Office 2013).³²

Of course, redundancies only matter when they present serious practical obstacles to coordinated regulation of the Delta ecosystem. And once again, the DPIIC can help by both identifying such situations and providing evidence to state and federal authorities of the need for action.

Ensuring Integrated Regulation

Regulatory agencies must also ensure that their regulations reflect an integrated assessment of the Delta. As noted earlier, stressors are of varying importance to the health of the Delta. They also interact with each other, and in some cases they may be directly related. In other cases, there may be beneficial tradeoffs, where reducing one form of stress might reduce the need to manage another. Thus, to be effective for the Delta ecosystem, regulations need to take a broad perspective.

One example of the importance of integrated regulation is the relationship between water quantity and quality. The two issues are directly related. Reductions in water flows, for example, can reduce water quality. Partly in recognition of this fact, California (alone among western states) consolidated regulatory authority over water use and water quality in one agency—the SWRCB. Yet the board has historically made little use of this unified power and has missed important opportunities to exercise its integrated authority to achieve integrated regulation of water use and water quality.

³² The GAO also considered several alternative organizational options: moving all of NOAA into Interior, creating an overall department of natural resources, or establishing NOAA as a stand-alone agency. Benefits of moving all of NOAA into Interior would include a better integration of natural resource management by bringing many aspects of federal land and ocean management under the same department, but it could diminish attention to ocean issues since NOAA would be competing with other Interior agencies for funding. The GAO report concluded that both officials and stakeholders generally believed that the drawbacks of reorganizing the agencies would outweigh the benefits.

The board's approach to the interplay between water rights and water quality may be changing, however. In its 2010 flow criteria report, the SWRCB expressly recognized the interaction (State Water Resources Control Board 2010). Phase 2 of its flow criteria analysis will provide the board with an opportunity to study these interactions. In the course of this analysis, the board may call upon the Central Valley RWQCB (and perhaps the San Francisco Bay RWQCB) to explain the relative contributions of discharges and flow reduction and alteration on diminished water quality. Although the SWRCB has defined the focus of Phases 3 and 4 as adjustment of water rights and tributary flows, the board should not ignore the beneficial synergies possible through a more inclusive consideration of discharges *and* water withdrawals.

The SWRCB has acknowledged the important roles of the regional boards in this process through their establishment of TMDLs, discharge limits, and other controls (State Water Resources Control Board 2010). Independent action by the regional boards, however, is no substitute for the integrated jurisdiction that the state board can exercise to determine the appropriate blend of regulation needed to solve the combined problem of water rights and water quality.

A more integrated approach to regulation could also lead the SWRCB to provide regulatory incentives, through adjustments in flow prescriptions, for managing stressors that it does not directly regulate. Investments in expanded physical habitats, for example, may reduce the volume of instream flows needed to achieve a similar benefit. Although the board cannot compel the expansion of physical habitat, it could encourage such expansion by reducing flow prescriptions for water diverters who arrange for new habitat for aquatic and riparian species. In its draft water quality control plan for the San Joaquin River, the board has taken a step in this direction, proposing to adjust the volume of instream flows that upstream water diverters will be required to maintain in response to changing conditions (State Water Resources Control Board 2012c, Appendix K). This would provide incentives for water diverters to work with landowners to create more favorable conditions for aquatic and riparian species.³³

³³ From an equity standpoint, this is an imperfect solution, because the burden of compliance falls on water diverters, who will have to encourage land users to participate in habitat restoration (even though land users are benefiting from earlier destruction of physical habitat). But it is preferable to simply regulating flows as though other stressors do not exist.

Permitting to Manage Multiple Stressors

The absence of an integrated and comprehensive forum for addressing multiple stressors can impede even the less complex tasks of obtaining necessary permits for activities, including those intended to redress environmental harm. As state and federal regulators and water managers seek to ensure the sustainable use of the Delta ecosystem in response to the pressures of environmental mandates, water demands, hydrologic variability, climate change, and other dynamic forces, the inefficiencies and narrowness of the existing permitting structure will become more problematic. Environmental permitting processes were instituted to prevent various types of construction and development activities from causing environmental harm or risks to public safety. But this fragmented system is often costly in terms of both time and money, with little effort directed toward ensuring that the mitigation measures truly benefit the environment. Ironically, even projects in which the primary purpose is to help the environment are running into obstacles, leading to major delays and expenses that diminish the overall environmental benefits (Sustainable Conservation 2011; California Roundtable on Agriculture and the Environment 2010; Task Force on Removing Barriers to Restoration 2002).

Two examples illustrate these problems. In one case, a water utility within the Delta watershed is seeking to repair an old pipeline located in a small field that has been unmaintained and now qualifies as a wetland. Mitigation rules for disturbing such wetlands require several environmental permits from state, federal, and local entities. Administrative barriers linked to regional agency jurisdictional boundaries prevent the utility from acquiring habitat to offset the disturbed area in the vicinity through a local mitigation bank because that habitat would be outside the regional office of the permitting agency. Instead, the utility is being pressed to purchase property at a considerable distance, for a much higher cost, and with questionable ecological equivalence. As of December 2012, the entire process had already taken over a year and was likely to take more than ten additional months, and the projected costs for mitigation were \$1.3 million (not including staff time by the utility and regulatory agencies), versus pipeline repair costs totaling \$1.8 million. This example—mirrored by many others throughout the watershed—illustrates the need for a more rational permitting process to make better use of time and financial resources in the service of true ecosystem values.

The second example illustrates the complexity of environmental permitting for actions expressly designed to achieve environmental benefits. The McCormack-Williamson Tract is an island of approximately 1,600 acres in the northwestern Delta, owned by The Nature Conservancy since the late 1980s. Ecologists have identified this land as particularly suitable for expanding shallow water and tidal marsh habitat in the Delta, and there is broad agreement on the importance of moving ahead with this restoration—as evidenced by inclusion of this project in a list of near-term actions that a broad stakeholder coalition has endorsed (California State Senate 2012). Although DWR analyzed the project as part of its 2010 environmental impact report on North Delta Flood Control and Ecosystem Restoration, a separate federal environmental review will be required under NEPA (Department of Water Resources 2010). In addition, the project will require local land use permits and possibly approvals from an array of other federal, state, and local agencies (Table 1). Each of these permits will need to be acquired through a separate process, increasing costs for all parties and posing the risk that agencies will require inconsistent terms for approval. As described in Box 4, similar issues arise for the permitting of experimental research activities designed to improve understanding of how to help native species recover.

These examples illustrate the complexities and costs of environmental permitting, even on a small scale. California needs to rationalize the permitting process to make sure that dollars spent on environmental review and mitigation serve their intended goals of improving ecosystem health.

We consider two options for bringing greater coordination and cohesiveness to multiagency permitting. The first would be to replace the existing, fragmented system with unitary permitting by a single agency. Although such an approach may seem appealing in principle—and has been used successfully in specific cases such as the permitting of new power plants in California—it has disadvantages that make it impractical in the context of the Delta ecosystem. The second, more practical option is to restructure the current system and require the various regulatory agencies (or at least provide them with incentives) to coordinate their work with the goal of issuing multiple permits that functionally account for one another. We propose this route, with the establishment of a Delta Ecosystem Regulatory Coordinator (DERC).

TABLE 1

Possible permits, consultations, and program consistency determinations for a tidal marsh/floodplain restoration project in the North Delta

Regulation	Agency	Trigger
Required Permits		
CWA, Section 404	USACE, Sacramento District	Discharge of dredge or fill material into waters of the U.S. (for any discharge below high water mark)
CWA, Section 401	Central Valley RWQCB	Federal action that has the potential to result in a discharge to waters of the state
CWA, Section 402	SWRCB	Construction-related activities that disturb one or more acres
Porter-Cologne Water Quality Act	Central Valley RWQCB	Action that has the potential to result in a discharge to waters of the State
USACE, 408 Permit	USACE	Action that affects federal project levees beyond normal operations and maintenance
Encroachment Permit	CVFPB and USACE	Encroachment into floodways designated by the State requires a permit
Fish and Game Code, Sections 1600 to 1607	DFW, Bay-Delta Region	Activity that may substantially modify a river, stream, or lakebed
Lease Amendment	State Lands Commission	Modification of sovereign lands of the state
Grading Permit	County Department of Public Works	Soil grading
Conditional Use Permit	County Planning Department	Land use conversion
Consultations		
California ESA	DFW, Bay-Delta Region	Action that may affect state-listed plants or wildlife
Federal ESA	USFWS/NMFS/USACE consultation	Action that may affect federally-listed plants or wildlife
National Historic Preservation Act	State Historic Properties Office	Federal action that may affect historic resources
Magnuson-Stevens Fishery Conservation and Management Act	NMFS	Federal agencies must consult with NMFS if proposed actions may adversely affect "essential fish habitat"
Farmland Protection Policy Act and Memoranda on Farmland Preservation	Natural Resource Conservation Services	Possible conversion of prime or unique farmland to nonagriculture
Floodplain Management Executive Order (EO) 11988	Council on Environmental Quality, Water Resources Council	Federal action that is located in or affects the floodplain
Protection of Wetlands EO 11990	USACE	Federal action that is located in or affecting wetlands
Environmental Justice EO 12898	USACE	Federal agencies must ensure that actions do not directly or indirectly result in discrimination on the basis of race, color, or national origin
Indian Sacred Sites EO 13007 and April 29, 1994 Executive Memorandum	USACE	Federal agencies must ensure confidentiality of sacred sites
Federal Clean Air Act	Air Quality Management District and USEPA	Federal action must be evaluated for its potential impact on air quality in the project region
Major Programs		
CEQA EIR	DWR	State sponsorship and possible significant effects
NEPA Environmental Impact Statement (EIS)	USACE	Federal sponsorship and financial support
Delta Plan Consistency	Delta Stewardship Council	Determine if a covered action and if consistent with Delta Plan (may not require formal permit)
CALFED Levee Stability Program	USACE	Already authorized
Public Trust Doctrine	SWRCB	Planning and allocating water resources
Davis Dolwig Act	Department of Parks and Recreation	Recreation and fish and wildlife enhancement, part of SWP
San Francisco Conservation and Management Plan (SFCMP)	San Francisco Estuary Project	Activities in the Delta that will affect goals of CMP
Clean Water Act 303d	SWRCB and Central Valley RWQCB	TMDL for mercury

SOURCE: Pawley 2012.

Box 4: Science and incidental take permits

One of the most important challenges for Delta science is how to study fish listed for protection under the state and federal endangered species acts. Populations are so small that meaningful data collection is difficult. Moreover, field research on these fish often requires a “taking” — the harassment, capture, harm, or death of listed fish. Yet, information about the movement, feeding behavior, and condition of listed fish is essential for monitoring their status, developing life-cycle and population models, and devising practices to improve their numbers and lead to recovery. This has especially become a problem for studies of listed salmon and delta smelt, where the incidental take permit for salmon is issued by NMFS and the incidental take permit for smelt is issued by USFWS. Efforts to collect one fish often leads to take of another, ending experiments or reducing the allowed take of other experiments and leaving gaps in understanding.

Scientific take permits are very difficult to obtain, and when the take is allowed, it is very precise and almost always very small. For example, in December 2012 an extensive and costly joint state and federal study of the response of delta smelt to early winter flows was allowed by NMFS to take only six juvenile spring-run Chinook and four juvenile winter-run Chinook. To most scientists, these numbers are arbitrary, with no evidence that scientific take of individual fish has any effect on the population of these species. Researchers in the field observed high numbers of juvenile salmon in the Delta during the experiment. Thus, as expected, while trying to monitor smelt movement they inadvertently exceeded their legal limit by a handful of fish and had to end a vital experiment. The initial results of the experiment were quite promising and were likely to offer valuable information on how smelt and salmon will respond to future flow changes. But because the researchers were unable to complete the experiment, uncertainties will only increase.

By strictly controlling the scientific take permits, the fisheries agencies effectively control research in the Delta. While they cooperate in programs like IEP, they ultimately decide which teams are allocated permits and which are not. Ironically, the total scientific take of fish, particularly delta smelt, is dwarfed by the average annual take of fish from other sources, particularly the South Delta export pumps, which “salvages” but likely kills thousands of smelt each year (Kimmerer 2008; Grimaldo et al. 2009).

Unitary Permitting

Under a unitary system, all permits—for water rights, discharges, dam operations, construction of new facilities, restoration of wetlands, fisheries actions, land use, and other activities that potentially affect the waters of the ecosystem—would be issued by a single entity. One example of this is the process that the California Energy Commission (CEC) adopted for new facilities.³⁴

If the state were to create a unitary permitting authority for the Delta ecosystem, the most logical forum would be the SWRCB, as it is the agency with the broadest and most multifaceted jurisdiction over the

³⁴ The CEC was created in 1974 through the passage of the Warren-Alquist Act (Public Resources Code 25000). The purpose of the act is to “ensure that a reliable supply of electrical energy is maintained at a level consistent with the need for such energy for protection of public health and safety, for promotion of the general welfare and for environmental quality protection...” The legislature thus granted the commission the jurisdiction to review and approve thermal power plants that generate 50 megawatts (mw) of electricity or more. This unitary permitting process was designed to eliminate duplication and regulatory uncertainty and to encourage public participation. Once issued, the CEC’s certificate (permit) is in lieu of any permit or license issued by any state, local, or regional agency to the extent permitted by federal law. The CEC’s permitting process also ensures that a project applicant will have a decision on its project within a specific time period. The CEC has a Public Advisor on staff who informs the public of new permit applications and how the public may participate in the permit process. (www.energy.ca.gov/sitingcases/)

various activities that affect the lands, waters, and resources of the system. However, although the board's jurisdiction is substantial, it is far from complete. For example, primary jurisdiction over the biological opinions, HCPs, NCCPs, and incidental take permits that protect the species and their critical habitat resides with the USFWS, NMFS, and DFW. Similarly, the USACE has preemptive authority over discharges of dredged and fill material into "the waters of the United States" under section 404 of the Clean Water Act. Thus, a wholesale revision of the regulatory status quo would require significant amendments to some of the most prominent federal and state laws that govern the Delta ecosystem. Such changes are unlikely in a political environment influenced by traditional agency turf protection, permittees' aversion to more stringent environmental regulations, and concern on the part of environmental advocates that even beneficial, focused reforms could open a Pandora's Box of unwanted changes in important environmental laws.³⁵

Coordinated Permitting

A more practical alternative is to devise a way to foster cooperation and coordination among the various permitting agencies with jurisdiction over the Delta ecosystem.³⁶ The essential components of a well-functioning system of coordinated environmental review and permitting are:

- Inclusion of all agencies—federal, state, and local—with jurisdiction over the proposed action and/or the resources that may be adversely affected by the action.
- Identification of a lead agency or independent entity that would seek to include all relevant agencies in the coordinated environmental review and permitting proceedings, and that would serve to resolve conflicts among the agencies, supervise review under NEPA and CEQA, and ensure that the various permitting decisions are in fact integrated, coordinated, consistent, and comprehensive.³⁷
- Imposition of enforceable time limits to ensure that the coordinated environmental review and permitting process is completed in a timely manner appropriate to the scope and complexity of the proposals subject to permitting.³⁸

³⁵ Creation of a unitary permitting authority could also increase the risk of "regulatory capture," where the principal subjects of the regulation gain undue influence over the agency's decisions by virtue of their regular and long-standing dealings with the agency's members and staff. A unitary permit program therefore would likely engender opposition from environmentalists and other interested parties who believe that it is better to maintain the current system because it divides power among a variety of agencies and hence diffuses the risk of capture. On the other hand, the dispersal of regulatory jurisdiction across many federal, state, and local agencies also increases the likelihood of conflict and opportunities for delay and impediment of environmentally beneficial regulations.

³⁶ There have been some targeted efforts to achieve such coordination in California. Notably, Sustainable Conservation's Partners in Restoration Program is a statewide effort to assist landowners with the process and costs of voluntary small-scale (usually under 5 acres) habitat restoration projects on their lands. Sustainable Conservation works with local Resource Conservation Districts (RCDs) to authorize commonly accepted restoration activities and maintenance under coordinated programmatic permits with relevant state and federal agencies. Once the agencies issue the permits and the RCDs have the permit packages in hand, landowners can be enrolled in the voluntary restoration programs (Sustainable Conservation 2011). Another approach gaining ground is habitat mitigation and conservation banks, which have been developed to rationalize the acquisition and management of habitat required as offsets for the destruction of wetlands or other sensitive habitat. Although such banks represent progress—they typically involve coordination between the USACE, DFW, USFWS (and in some cases the RWQCBs)—they are too limited in scope to serve the function suggested here.

³⁷ The Environmental Protection Permit Reform Act of 1993 authorizes the state Secretary for Environmental Protection to establish a process for consolidating the permitting projects that require a variety of individual state and/or local environmental permits (Public Resources Code §§ 71000-71031). The California Environmental Protection Agency has recently begun implementing this effort (after a failed attempt immediately following the enactment of the legislation) with a pilot program that includes two projects still in the permit approval stage (California Environmental Protection Agency 2012). Within the San Francisco Bay Area, a Joint Aquatic Resources Permit Application (JARPA) consolidates federal, state, and local permits and simplifies the permit process for applicants proposing construction, fill placement, public access impingement, and other development activities in or near aquatic environments or wetlands (<http://www.sfestuary.org/about-the-estuary/documents-reports/>).

³⁸ The California Permit Streamlining Act (1977) (Government Code §§ 65920-65964) embodies some of these features. It requires most state and local permitting and licensing agencies to determine whether applications are complete within 30 days of receipt. The statute also requires the agencies to establish an administrative appellate process for applicants who want to challenge an incompleteness decision, and it sets a time limit

There are several options for designating the environmental review and permitting coordinator, each with different benefits and risks.

One option would be to vest this responsibility in the Delta Stewardship Council, specifically in the office created for reviewing actions by other agencies for consistency with the Delta Plan. Over time, that office will develop a breadth of knowledge about the Delta ecosystem and its multiple sources of stress. Its personnel could then apply this expertise to determine which regulatory agencies with jurisdiction over a particular project should work together to coordinate their environmental review and permitting and assist the agencies in their collaborative work. At the end of the process, the office would issue an opinion as to whether each of the permits and other actions are consistent with the Delta Plan. The office would then advise the council whether to issue a consistency certification under existing law or a consistency opinion under the proposal suggested earlier in this report. Because the office of consistency review within the DSC would have substantial influence on the council's final consistency decisions, permitting agencies with jurisdiction over activities within the Delta ecosystem would have an incentive to follow the office's advice on how they should coordinate their environmental review and permitting decisions with other relevant agencies.

A second option would be to follow the NEPA and CEQA environmental review processes and designate one of the regulatory agencies with jurisdiction over the proposed activity as the "lead agency" for the purpose of facilitating coordinated analysis and permitting. Because of the breadth of its existing authority, the SWRCB would be the most logical choice for such a role.

Yet, there are at least two problems with each of these options. First, it is the responsibility of the "lead agency" in this context to help resolve conflicts and inconsistencies among the various regulators and to ensure that individual permitting decisions are integrated with one another and, as a group, regulated in a fair, effective, and comprehensive manner. As the DSC will have consistency review authority over many of the proposed actions that affect the Delta ecosystem, and the SWRCB is likely to be a participant in most coordinated permitting proceedings, it might be better to vest the leadership responsibilities in an entity that does not have its own jurisdictional perspective and stake in the process. Second, since many permits for activities in the Delta watershed will involve agencies with significant and long-standing jurisdictional prerogatives—and may be likely to resist exercising their authority in concert with other agencies—it might be desirable to place the leadership role at a higher level of government with power to force at least some of the recalcitrant agencies to collaborate and to set appropriate time limits on individual and collective decisions.

We therefore recommend that the governor establish a Delta Ecosystem Regulatory Coordinator (DERC), either in the Office of Planning and Research or as a separate office. This coordinator would report directly to the governor and would exercise the authority of the executive to convene the various federal, state, and local agencies whose approval is needed for particular projects and activities that affect the lands, waters, and resources of the Delta ecosystem.

The DERC would supervise the work of the agencies to ensure that they share information, collaborate, establish coordinated record submission and hearing schedules that encourage applicants to present integrated analyses and minimize duplication, and make timely decisions. However, actual permitting

on the agency's consideration of the appeal. If the agency fails to decide the appeal within 60 days, the statute declares that the application shall be deemed complete (*ibid.* § 65943). The Act then imposes specific time limits on the agency's decision on the merits of the application—for most projects, 180 days following certification of the EIR and 60 days for projects that only require a negative declaration (*ibid.* § 65950). The applicant and the agency may agree to extend these time limits by up to 90 days (*ibid.* § 65957). The deadlines do not apply to the SWRCB's consideration of protested applications to appropriate water or to its review of petitions to change the purpose or place of use of water (*ibid.* § 65955).

decisions would remain in the individual agencies, and the DERC would have no authority to intercede in the substantive decisionmaking process or to modify or overrule the agencies' decisions. Two potential models for such a process have recently been established for expedited permitting of renewable energy and transmission projects (see Box 5).³⁹

Box 5: Permitting renewable energy and transmission projects

To help meet state and federal renewable energy goals and improve the performance of the transmission grid while ensuring environmental protections in site locations, two high-level processes have been launched to coordinate and expedite permitting.

Desert Renewable Energy Conservation Plan (DRECP): California Executive Order S-14-08 requires the development of the DRECP for the Mojave and Colorado deserts to provide binding, long-term endangered species permit assurances and to facilitate the review and approval of compatible renewable energy projects. The DRECP will include implementation of a scientifically-based adaptive management and monitoring program as a part of its overall conservation strategy. Goals include (1) environmental protection of covered species, (2) streamlined environmental review and permitting, and (3) identification of appropriate areas for development of utility scale projects. The DRECP will include an NCCP/HCP to comply with state and federal ESAs and a Land Use Plan Amendment in accordance with the Federal Land Policy and Management Act. Participating agencies include the California Energy Commission, DFW, USFWS, and the U.S. Bureau of Land Management (together, also known as the "Renewable Energy Action Team) with a memorandum of understanding (MOU) between the federal Departments of Energy and the Interior. Projects are getting the go-ahead before the completion of the DRECP, but also are already being litigated. (<http://www.drecp.org/index.html>)

Interagency Rapid Response Team for Transmission (RRTT): Transmission projects involve multiple federal, state, and tribal agencies and require numerous statutory reviews, permits, and consultations. Recognizing the need to respond quickly to challenges, nine federal agencies have been closely coordinating their review of electric transmission on federal lands under a joint MOU executed in 2009. The administration has also created a Rapid Response Team for Transmission (RRTT), which aims to improve the overall quality and timeliness of electric transmission infrastructure permitting, review, and consultation by the federal government on both federal and nonfederal lands by: (i) coordinating statutory permitting, review, and consultation schedules and processes among involved federal and state agencies, as appropriate, through "Integrated Federal Planning"; (ii) applying a uniform and consistent approach to consultations with tribal governments; and, (iii) resolving interagency conflicts and ensuring that all involved agencies are fully engaged and meeting timelines. Participating agencies include the Departments of Agriculture, Commerce, Defense, Energy, and Interior, USEPA, FERC, the Advisory Council on Historic Preservation, and the White House Council on Environmental Quality. California Projects under the RRTT include Barren Ridge (Los Angeles Department of Water and Power), Energia Sierra Juarez (ESJ) Transmission Line Project (Sempra Generation), Devers-Palo Verde II and Eldorado-Ivanpah Transmission (Southern California Edison) and Sunrise Powerlink (San Diego Gas and Electric).

³⁹ In addition to these more fixed processes for expedited permitting of renewable energy and transmission projects, the California Permit Streamlining Act provides for *ad hoc* coordinated review options for certain types of environmental permits (Government Code §§ 65920-65964).

Any agency with jurisdiction over activities that may affect the Delta ecosystem, as well as permit applicants and other interested parties, could request the DERC to convene a coordinated environmental review and permitting process that includes other relevant agencies. But the decision to convene a coordinated regulatory group would be left to the discretion of the DERC. Although coordinated and integrated regulation and permitting is desirable in all contexts, the demands for coordinated review could overwhelm the DERC (especially during the first few years) and therefore it is appropriate to vest some discretion in the DERC to decide how best to allocate its resources and expertise. We expect that the DERC will focus its contributions on proposals having the greatest potential for inconsistent permitting standards, gaps in regulation, and delay. Although the success of coordinated permitting will depend on many factors—including political will, good faith cooperation, and useful results—DERC’s early efforts could make a persuasive case that integrated and coordinated permitting should become a regular feature of federal, state, and local regulation of proposed actions that influence the Delta ecosystem.

Integrating Delta Science

All parties involved in setting policies for managing multiple stressors in the Delta advocate the use of science as the basis for decisionmaking. This endorsement is prominent in the mission statement of the Delta Stewardship Council, the ongoing deliberations over the Bay-Delta Conservation Plan, SWRCB efforts to revise Water Quality Control Plans for the Delta and its tributaries, and rationales for the biological opinions that govern SWP and CVP operations, among other planning and policy processes.

Science can play many roles in supporting the Delta ecosystem, including basic research, regulatory support, performance evaluation, and the exploration and development of promising solutions. To be useful, Delta science must develop reliable and relied upon knowledge and insights while systematically reducing uncertainties. The knowledge science produces should inform, but not prescribe, policies and decisionmaking; political and legal processes must ultimately determine trade-offs and balance uses of the Delta's land and water resources. Yet today, the science developed for decisionmaking lies at the heart of some of the Delta's most vigorous disputes and contentious litigations. By all measures, science in the Delta, like Delta management, has been unable to effectively execute its missions (National Research Council 2012).

Several reasons explain the failure of Delta science to meet the needs of managing multiple stressors. First, stressors cut across agency and geographic boundaries, making it difficult for agencies and other concerned parties to share scientific knowledge and priorities. The National Research Council's 2012 review of multiple stressors cited the lack of an integrated, unified approach to science in the Delta as a primary reason for the failure to understand and effectively manage its stressors. The NRC found that mere coordination of science—attempts to align the numerous, disparate scientific activities in the Delta through negotiation and cooperation—were not as effective as integration. In an integrated system, leadership and planning are more centralized and science is more of a shared enterprise. New proposals for coordinating, rather than integrating, Delta science by BDCP and others are unlikely to resolve this issue (see Box 6).

Box 6: BDCP coordination, but not integration, of science

In a July 2012 press release, Governor Brown and U.S. Secretary of the Interior Salazar promoted the establishment of a science program for BDCP that would “guide how to best restore the ecosystem and how much water can be exported.” To achieve this goal, BDCP will have to develop a genuinely integrated science program that addresses all of the stressors impacting the ecosystem. The governance structure of this science program is described in chapter 7 of the draft BDCP released on March 27, 2013 (Bay Delta Conservation Plan 2013c). The BDCP negotiators propose to create the following new entities and positions:

Permit Oversight Group: consisting of Delta regulators, principally the federal and state fisheries agencies.

Authorized Entity Group: consisting of the regulated entities (DWR, USBR, and their local contractors) who will run the Implementation Program, housed in an Implementation Office.

Adaptive Management Team: a coordinated consensus group consisting of regulating and regulated entities, as well as monitoring and research entities such as the Interagency Ecological Program (IEP).

Stakeholder Council: an advisory council consisting of the regulated and regulating entities and multiple stakeholder groups providing a forum for input on operations and planning.

Program Manager: overseeing the implementation of the Plan and the Implementation Office.

Science Manager: overseeing the science for BDCP and coordinating activities of the Permit Oversight Group, the Authorized Entity Group, the Adaptive Management Team and the Implementation Office.

All of the above entities will either sponsor or rely upon science developed by a distributed, ad hoc network of science organizations created for various agency purposes. There are no proposals to achieve integration through merging and reorganization. Rather, the approach increases institutional complexity that, the plan asserts, will be mitigated by improved coordination.

Second, current efforts to coordinate science among disparate agencies with different cultures and bureaucracies have proven inefficient. The many agencies involved in every decision regarding science and science planning requires extensive coordination meetings that consume staff time and slow the advancement and adaptation of science in the Delta. The inefficiencies are particularly acute in science funding, a prerequisite for research. Contracting complexity—including interagency conflicts in standards and procedures and difficulties contracting with non-profit entities, universities, and consultants—controls the pace and agenda of Delta science. This is a chronic problem recognized by all parties, with little prospect of improvement under current structures.

Third, no single agency or individual has authority or responsibility for Delta science. The distributed nature of responsibility and accountability does not create incentives for efficiency and effectiveness.

Fourth, the current structure of coordinated science is driven principally by agency mandates, with agencies setting priorities and developing plans. While most organizations consult with regulated parties and stakeholders, stakeholders are generally excluded from discussions pertaining to scientific priorities. Excluding stakeholders from science management discussions has exacerbated stakeholders’ low acceptance of the results of public agency science, as we discovered in our surveys (Hanak et al. 2013a, 2013b).

Finally, science dysfunction in the Delta stems from the complexity of the problems themselves, often characterized as “wicked problems” because every potential solution involves multiple and often competing hypotheses and unknown consequences (Healey et al 2008). The multiple uncertainties, and the inability of the scientific community to address them, frustrates policymakers, with blame often directed toward the science itself as unreliable, out of touch, or biased. Each interest group tends to cite uncertainty as a rationale for its own position and resistance to particular recommendations for addressing stressors,⁴⁰ which further exacerbates the differences in perception between stakeholders, Delta scientists, and government officials (Hanak et al. 2013a, 2013b).

The limited integration of science, coupled with uncertainty and low levels of trust, has made Delta science less useful and less effective in addressing the Delta’s many problems. Nowhere are the consequences of this more evident than in the steady rise of “combat science” —i.e., science purposefully developed to advance a political or economic interest or to disadvantage the interests of others, often in a context of litigation. On the stakeholder side, combat science often appears as selectively developed or released studies that seek to refute agency conclusions or deflect blame for actions. On the agency side, combat science manifests itself as a prioritization of science that is defensible in court or supports existing policies, rather than science that tests assumptions and reduces uncertainties.

Yet, in the midst of all of this discord, some important advances have occurred in the organization of Delta science. Two in particular stand out. The first is the Interagency Ecological Program (IEP), which now conducts most of the environmental monitoring in the Delta and houses numerous collaborative science initiatives focusing on the functions of the Delta ecosystem. The nine IEP member agencies seek to coordinate activities that support the regulation and management of Delta water export operations. The program has improved substantially over the past decade in terms of its commitment to coordination, timely publication, and peer review. Nonetheless, as the NRC notes, the IEP and other state and federal efforts have failed to achieve the integration needed to address multiple stressors. Programmatic reviews by IEP’s Science Advisory Group and the Delta Independent Science Board have made many suggestions for modernizing and integrating IEP’s efforts.

The second important development has been the creation of the Delta Science Program (DSP). Established by the 2009 Delta Reform Act, DSP is charged with developing, integrating, and communicating the best science available for decisionmaking in the Delta. The DSP, which reports to the Delta Stewardship Council and manages the Delta Independent Science Board, has a solid reputation for promoting and providing peer review and evaluation of Delta science, synthesizing and communicating results, and providing modest funding for scientific research. Although the program has achieved much in a short time, it lacks sufficient statutory authority to organize all of the science in the Delta and to guide the development of scientific priorities. In addition, its small budget and staff and uncertain future funding have limited its capacity to lead Delta science.

In sum, science to address multiple stressors in the Delta remains fragmented and reliant on cooperation and collaboration among a host of agencies and stakeholders with often conflicting interests. As in the case of Delta planning, scientific work on discharges, habitats, flows, and fish management tend to be located in different agencies or parts of agencies with little structure or attention to bringing these elements together to better understand their interactions and support more effective Delta management (Mount 2011; Hanak et al. 2011). Here, and in our earlier work (Moyle et al. 2012) we recommend some ways to improve the contribution of science to the Delta.

⁴⁰ For an illustration of this problem in the field of climate change, see Kahan 2012.

Shared Purposes, Resources, and Results: Two Models for More Effective Science

The management of multiple, interacting stressors that cut across agency mandates and scientific competencies is likely to dominate Delta science for the indefinite future. Successful Delta management will require a new approach. The overall scientific enterprise must also acknowledge and address common stakeholder perceptions of bias and unreliability, as well as the actual bias that sometimes occurs in the management of science. We recommend that Delta science be reorganized, rather than merely strengthened, to meet these challenges.

Two successful cases in California illustrate how integrated science has bound together regulators with regulated entities and stakeholders in ways that can serve as models for reorganizing science in the Delta. These are the Southern California Coastal Water Research Program (SCCWRP) and the San Francisco Estuary Institute/Aquatic Science Center (SFEI).

Formed in 1969 under a joint powers agreement (JPA), SCCWRP unites stormwater and sanitation management agencies with water quality regulating agencies to develop a common science for the purpose of informing decisions for managing stormwater and wastewater. This program includes monitoring networks and analytical laboratories; but most importantly, it designs and conducts scientific investigations (along with numerous research partners at universities) that help resolve critical issues.

The hallmark of SCCWRP is its cooperative, consensus-based approach to organizing and delivering science. A commission of 14 participating organizations oversees the program. The members are from regulatory and regulated agencies (with the latter contributing significantly to the program's annual budget), with extensive involvement by other stakeholders. With guidance from an executive director, the commission selects and approves SCCWRP's scientific efforts. In this way, scientific plans are tailored to the information needs of regulators and water agencies alike, with a buy-in by all parties. SCCWRP has adopted a culture of seeking consensus on scientific plans, findings, and recommendations, which often requires lengthy exchanges between scientists and water managers to develop a common understanding, if not outright shared ownership, of the science. This approach—agreed upon scientific efforts and a consensus understanding of results—increases the likelihood that science will be used in, and be useful for, decisionmaking, while also reducing the likelihood of litigation over decisions. As a JPA, SCCWRP can also be more nimble in contracting than most public sector agencies.

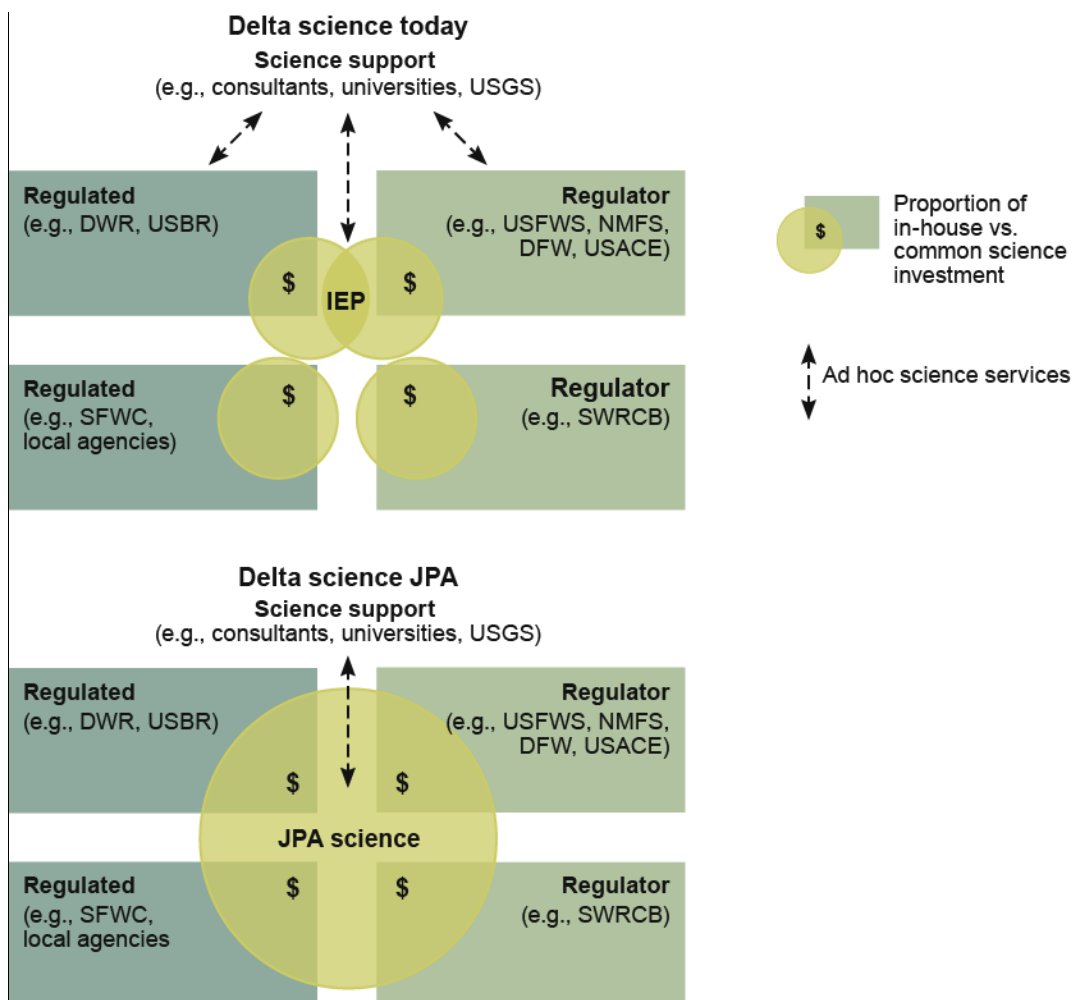
The Aquatic Habitat Institute—the precursor to the San Francisco Estuary Institute/Aquatic Science Center—was established in 1986 to provide information about water quality in San Francisco Bay and to develop synthesis reports on the impacts of discharges into the Bay. The organization arose to resolve significant political and scientific conflicts over water quality regulations issued by the San Francisco Bay RWQCB and USEPA. In 1993 it was renamed the San Francisco Estuary Institute, and its mission was broadened to include monitoring and research activities that address overall estuarine health and multiple stressors. Today, SFEI works in close partnership with many agencies and universities on Bay and Delta research. Its governing board includes regulators, regulated entities, stakeholder groups, and university scientists.

As is the case with SCCWRP, SFEI's diverse board works with an executive director to build consensus around monitoring and research programs. However, unlike SCCWRP, SFEI is a nonprofit, with no dedicated budget provided by entities on the governing board. Thus, SFEI must compete against nonprofits, agencies, and universities for funds to support its operations. In 2007, SFEI began administering the Aquatic Science Center, a JPA created by the SWRCB and wastewater agencies in the Bay Area. This program is similar to SCCWRP in its design, and it has helped expand monitoring, research, and synthesis work into the Delta and Central Valley.

The Delta Science JPA

Based on lessons from SCCWRP and SFEI, we recommend that science for multiple stressors in the Delta ecosystem be addressed by an organization that pools resources, plans jointly, shares data, and commits to consensus understanding of scientific results and their implications for management. Figure 2 compares the current and proposed systems. Under the current system, agencies generally allocate science resources to meet in-house needs but, with varying proportions, also contribute to a common pool. For example, some regulated entities (DWR and USBR) contribute significantly to common pool efforts such as IEP, as do some of the regulatory agencies (DFW, USFWS, NMFS, USACE). Other regulators, such as the SWRCB, primarily fund science in-house or on an ad hoc basis.⁴¹ The same is generally true for local regulated entities, including water, wastewater, and flood management agencies and their associations, such as the State and Federal Water Contractors (SFWC), an association of contractors and water users who receive water from the CVP and SWP.

FIGURE 2
Current and proposed structures for Delta science



To improve the efficiency and effectiveness of these efforts, a JPA or similar instrument would bring together the primary regulators (including USFWS, NMFS, DFW, USEPA, SWRCB, RWQCBs, USACE, and DSC) and

⁴¹ Like the other agencies listed above, the SWRCB is a member of IEP, but it participates less actively.

the regulated entities (USBR, DWR, state and federal water contractors, upstream and in-Delta diverters, representatives of dischargers, and others).⁴² Only two agencies are needed to establish a JPA, with others listed in the founding documents as voting members. It may also be appropriate to include other key groups as members of this JPA to improve consensus on scientific results.

This new program would not replace the science needed for meeting specific agency mandates. Nor would agencies be expected to move all of their scientific research and monitoring efforts into the JPA. Rather, this organization would focus on the large, overarching and controversial questions that cut across agencies in the Delta and its watershed and would have an ability to organize science to independently address other issues and oversee development of capabilities of broad interest, such as databases, models, and broad scientific syntheses.

Currently, the development and operation of computer models (hydrologic, water quality, hydrodynamic, ecosystem, and ecologic) for research and monitoring, is conducted by various state and federal organizations, but principally by DWR. The new JPA science program would oversee the organization and maintenance of such models—including the development of new models, setting common data standards, and overseeing storage and access—so that the computer models could serve a range of state, local, and federal agencies in a more timely manner.

All parties to the Delta JPA must be vested in the outcome by contributing finances and/or staff. This arrangement will create an incentive for parties to resolve issues within the JPA and to achieve consensus, on both plans and results, for addressing uncertainties. It also creates an incentive for the parties to use this science in setting policies and priorities.

To achieve the broader goal of integration (rather than mere coordination), the many disparate science and, where appropriate, monitoring initiatives should be brought under the JPA. The present IEP would be reorganized, with an expanded portfolio of responsibilities and personnel contributed from *both* regulating and regulated agencies. Substantial science personnel, including some agency employees, would be housed within the JPA, rather than in their home institutions, promoting closer collaboration, integration, and common purpose.

Some scientists would be paid by the JPA as in-house staff or under research contracts. Much of the research outside of the JPA (such as that conducted by the U.S. Geological Survey [USGS], non-profits, and universities) would be funded by the JPA through contracts and grants. In addition, the JPA would take on the thorny issue of recommending effective and fair ways to allocate the incidental take of listed species in research programs (See Box 4 above). And finally, under the umbrella of a JPA, scientific efforts will be more nimble because they will be less encumbered by the complex and differing contracting requirements of multiple agencies.

Achieving scientific integration and buffering from political interests will require strong leadership and management of the JPA. The most logical organization to lead the JPA is the Delta Science Program. The DSP's Lead Scientist would work with the JPA members to determine research agendas, oversee scientific quality control, and build consensus with regard to program priorities. The Lead Scientist would also be responsible for managing program reviews, funding, and activities. This structure would overcome one of the more significant impediments to effective science in the Delta, the lack of a responsible authority.

⁴² Federal agencies cannot be signatory members of JPA's since these are state-sponsored organizations. However, they can be named as commissioners in the founding documents and granted voting authority.

Rather than creating a new, stand-alone (but coordinated) science program, BDCP signatories would join the JPA and under its aegis conduct the research and monitoring activities needed for their HCP/NCCP permit requirements. Indeed, the substantial scientific effort that will be required for the BDCP could be the impetus for reorganizing Delta science. The JPA, in turn, would benefit the BDCP by creating cost efficiencies and a clearer understanding and acceptance of the projects' contributions to addressing the multiple stressors affecting the Delta, many of which fall outside the narrower scope of the BDCP, including upstream management, discharges, and other factors.

The current Delta Independent Science Board (DISB), which has the charge of overseeing the quality of science used in decisionmaking in the Delta, would become a standing programmatic review body for the JPA, and also might provide programmatic and specific reviews for relevant scientific work falling outside of the JPA. This would increase the effectiveness of the DISB by connecting it directly to a common organization that plans and implements science programs.

Following the SCCWRP model, funding for the JPA's work would come from a variety of sources, including unrestricted contributions from regulated entities, bond funds, state general funds, and restricted funds for specific research and monitoring projects from all JPA members and other entities.

Creating a Delta Science JPA will be a stretch for many regulatory agencies, which are unaccustomed to collaborative interagency analysis and decisionmaking and the pooling of resources. It will also be a stretch for some parties to the BDCP, who might prefer to control their own science efforts. But such integration is necessary for conducting effective science on a complex ecosystem beset by multiple stressors and burdened by combat science and litigation. The JPA common pool approach—in which each entity gives up some control of science to make it more useful, reliable, and relied upon—may be a worthwhile and necessary tradeoff. Even an ideal scientific organization cannot eliminate uncertainty, controversy, and litigation over Delta science. The complexity of the Delta ecosystem, changing environmental conditions, and deeply entrenched stakeholder interests and beliefs make future controversy certain. However, a well-organized and integrated science program, coupled with a robust adaptive management structure, as discussed in the following section, offers the best option for reducing conflict.

The forthcoming Delta Science Plan, being developed by the Delta Science Program and scheduled to be completed by the end of 2013, presents an opportunity to create a more organized and effective science program for managing the Delta's ecosystem along the lines described here.

Adaptive Management: Using Science in Management

A strong, integrated scientific program cannot improve management by itself. Also needed is a framework to organize ecosystem management efforts and to ensure that management efforts both inform and are informed by evolving scientific understanding. This is the essence of the adaptive management idea called for in so many Delta planning processes, including the Delta Plan and BDCP.

Adaptive management is an approach that brings scientific work into the center of management decisions dealing with complex problems that involve uncertainty. As originally conceived, it envisioned a central synthesizing scientific group that would regularly suggest promising actions to a management group that, in turn, would modify operations and test the actions in the field (Hollings 1978; Walters 2007). Promising actions were to be developed experimentally using computer and conceptual models, pilot scale studies, and empirical results from

field data. The scientific group would then use the results from each cycle of managerial changes and field-testing to increase scientific understanding of the system and foster improved management.

Although there have been some important advances in knowledge using adaptive and experimental approaches within the Delta (Box 7), most efforts are still too fragmented to be effectively used in such a complex and controversial system. This helps explain why adaptive management in this vast watershed has been invoked much more often than attempted (Healey et al. 2008; Walters 2007; Delta Stewardship Council 2012; Lund et al. 2011).

Box 7: Examples of adaptive management in the Delta

A frequent criticism of Delta management is that it is not adaptive (i.e., costs, laws, policies, and public scrutiny tend to circumscribe the range of actions that can be taken, making it difficult to treat actions as experiments and to learn from them). This is especially problematic in trying to manage endangered species, where the potential to cause harm (or “take”) can derail experiments that have the potential to improve conditions, but are unproven.

Despite these barriers, informal adaptive management is going strong in the Delta. These efforts generally do not fit into the classic definition of adaptive management of Hollings (1978) and later authors. But they are experimental, providing learning opportunities and leading to adaptation.

One example is the current efforts to improve floodplain habitat for salmon and other native fishes. Studies funded by CALFED in the 2000s demonstrated that juvenile salmon grow faster when they have access to floodplain habitat, leading to higher survival rates (Sommer et al. 2005; Jeffres et al. 2008). These observations emerged from an initial adaptive management experiment (seeking to promote forest growth) conducted by The Nature Conservancy on the Cosumnes River floodplain.

Thanks to these early experiments, the value of floodplains for supporting listed species of salmon has become conventional wisdom. Formal experiments are now under way in several locations, most notably in the Yolo Bypass (Katz 2012), where hypotheses about the compatibility of rice farming, waterfowl habitat, and seasonal flooding are being tested in a variety of ways typical of adaptive management experiments. Extensive hydrodynamic and habitat modeling is being used to explore how to balance economic interests and habitat restoration. Pilot projects are also under way to assess how to manage rice farms to improve salmon growth rates and to limit stranding and predation. Finally, state and federal agencies, with support (and opposition) from various stakeholder groups are evaluating modifications to the Fremont Weir that might improve floodplain conditions for fish.

All of these efforts to improve floodplain conditions for fish are inherently adaptive management experiments, requiring constant learning and adjustment. Many other such activities are occurring throughout the Delta, including experimental changes to the low-salinity zone in the western Delta, experiments with gates and barriers in Delta channels, fish screens and diversions, invasive species management, and more. These activities typically operate at a subregional level, rather than within a large, unified program as proposed in this report. However, the lessons learned from these subregional approaches will be useful as the Delta Plan and BDCP adaptive management experiments move forward.

Current Adaptive Management Proposals

The draft Delta Plan includes a useful review of experience and impediments to adaptive management in the Delta. Its approach for adaptive management is sound philosophically, but it remains vague on how to make it all work on the ground. The current BDCP draft (March 2013, Chapter 7) postulates a large “Adaptive Management Team” consisting of scientists from a wide range of sovereign Delta science programs and several Delta managers who make decisions by consensus and are separated organizationally from those responsible for overall project management and annual operation planning (See Box 6). Removing the adaptive management team from the operational and project management group seems likely to prove ineffective for both science and management. Separating BDCP’s science and adaptive management programs from related efforts also seems unlikely to be effective for achieving the coequal goals for the Delta.

One feature of the BDCP proposal has particular promise, especially if positioned within a larger context: the development of an annual operation and implementation plan. The SWRCB’s proposed flow standards for the San Joaquin River tributaries have a similar annual implementation discussion process (State Water Resources Control Board 2012c). Annual implementation plans developed within a larger context could be very useful in making cooperation among the Delta’s many different authorities more routine and in facilitating effective long-term Delta management of the coequal goals.

Organizing Management for Science-based Adaptation

To integrate the necessary expertise, resources, and authorities, we suggest that the major planning, management, and regulatory agencies—including BDCP—pool adaptive management efforts through an “Adaptive Management Alliance” under the auspices of the Delta Plan Interagency Implementation Committee (DPIIC). The participants would use this forum to present annual implementation and operations plans and would meet more frequently to review the state of science as it relates to management.⁴³ These efforts would rely on science developed by the JPA. Additionally, the critical uncertainties and information and monitoring needs addressed by the JPA would, in turn, be guided by annual implementation and operations plans.

As described in a companion report, *Where the Wild Things Aren’t: Making the Delta a Better Place for Native Species* (Moyle et al. 2012), there is now increased understanding that improving ecosystem conditions in the Delta will require managing different parts of the Delta for different ecological purposes. This area specialization is highlighted in Figure 3, which depicts one vision of a healthier, more sustainable aquatic ecosystem: Areas stretching from Suisun Marsh, up the Sacramento River corridor toward Yolo Bypass along the western and northern Delta currently provide some of the most hospitable habitat for native fishes, and these areas also have the most potential for habitat improvements in support of these species. Eastside rivers and streams also provide some opportunities to support native fishes, while the Central Delta is likely to remain more favorable for alien fishes such as largemouth bass and less favorable for native fishes. Both BDCP and the Delta Plan recognize similar notions of area specialization in their visions for supporting native fish in the Delta (Hanak et al. 2013a).

Adaptive management of complex, deteriorating systems requires that many experiments be undertaken quickly, so that learning happens fast enough to improve management. An ability to conduct many adaptive management experiments in parallel will be essential for growing and refining scientific knowledge in the Delta system.

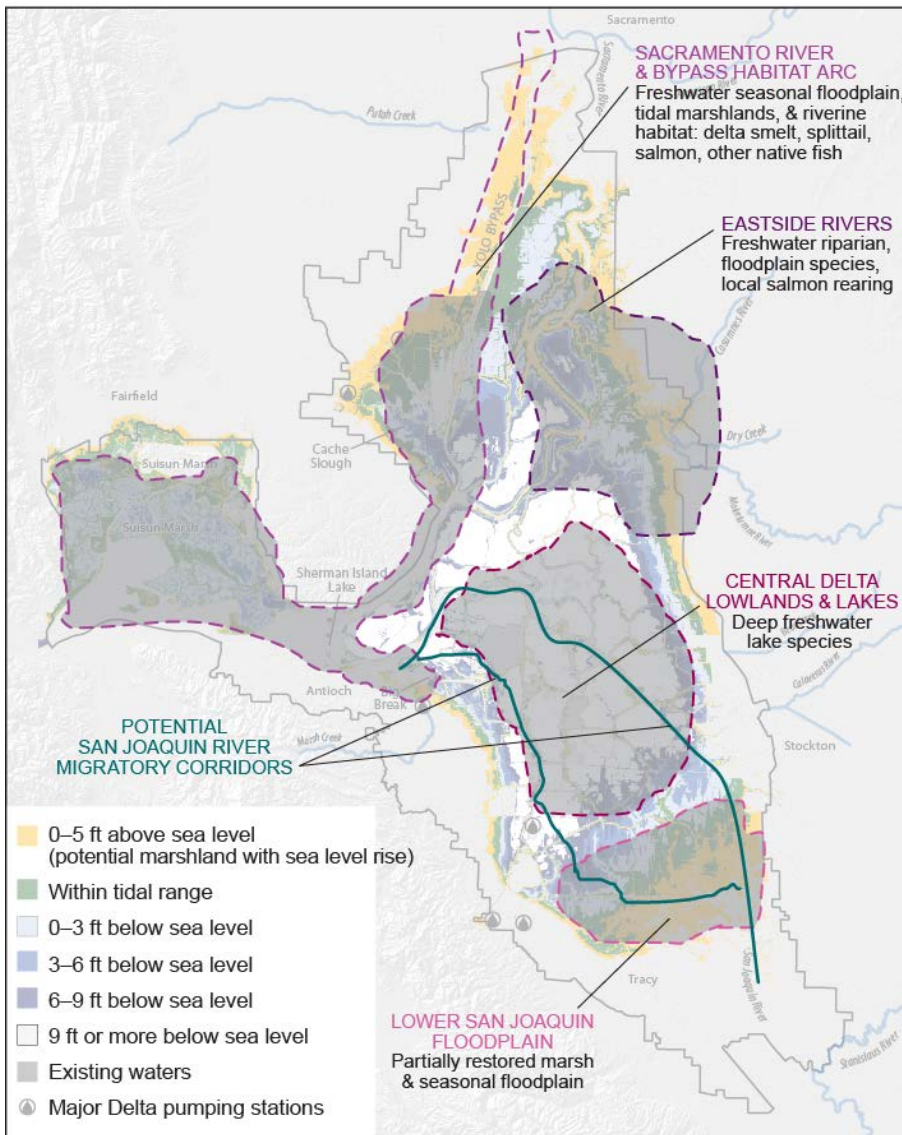
⁴³ For earlier discussions of this idea, see Moyle et al. (2012) and Lund et al. (2011). These earlier proposals envisaged creating an Adaptive Management Alliance from scratch. However, we believe the DPIIC—soon to be created to coordinate implementation of the Delta Plan—can successfully fulfill the convening role for this function.

To address ecosystem-wide issues alongside subregional approaches to habitat restoration, a tiered planning approach that recognizes the multiple, nested scales of management and adaptation will be necessary.

In the scheme proposed here, an annual implementation plan, prepared by the DPIIC with support from the JPA, would address high-level, Delta-wide objectives and approaches to adaptive management. This would include, for example, annual plans for operating the SWP and CVP, and broad goals and objectives for improving habitat, discharges, invasive species, and fisheries activities that impact the Delta. This overarching multiple stressor implementation plan would both guide and be informed by a series of component plans for each specialized Delta subregion. These subregion plans would be the key link in adaptive management in the Delta, prescribing and learning from the on-the-ground activities to manage Delta stressors and connecting this information to the broad goals and objectives in the AMA implementation plan. For example, the subregion plans would harvest lessons from habitat restoration efforts, using this information to evaluate, implement, and test new local strategies. Given the complexity of the Delta, this subregional approach is likely to be more nimble and responsive than attempting to aggregate all activities into a single planning and management effort.

The Delta Stewardship Council would appoint an Adaptive Management Director with ultimate responsibility to develop the adaptive management implementation plan and to supervise the development of subregional plans. These latter plans may be developed by conservation entities, such as the Delta Conservancy, or agencies such as DFW and DWR. The Director would work closely with the Lead Scientist of the JPA to insure that adaptive management in the Delta is guided by and tightly linked to science programs. The Delta Independent Science Board would, under its existing mandate, provide periodic overall review of Delta science and adaptive management programs.

FIGURE 3
Field-level adaptive management would focus on ecologically distinct subregions



SOURCE: Moyle et al. 2012. Base elevation map adapted from Stuart Siegel, Wetlands and Water Resources (2009).

NOTE: This map shows ecosystem areas as regions. These regions would continue to support most urban and agricultural land uses as well as transportation functions. Islands within the central Delta whose economic value (including strategic uses such as roads and rail lines) justifies the expense would continue to be protected.

Conclusion

The challenges of managing the multiple stressors affecting the Delta ecosystem will require a combination of reforms. The science of identifying and understanding the various stressors must be conducted in a manner that facilitates comprehensive and integrated analysis. The scientists and other experts employed by the agencies that administer the waters, lands, and other resources of the ecosystem must communicate regularly and systematically so that they engage in a cohesive and collaborative approach to the problems. In turn, the planning, management, and regulatory agencies active in the Delta, its upstream watershed, and the areas beyond that rely on Delta waters all must seek to ensure that they take a comprehensive and nuanced view of the ecosystem, rather than simply focus on one stressor or one project within their narrow individual jurisdiction.

Building on existing governance structures and management models, we propose four types of institutional change to achieve these outcomes:

- **Consistent planning.** The Delta Plan is the foundational long-term plan for meeting the state's coequal goals of ecosystem health and water supply reliability for the Delta, established by the Delta Reform Act of 2009. The first Delta Plan, scheduled to be adopted by the Delta Stewardship Council in spring 2013, comprehensively examines the ecosystem's problems and establishes policies to guide the council's own work and the actions of other agencies and individuals. The council's regulatory authority for overseeing plan implementation is limited, confined to certifying whether local actions and state non-regulatory actions within the statutory Delta and Suisun Marsh are consistent with the Delta Plan. However, as the expert agency responsible for meeting the coequal goals, the council can and should use its advisory role to provide non-binding reviews and opinions on the consistency of other planning efforts and determine whether individual land and water decisions are consistent with the overall Delta Plan.
- **Integrated and accountable management.** An underappreciated new structure created by the Delta Reform Act of 2009 is the Delta Plan Interagency Implementation Committee, charged with coordinating implementation of the Delta Plan. This committee provides an ideal forum for coordinating individual agency plans and integrating multiagency adaptive management. To achieve these goals, the Delta Stewardship Council should require agencies to present work plans and hold agencies accountable in this public forum.
- **More comprehensive and integrated regulatory oversight.** Both effectiveness and fairness call for improved regulation of stressors to address regulatory gaps, reduce duplication, and create regulatory incentives for joint stressor management. In addition, to reduce costs and delays in environmental management, coordinated and expedited permit review should be assisted through a new office, the Delta Ecosystem Regulatory Coordinator.
- **Common pool science and adaptive management.** Drawing on effective models from northern and southern California, we recommend the creation of a Delta science joint powers authority that would bring together planners, managers, regulators, regulated parties, and the Delta Science Program to address the large, cross-cutting issues in an integrated manner. This structure would work in tandem with an Adaptive Management Alliance that coordinates the conduct of field-level management and experimentation, under the auspices of the DPIIC.

Most of these changes can be accomplished without new legislation, but they will require new commitments by, and interactions among, various state, federal, and local agencies, including some pooling of resources. Though not radical, these proposals will be a stretch for many agencies, perhaps most of all for parties to the Bay Delta Conservation Plan, who have proposed parallel science and adaptive management structures tailored to implement a project that is ambitious, but not sufficiently comprehensive to address the many sources of ecosystem stress. In particular, a common pool approach to science, which requires each entity to give up some control to make it more useful, reliable, and relied upon, may be a worthwhile and necessary tradeoff.

These proposals will also require secure and stable resources, so that the DSC can serve as a coordinating agency, the new DERC can coordinate and expedite permits, and the DSP can manage the new science JPA. More generally, strong institutions will require strong leaders at the helm. Although integration will be elusive in some areas, existing institutions can be managed and adapted to become more ecologically successful and more cost-effective.

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