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## Averting Ecological Collapse in California's Bay-Delta

As planners worked on the Comprehensive Everglades Restoration Plan in Florida, a second major aquatic ecosystem-based management (EBM) initiative got under way on the West Coast. The process formally began in December 1994, when California Governor Pete Wilson, Interior Secretary Bruce Babbitt, and EPA Administrator Carol Browner signed a historic agreement that became known as the Bay-Delta Accord. The agreement did two things: it established an interim water quality standard for northern California's Sacramento-San Joaquin Delta, and it committed the state and federal governments to developing a long-term plan to restore the health of the Delta and San Francisco Bay ecosystem (the Bay-Delta). By August 2000, negotiations among state and federal policymakers, in consultation with stakeholders, had yielded a second agreement, the CALFED Record of Decision (ROD). The ROD constituted a commitment to "develop and implement a long-term comprehensive plan that will restore ecological health and improve water management for beneficial uses of the Bay-Delta system" (CALFED Bay-Delta Program 2000a, ES-3).

Like the other EBM programs described in this book, CALFED succeeded—at least initially—in attracting large sums of money: between 1995 and 2005, the program garnered about \$3 billion, mostly in state bonds. It spent about one-third of that on ecosystem restoration projects, such as installing fish screens and ladders and acquiring and restoring wetlands; a portion of the remainder funded CALFED's science program. In addition, the program enhanced interagency coordination; in particular, under the auspices of CALFED, water managers have worked with fisheries scientists to devise and institute an environmental water account that aims to facilitate real-time adjustments in water project

operations to prevent the deaths of migrating and estuarine fish species at state and federal water export pumps.

Despite these achievements, there is overwhelming evidence that the Bay–Delta has continued to deteriorate. Most notably, in 2003 the delta smelt—a prime indicator of the ecosystem’s biological vitality—went into a precipitous downward spiral, and by 2005 scientists were warning of its imminent extinction. The blame for the ecosystem’s collapse cannot be laid at CALFED’s door, but neither can the program be credited with halting the decline, much less reversing it. CALFED’s management-intensive approach put the risk associated with failure directly on the natural system, rather than on water users: instead of trying to restore natural functions and processes by reducing exports of freshwater from the system, the program relied on a precisely manipulated water delivery system that aimed to ensure that urban and agricultural water supplies were not disrupted, while providing just enough water to satisfy legal requirements for the region’s endangered fish. Nor did a commitment to adaptive management compensate for the program’s weaknesses. Policymakers were unwilling to experiment with reducing water diversions and unable to agree on performance measures, making it impossible to assess whether the program’s ecological restoration activities were achieving their objectives and, if not, what to do differently. The EWA, CALFED’s most frequently cited instance of adaptive management, was severely constrained in its ability to respond to information about its effectiveness by assurances to water users and by consistent underfunding for environmental water.

CALFED yielded an approach that had little prospect of restoring the ecological health of the Bay–Delta ecosystem because the ROD rested on a promise to meet the demands of all stakeholders—simultaneously ensuring flood control; reliable, high-quality water supplies; and environmental improvement. This requirement, deemed essential to ongoing collaboration, made it extremely difficult for planners to recommend options that would impose costs on powerful stakeholders. Similarly, CALFED’s flexible governance—in which each participating agency chose whether to comply with the program’s mandates—undermined the environmental protectiveness of its implementation: when CALFED’s goals conflicted with their institutional missions, water project operators simply circumvented the interagency process.

In response to the ecological collapse in the Delta and in recognition of CALFED’s shortcomings, in 2006 the state of California undertook a massive reassessment of its Bay–Delta policy. That process is occur-

ring within a context in which power is shifting in favor of environmentalists and fishing interests, thanks to a series of pro-environment court decisions. In the absence of leaders committed to an overarching goal of restoring ecosystem health and willing to employ their regulatory authority to ensure compliance, however, powerful water users may nevertheless succeed in blocking major changes to the status quo.

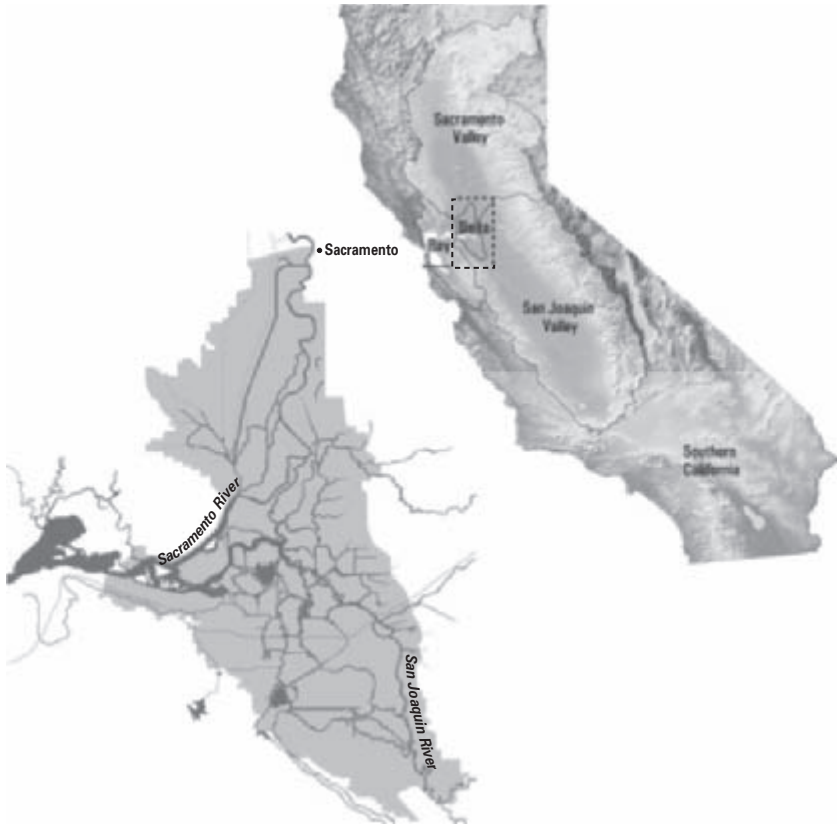
### **The Evolution of Landscape-Scale Planning**

The CALFED planning process began not in response to a change in the Bay-Delta's environmental conditions, which had been deteriorating for decades, but after legal action by environmentalists precipitated a regulatory "crisis" that threatened the reliability of water supplies to urban and agricultural users and jeopardized the state's autonomy. Galvanized by the impasse that ensued, high-level state and federal policymakers initiated a process to address the system's problems in a comprehensive fashion. CALFED created a forum in which all the state and federal agencies involved in regulating and distributing water could devise a long-term solution cooperatively, in collaboration with stakeholders and based on knowledge gathered by reputable scientists.

### **The Origins of Environmental Problems in the Bay-Delta**

The Bay-Delta watershed originates in the Sierra Nevada and part of the Cascade range, where each spring the mountain snowpack melts into hundreds of streams that merge into the Sacramento and San Joaquin rivers (see figure 6.1). For centuries those two rivers flowed west out of the foothills, through the Central Valley, to the Sacramento-San Joaquin Delta, a vast expanse of marsh and grassland where freshwater and seawater mixed, and finally to San Francisco Bay. Because of its brackish, estuarine conditions, the 1,315-square-mile Delta supported a rich diversity of plants, fish, birds, and wildlife.

Serious human modification of the Bay-Delta ecosystem dates back more than 150 years. In the 1800s settlers began to transform the watershed by draining marshes, logging forests, and building dikes to control flooding. During the Gold Rush, miners dumped millions of tons of sludge and debris into the Sacramento and San Joaquin rivers and their tributaries. In the early 1900s, as mineral exploration slowed, miners-turned-farmers built canals and levees to control the region's unruly water so they could exploit its fertile soil. The most significant alterations



**Figure 6.1**  
California Bay–Delta Watershed

to the system, however, began in the 1930s, when the federal government initiated the Central Valley Project (CVP), a massive system of reservoirs, dams, canals, aqueducts, and tunnels whose purpose was to provide water for farmers in the Sacramento and San Joaquin valleys. In the early 1970s the state of California completed its own water management infrastructure, the State Water Project (SWP), to provide additional irrigation to San Joaquin Valley farms and facilitate growth in California's south coastal basin.

Undertaken with little concern for their environmental consequences, the CVP and SWP had a variety of potentially damaging effects: they established a freshwater flow regime that was antithetical to the one

within which native species evolved, dramatically reduced the areal extent and function of floodplains and other habitats, imposed numerous barriers to fish movement, and encouraged the invasion of exotic species into the system. Not surprisingly, shortly after portions of the SWP came on line in the 1960s, signs of an ecological breakdown appeared (Zakin 2002). For instance, the striped bass index—a measure of the number and distribution of striped bass in the estuary and considered an indicator of the Bay-Delta's ecological health—began to decline (Nolte 1990).

Nevertheless, water exports increased steadily over the next three decades, as both state and federal managers strove to meet the growing demands of water users. By the early 1990s the Delta was supplying drinking water to 22 million Californians—furnishing as much as 40 percent of the state's supply in some years—and providing irrigation water for about 4 million acres of farmland. To accomplish this, project operators diverted anywhere from 30 to 60 percent of the freshwater flowing down the Sacramento and San Joaquin rivers each year. In an “average” year, and counting both upstream and in-Delta withdrawals, the CVP and SWP together diverted about 6 million acre-feet of the 23 million acre-feet flowing through the system.<sup>1</sup> Further stressing the system, 7,000 small upstream and in-Delta water operators diverted another 5 million acre-feet per year (Lund et al. 2007; G. Martin 1999b).

### **The Impetus for Landscape-Scale Planning**

As the environmental impacts of these diversions became evident, scientists raised concerns about the state's water policy. Critics recognized that water diversions were not the only cause of problems in the ecosystem: industrial pollution, the loss of more than 90 percent of the region's historic wetlands, overfishing, toxic pesticides in agricultural runoff, and the proliferation of invasive species also had compromised the integrity of the ecosystem. Many scientists suspected, however, that changes in the timing and amount of freshwater flows were critical causes of the ecological decline. For example, some believed that reductions in freshwater entering the Bay had forced the zone where freshwater and seawater mix to compress and shift upstream, facilitating the proliferation of invasive species while making the system less hospitable to natives, particularly the pelagic species that spend part of their lives in the Delta. Others hypothesized that changes in the temperature and timing of freshwater releases, as well as the presence of physical barriers in the forms of dams and diversions, hampered the migration of salmon and other anadromous fish.<sup>2</sup>

While scientists in various settings refined their understanding of the Bay–Delta ecosystem, northern California’s environmentalists and fishermen tried to bring about changes in the state’s approach to water management through lobbying and public education campaigns. They faced a formidable array of adversaries, however; urban and agricultural users who rely on the Bay–Delta’s water mounted a formidable defense of the status quo. For example, the Central Valley’s massive Westlands Water District, which represents 600 farm conglomerates spanning 600,000 acres, is a beneficiary of CVP water and lobbies aggressively to protect its (junior) water rights. The entity with the largest entitlements to the SWP is the Metropolitan Water District (MWD) of Southern California, which is “a giant among public water agencies” (Gottlieb and Fitzsimmons 1991, 5) that serves an area of 5,135 square miles and a population of 15 million. Robert Gottlieb and Margaret Fitzsimmons (1991, xvi) explain, “Water politics in Southern California have always been politics of growth, of heating up the local economy by finding strategies to subsidize an increased and reallocated supply of a necessary natural resource so that, no matter how rainfall might fluctuate from year to year, economic growth would anticipate no checks and limits.” Historically, California’s urban and agricultural users made common cause and dominated water policymaking at the expense of the natural system (Hundley 2001).

By the early 1990s, however, the balance of power was beginning to shift, as the catastrophic effects of a multiyear drought that began in 1986 gave environmentalists and fishermen some legal leverage over state policymakers. State and federal endangered species laws provided one legal hook. During the drought, the CVP and SWP increased exports to record levels, causing the populations of several key fish species to plummet. In August 1990 the California Department of Fish and Game reported that the striped bass index had reached a record low, and state biologists advised the state’s Fish and Game Commission to list the once-plentiful delta smelt as threatened because of its precipitous decline (Nolte 1990). In November 1990 the National Marine Fisheries Service (NMFS, pronounced “nymphs”) listed the Sacramento River winter-run Chinook salmon as threatened after the population dropped to 533 fish (Zakin 2002). By the spring of 1992, the U.S. Fish and Wildlife Service (FWS) had listed the delta smelt as threatened, and environmentalists had filed petitions to list other fish species as well. Biologic al opinions issued by the FWS and NMFS had caused intermittent, brief pumping shutdowns, and water users feared the Endangered Species Act consultation proc-

ess would ultimately result in permanent restrictions on CVP and SWP operations (Rieke 1996).

During the early 1990s, state and federal water managers also ran afoul of the Clean Water Act. Responding to a 1986 appellate court mandate, the State Water Resources Control Board (SWRCB) undertook extensive Bay-Delta water quality and water rights adjudicatory proceedings, which resulted in a 1988 draft order that contemplated a new “water ethic.”<sup>3</sup> The order contained water quality standards that would have limited water exports to the south and given the Bay an additional 1.5 million acre-feet in the spring, when fish need water to carry them through the mazelike Delta (Diringer 1991a). Although the new draft standards were only moderately protective, irate southern California water interests lobbied ferociously against them, and an intimidated SWRCB promptly withdrew the proposal. Then, in January 1989 the board eliminated the plan’s two most controversial provisions—freezing the amount of water diverted from the Delta and increasing flows into the Bay—and in August 1990 it published a revised order that skirted the issue of freshwater flows altogether (Ingram 1990).<sup>4</sup> Despite environmentalists’ protests that the plan’s protective measures were virtually indistinguishable from those rejected by the court years earlier, in the spring of 1991 the SWRCB voted unanimously to adopt the revised plan.

Environmentalists immediately threatened to sue both the EPA and the Water Board, noting: “The water interests won’t take us seriously as long as they have a state plan that allows them to continue to divert most of the freshwater flow from the delta. The environmental community won’t have the leverage it needs to have an equal place at the bargaining table” (Diringer 1991b). In early September 1991 the EPA reinforced the environmentalists’ position by rejecting the board’s salinity and water temperature standards, describing them as “not adequate to protect the health of the estuary” (Petit 1991). Shortly thereafter—again at the urging of environmentalists—the EPA issued an ultimatum: if the state did not adopt more protective standards expeditiously, the agency would substitute its own.<sup>5</sup>

In the spring of 1992, in hopes of reestablishing state control over the allocation of water, Governor Pete Wilson proposed to “solve” the Bay-Delta’s problems through a combination of conservation, marketing, and new water storage facilities, based on the recommendations of a state water policy task force. The task force report established the principle, popular among water users, that crisis could be averted only

if “assurance is given that no user group will prevail at the expense of another” (Diringer 1992a). Environmentalists were not appeased by the governor’s proposal, however, and in late July 1992 a coalition led by the Sierra Club Legal Defense Fund filed notice of intent to sue the federal government if it did not follow through on its threat to enact new protections for the Bay and Delta within 60 days (Diringer 1992b). The EPA responded by presenting a set of restrictions on freshwater exports and pressing the state to adopt them. State water managers balked, however, again warning that the EPA’s prescription would commit so much freshwater that users up and down the state could face cuts as high as 30 to 60 percent of current deliveries, causing “tremendous economic damages” (Diringer 1992c).

As California and the EPA were facing off over Bay–Delta water quality standards, in October 1992 Congress approved (and President George H. W. Bush signed) the Central Valley Project Improvement Act (CVPIA). The CVPIA, which was the result of lobbying by an unusual coalition of environmental and urban interests, declared environmental protection an official purpose of the CVP and set a goal of doubling anadromous fish populations in rivers affected by the project by 2002. To this end, the legislation allocated 800,000 acre-feet of water to fish and wildlife (along with numerous other environmental provisions). Although environmentalists regarded the CVPIA as a triumph, it was nevertheless clear that addressing the Bay–Delta’s problems in piecemeal fashion would not suffice in the long run.

At the same time, the federal government’s increasing intervention in California water policy provoked state officials to try to regain their autonomy by taking a more comprehensive approach. On December 9, Governor Wilson created two entities: the 21-member Bay–Delta Oversight Council and the California Water Policy Council. He directed the Oversight Council, which included both water managers and prominent stakeholders, to develop a comprehensive plan to reverse the environmental decline in the Delta while simultaneously enhancing the quality and reliability of water supplies. He asked the Water Policy Council, composed exclusively of state officials involved in water management, to coordinate with federal officials in formulating a long-term water policy for the state.

On the same day, the SWRCB announced a plan to impose a series of interim measures that could deprive water users of well over 1 million acre-feet of water each year, to be put in place while the Oversight Council devised its long-term plan. Environmentalists pointed out that although the

board's proposal was an improvement over its 1991 plan, it nevertheless assured the Bay and Delta of only half as much additional freshwater as would have been provided under the board's 1988 draft decision. The EPA was similarly unimpressed, and in mid-January it declared that the state's latest plan was still too weak, so it would move ahead with its own scheme. Despite this threat, the SWRCB—which faced simultaneous pressure from users—proceeded to release a plan that was even weaker than its predecessors, although insufficiently lax to satisfy agricultural interests. Kern County Supervisor Ben Austin reprimanded the board, saying, “Water means life, not only for the species this plan proposes to protect, but also for the 3 million people who live and work in the San Joaquin Valley. You will effectively write off an entire region. Certainly people are at least as important as fish and wildlife” (Diringer 1993a). In a gesture of support for agricultural interests, Governor Wilson asked the SWRCB to shelve its latest proposal (Olszewski and Kershner 1993).

Fed up, in mid-April 1993 the Sierra Club Legal Defense Fund—on behalf of 18 fishing and environmental groups—sued the EPA for failing to set standards for the Bay in accordance with federal law. In hopes of settling the suit, in mid-September the EPA agreed to issue more stringent water quality standards by the end of the year. At the same time, the four key federal agencies involved in California water management—the EPA, the Bureau of Reclamation, the FWS, and NMFS—signed a memorandum of understanding that created the Federal Ecosystem Directorate (Club Fed), whose role was to coordinate federal resource protection and management decisions.<sup>6</sup> In mid-December, Club Fed announced a sweeping set of measures for restoring freshwater to the Bay and Delta. The group estimated the restrictions could result in a 9 percent cut in exports from the system during “average” years, and as much as a 21 percent cut (1.1 million acre-feet) in dry years (Diringer 1993b). The centerpiece of the package was a set of water quality standards based on the X2 salinity criterion developed in the early 1990s by a technical team that had been convened as part of the San Francisco Estuary Project.<sup>7</sup> In April 1994, the EPA settled the environmental lawsuit against it by agreeing to adopt and enforce Club Fed's water quality standards by December 1994.

### **The Bay-Delta Accord: A Decisive Step toward Landscape-Scale Planning**

The federal government's aggressive moves to list endangered species and institute water quality standards unilaterally made clear to Governor

Wilson, as well as to urban and agricultural users and much of the business community, that the state was no longer in control of water policy, and prompted tentative steps toward cooperation (Rieke 1996). In June 1994 the governor's Water Policy Council signed a memorandum of understanding with Club Fed that committed all parties to working cooperatively on a resolution of California's water wars. The primary goal of this endeavor was not ecological restoration but rather to "minimize the overall costs in water and dollars for achieving environmental protection and provide meaningful regulatory stability for users of the Bay-Delta's resources." More specifically, under the Framework Agreement state and federal agencies agreed to (1) work together to develop new state standards that would satisfy federal Endangered Species Act and Clean Water Act requirements, (2) coordinate operations of state and federal water projects, and (3) develop a long-term planning process (Wright 2001).

The agreement prompted an intense round of negotiations with Bay-Delta stakeholders. With the settlement deadline looming, Betsy Rieke, the Assistant Interior Secretary for Water and Science, got the disputants to agree on a plan, and on December 15, 1994, state and federal officials, joined by ten "interested parties," signed the Bay-Delta Accord. The Accord retained the EPA's water quality standards, which regulated the amount and timing of freshwater flows on behalf of fish,<sup>8</sup> created some operational flexibility in complying with the Endangered Species Act to prevent disruptions to users' water supply, and aimed to improve conditions for fish by taking steps unrelated to freshwater flow, such as installing fish screens and restoring habitat. The Accord also set in motion the CALFED Bay-Delta Program, an effort to generate a comprehensive, long-term solution to the Bay-Delta's problems. Although CALFED followed in the footsteps of a series of collaborative initiatives—including the San Francisco Estuary Project and a "three-way process" among environmentalists, agricultural interests, and urban users—it devised its own collaborative problem-solving structure. The Accord established a Policy Group, comprising high-level officials from ten state and federal agencies and presided over by Executive Director Lester Snow, as the program's decision-making body. It also created the Bay-Delta Advisory Council (BDAC), a 32-member panel made up of stakeholders whose purpose was to solicit public input and advise the Policy Group.

Formerly warring stakeholders agreed to participate in the CALFED process for a variety of reasons. For environmentalists, many of whom

had been skeptical about earlier collaborations, CALFED promised to generate results that might actually be implemented. By contrast, previous processes, such as the San Francisco Estuary Project, involved enormous commitments of time and resources, but had no mandate. Furthermore, rather than continuing to address problems as they arose in piecemeal fashion, CALFED had the potential to yield a sustainable, holistic regime for managing the Bay-Delta's water, and therefore to improve the overall health of the regional ecosystem. Some environmentalists welcomed the program's collaborative approach out of concern that continuing to use regulatory clubs—although they had changed the balance of power somewhat—would end up weakening support for the Endangered Species Act in the long run.<sup>9</sup> Agricultural and urban interests hoped the process would both alleviate the uncertainty caused by enforcement of environmental laws and pave the way for building additional storage and conveyance facilities that could improve drinking water quality and enhance overall supply reliability. Everyone wanted to move away from year-to-year, crisis-driven decision making; as CALFED's executive director Lester Snow (2005) put it, "People understood that as bad as things [were then], they could get a lot worse."

### **Collaborating with Stakeholders on a Comprehensive Plan**

From the outset, CALFED planners focused on gaining consensus among stakeholders on the goals and elements of a comprehensive plan.<sup>10</sup> That focus yielded outputs that are consistent with the predictions of the pessimistic model of EBM. Reaching agreement on broad goals was relatively straightforward; planners were able to move forward by promising to improve conditions for everyone. On specifics, however, consensus was elusive. Spending money to acquire and improve wildlife habitat provoked little conflict because restoration projects neither were funded by users nor threatened any change in the amount of water delivered. By contrast, figuring out how to provide adequate amounts of freshwater for fish without reducing exports from the system was extremely contentious, and intensive negotiations among stakeholders and policymakers failed to produce agreement. A final round of discussions among high-level officials yielded an innovative solution that broke the impasse: an environmental water account that was designed to ensure that water users faced no disruption in their supplies as a result of fish protection measures.

### **Establishing CALFED's Mission, Principles, and Goals**

During its initial phase, the summer of 1995 through the summer of 1996, CALFED staff, in consultation with stakeholders, established as the program's dual mission "to develop and implement a long-term comprehensive plan that will restore the ecological health and improve water management for beneficial uses of the Bay-Delta system." That mission was tightly linked to and qualified by the program's six solution principles, according to which a long-term solution had to be affordable, equitable, implementable, and durable; in addition, it had to reduce conflicts in the system and could not solve problems in the Bay-Delta by redirecting them elsewhere. Finally, planners delineated four primary objectives: (1) to provide good water quality for all beneficial uses; (2) to improve and increase aquatic and terrestrial habitats and improve ecological functions in the Bay-Delta to support sustainable populations of diverse and valuable plant and animal species; (3) to reduce the mismatch between Bay-Delta water supplies and current and projected beneficial uses dependent on the Bay-Delta system; and (4) to reduce the risk to land use and associated economic activities, water supply, infrastructure, and the ecosystem from catastrophic breaching of Delta levees (<http://calwater.ca.gov>).

Although these goals and principles were acceptable to all, there was neither a recognition that CALFED's four main objectives might be in conflict nor an effort to establish priorities among them; in fact, the CALFED mantra—"getting better together"—implicitly assumed the existence of a win-win solution and the sustainability of the existing export regime. The program's unwillingness to make trade-offs was reflected in the three alternatives that emerged from the first stage of the planning process, all of which promised something for everyone: each combined an ecosystem restoration program with projects that would enhance the water supply by increasing storage, widening and deepening channels, or building a canal to circumvent the Delta. None departed substantially from the status quo.

### **Collaborating with Stakeholders**

For the next three years, policymakers worked extensively with stakeholders in an effort to gain consensus on the specific elements of a comprehensive plan. Although the Bay-Delta Accord established a formal stakeholder advisory committee, participants made it clear that the most productive collaboration occurred in subcommittees, interagency teams,

and ad hoc work groups, rather than in large public meetings. In the more informal settings they were able to explore ideas without having to defend them or posture for their constituents. Some of these groups broke down in conflict, but others built trust and engaged in joint learning and creativity (Bobker 2005; Innes et al. 2006; Innes, Connick, and Booher 2007; Wright 2006). Some observers firmly believe these negotiations wrought a genuine transformation among water users, and hence a concurrence among all stakeholders that the Bay-Delta's environmental problems were real and needed to be addressed (S. Johnson 2005). Public statements by some stakeholders suggest that attitudes and positions did, in fact, change. For example, Tim Quinn, then-deputy general manager of the MWD, said that historically, Delta water users thought only about how to transport water out of the system reliably. By the late 1990s, however, they were being forced to think about the health of the Bay-Delta. "If we are not taking care of that Bay-Delta watershed," said Quinn, "we are not taking care of California's economic future" (Curtius 1998).

But other urban and agricultural interests endorsed ecosystem restoration projects because they were funded with bond money, rather than user fees, and they anticipated that restoration would create tangible evidence of the program's benefits, thereby easing opposition to new storage and conveyance projects. Moreover, deep divisions among stakeholders persisted over conservation (known within CALFED as water-use efficiency) and the appropriate allocation of water, and those differences surfaced as the discussion moved from general principles to specifics. Lester Snow explained (Anon. 1997): "Early on, when we said there were no preferred approaches, everyone agreed intellectually. As we move to more detail, we see people move back to 'our way is right, your way is wrong.'"

Reflecting an ongoing interest in retaining their existing water allocations, water users employed a variety of tools to shape the context for CALFED's deliberations and, in particular, to influence the baseline for future water allocation decisions. In the fall of 1995 San Joaquin Valley water agencies sued the Interior Department, saying that implementation of the 1992 CVPIA would illegally divest districts of their water. The department survived this legal challenge, but in 1997 a Central Valley water consortium filed suit when the department tried to implement the CVPIA's 800,000-acre-foot environmental water set-aside from the CVP's "unsold" capacity, and in that litigation the users prevailed. Similarly, in 1995 and again in 1996, Rep. John Doolittle (R, Rocklin) introduced bills on behalf of agricultural interests that aimed to overturn the CVPIA,

and in the summer of 1998 Governor Wilson lobbied President Clinton on behalf of farmers, saying that implementation of the law could imperil CALFED.

In addition to contesting the allocation of water for fish, agricultural interests joined forces with urban water districts to press their representatives to circumvent CALFED. In late 1996, representatives of the urban and agricultural water agencies formed a “working group” separate from CALFED to “develop a solution package to present to CALFED and other stakeholders as a foundation for discussion” (Anon. 1997). Around the same time, the Bay Area Council, a group representing regional business interests including the California Farm Bureau and the Los Angeles Chamber of Commerce, sought to persuade Governor Wilson, Secretary Babbitt, and Governor-elect Gray Davis that the best way to ensure the water supply needed to accommodate the state’s anticipated population growth was to expand the system of water storage and accelerate the pace of its construction (Clifford 1998). In the fall of 1998, at the urging of agricultural interests, Rep. George Radanovich (R, Mariposa) attached a rider to the omnibus spending bill in the House that authorized a study of raising the Shasta Dam near the headwaters of the Sacramento River (G. Martin 1998). Governor Wilson continued to advocate on behalf of agricultural interests as well, and in mid-November 1998 he infuriated environmentalists by appointing a 33-member panel of representatives of big agriculture to advise him on agriculture and water policy issues (Gledhill 1998).

While development interests emphasized new construction, environmentalists—who were organized in a loose coalition called the Environmental Water Caucus—continued to advocate publicly for their preferred approach. They argued that CALFED was relying on inflated demand forecasts while overlooking water savings achievable through conservation, recycling, new irrigation technology, groundwater banking, and water marketing. Peter Gleick, of the Pacific Institute, a Bay Area think tank, claimed that the state had grossly underestimated the potential for reducing waste, and proceeded to generate a series of studies showing the potential for conservation in California. The Bay Institute’s Gary Bobker pointed out that CALFED had adopted an engineering logic, even though it had not shown that it was possible to take more water out of the system and bank it without harming the environment. In response to these arguments, both Secretary Babbitt and Governor Wilson characterized environmentalists as “intransigent” and “obstructionist” (T. Perry and

Clifford 1998). According to Wilson, environmentalists were motivated by “the unrealistic belief they [could] stifle growth” (Ritter 1998).

### **State and Federal Officials Cooperate to Draft a Final Plan**

Given the fractiousness of the stakeholders, it is unsurprising that CALFED's release in March 1998 of a draft programmatic Environmental Impact Statement/Environmental Impact Review (EIS/EIR) provoked intense debate at public hearings around the state and drew more than 1,800 comments, even though it did not specify a preferred alternative. Undaunted by the ongoing posturing and dissension, as the Wilson administration drew to a close Secretary Babbitt and George Dunn, Governor Wilson's chief of staff, engaged in a “monumental effort to reach consensus among various stakeholder representatives on an appropriate preferred alternative” for CALFED (Wright 2001, 339). During the summer and fall of 1998, the two leaders sponsored weekly meetings to tackle thorny issues. As the deadline neared, however, divisions among stakeholders remained, and “The agencies were forced to weaken or qualify many of the key recommendations as they sought to gain universal support” (Wright 2001, 339)

On December 18, 1998, Wilson and Babbitt presented a \$4.4 billion draft plan that attempted to appease all the key parties while acknowledging it failed to resolve the toughest issues (Barnum 1998). The plan contemplated raising several dams and building new off-stream reservoirs, but made construction of new projects contingent on progress in conservation. To proponents' relief, upon taking office in early January, Governor Gray Davis expressed support for CALFED and “insisted upon a balanced plan that would address the key short- and long-term needs of each of the major stakeholder groups” (Wright 2001, 339).

Six months later, after holding extensive public hearings and soliciting comments on the draft plan, CALFED unveiled the details of its preferred alternative in a revised EIS/EIR. Rather than increasing freshwater flows through the Bay-Delta, as environmentalists had hoped, the plan relied on elaborate water delivery techniques to save fish and wildlife, such as timing water diversions more strategically and conducting those diversions more carefully. To solve the problem of maintaining a reliable water supply for users, the plan also recommended engineering solutions such as recharging subterranean aquifers, building off-stream reservoirs (supplied by pipes or canals), and augmenting existing reservoirs. (It eschewed the most controversial approach, construction of a canal around the Delta,

because program staff feared that proposal would provoke a massive public backlash.<sup>11</sup>) The basic idea underpinning the plan, according to Lester Snow, was that by rebuilding the channels and pumping when threatened fish were not present, managers could run the pumps at maximum levels and store water elsewhere for later use (G. Martin 1999b).

Despite the extensive consultation that preceded its release, public reaction to the draft plan was tepid, and hearings held during the comment period offered little indication that stakeholders' views had changed as a result of the collaborative process: CALFED officials were bombarded with complaints, dire predictions, and uncompromising rhetoric from all sides. Farmers charged the plan was tilted too heavily in favor of fish and birds and would be ruinous to agriculture. Environmentalists countered that the plan did nothing to curb farmers' wasteful ways. The MWD complained the proposal would not improve the quality or reliability of water flowing through the California Aqueduct. Observers warned that "The regionalism and tribalism that [had] blocked previous efforts at restoring the delta [were] once again reasserting themselves" (T. Perry 1999). Stakeholders' intractable differences manifested themselves internally as well: it was proving impossible to craft a final plan with the stakeholders in the room because negotiators could not get beyond lowest-common-denominator language. According to one CALFED staff person, "The phrase 'CALFED-speak' entered the lexicon in a derogatory manner, meaning that to get everyone to agree you'd end up with mush" (Innes et al. 2006, 23).

With efforts to build consensus among stakeholders bogging down, Secretary Babbitt convened a small group of high-level public officials representing a diversity of interests to hammer out the details of a final plan in advance of the impending presidential election. Critical to reaching agreement was the creation of a novel mechanism for allocating water: the Environmental Water Account (EWA). Because curtailing water exports appeared unthinkable, Secretary Babbitt directed agency officials and stakeholders to find a mechanism for applying export reductions on a real-time basis, rather than a fixed schedule, in hopes that such a mechanism could meet the legal requirements of the Endangered Species Act without jeopardizing the total quantity of water available for export. The development of this mechanism brought together fishery scientists and project operators in months of gaming exercises that simulated how real-time changes to project operations might be made in response to monitoring data—in the process creating mutual understanding of one another's

constraints. Final agreement on the EWA, however, hinged on the establishment of a baseline allocation of environmental water. According to Alf Brandt (2002), the stakeholders battled fiercely over how much water fish had a right to, and the SWP contractors prevailed. At the Davis administration's insistence, Secretary Babbitt agreed to reduce the amount of water allocated for the natural system under the CVPIA in exchange for a promise of additional water purchases under the EWA. That decision facilitated agreement but put the risk of tight water supplies on the ecosystem by further squeezing the baseline, which is the only "guaranteed" environmental water supply.

### **The CALFED Record of Decision**

On August 28, 2000, Secretary Babbitt and Governor Davis signed the record of decision (ROD) that laid out CALFED's Preferred Program Alternative, a 30-year plan that sought to achieve several goals simultaneously: restoring the Bay-Delta's ecological health while improving water-supply quality and reliability and enhancing flood control. Although the agreement had no legal force, it was backed by a commitment to joint implementation among the 18 state and federal agencies with management and regulatory responsibility in the Bay-Delta. The ROD did recommend creating a new, 12-member, joint federal-state commission. In the meantime, however, it relied on an interim governance structure similar to the one that crafted the ROD: a federal-state Policy Committee to advise participating agencies, which retained final decision making authority, and a Bay-Delta Advisory Committee to furnish input from stakeholders. To ensure that decisions were based on the best available information, the ROD established a formal science program whose purpose was to furnish policymakers with an "objective" understanding of the Bay-Delta system and thereby reduce conflict over technical issues.

The primary means by which CALFED aimed to achieve environmental benefits was by devoting substantial resources to ecosystem restoration. The goal of the Ecosystem Restoration Program (ERP) was to "improve and increase aquatic and terrestrial habitat and improve ecological functions in the Bay-Delta system to support sustainable populations of diverse and valuable plant and animal species." To that end, the ERP prescribed hundreds of actions to conserve and restore critical ecosystem elements and processes, such as: restoring, protecting, and managing diverse

habitat types representative of the Bay–Delta ecosystem and its watershed, acquiring water from sources throughout the watershed to provide flows and habitat conditions for fishery protection and recovery, restoring in-stream flows, improving Delta outflow during key springtime periods, reconnecting Bay–Delta tributaries with their floodplains, developing prevention and control programs for invasive species, restoring sediment, and reducing or eliminating fish passage barriers. In addition, the ERP conducted research to help decision makers define problems and establish priorities for action. Implementation of the program relied heavily on voluntarism; for example, the ROD emphasized that the ERP would preserve as much agricultural land as possible through partnerships with willing landowners, and would acquire land from willing sellers only as a last resort.

Another environmentally oriented CALFED element, the Water Use Efficiency Program, aimed to reduce the strain on the Bay–Delta ecosystem by accelerating the implementation of water conservation and recycling practices throughout the state. Planners estimated that if such practices were widely adopted, the urban sector could save between 520,000 and 688,000 acre-feet of water; the agricultural sector could save from 260,000 to 350,000 acre-feet; and water reclamation projects could save between 225,000 and 310,000 acre-feet (CALFED 2000b, 59). Like the ERP, the water-use efficiency program relied on incentives and voluntary mechanisms, such as a competitive grant/loan program and public relations efforts to encourage better local groundwater management.

To ensure that an adequate portion of the existing water supply benefited fish and wildlife, the ROD established three “tiers” of environmental water supply protection. The first tier included regulatory requirements already in place: the state’s Water Quality Control Program, the federal CVPIA, and rules for project operations under the Endangered Species Act. The third tier committed state and federal agencies to make water available if the combined protections of tiers 1 and 2 proved insufficient to protect endangered species. The element that had clinched the deal on the ROD, however, was the second tier, the Environmental Water Account, which facilitated the acquisition of an average of 380,000 acre-feet for the environment through a combination of setting aside water during system operation (195,000 acre-feet) and purchasing water from willing sellers (185,000 acre-feet). In exchange for adjusting their pumping schedules, the EWA absolved operators of liability for fish that were “taken” at the pumps (Rosenkrans and Hayden 2005).

In some respects the CALFED ROD improved on historic practices. Previously, single-purpose environmental protection efforts ignored, and often exacerbated, other problems within the watershed, and year-to-year water management decisions were crisis-driven and reactive. By contrast, consistent with the optimistic model of EBM, CALFED was relatively comprehensive: it defined the geographic scope of the problem as the legally defined Delta, Suisun Bay, and Suisun Marsh, while encouraging solutions from a much broader area—from southern California north to the Oregon border and from the Central Valley west to the Farallon Islands. Furthermore, CALFED explicitly recognized the interrelationships among its eight program elements: ecosystem restoration, water quality, levee system integrity, water-use efficiency, water transfer, watershed management, storage, and conveyance. And it provided a forum in which agencies formerly working at cross purposes could coordinate their permitting and other decisions (Freeman and Farber 2005).

According to the ROD (CALFED 2000b, 24), “Compared to the [No Action Alternative] and existing conditions, the [Preferred Program Alternative] provide[d] significant improvements in terms of ecosystem quality, water quality, water supply reliability, and levee system integrity effects. Under the [No Action Alternative], each of these four areas of critical concern would [have continued] to deteriorate.” As predicted by the pessimistic model, however, the ROD departed only marginally from the status quo, and its finely tuned, intensive management approach imposed the risk of drought on the natural system while assuring that urban and agricultural users would experience “. . . no reductions, beyond existing regulatory levels, in CVP or SWP Delta exports resulting from measures to protect fish under FESA and CESA” (CALFED 2000b, 57). Relatedly, the ROD retained firm control over the Bay-Delta, seeking to maintain it as a static, homogeneous system rather than one whose salinity fluctuates over time and across locations. The ROD also perpetuated the status quo by adopting the premise that there was enough water in the system to meet all demands, but not enough storage capacity. Reflecting this emphasis, it called for serious consideration of a variety of water storage initiatives: raising Shasta Dam by nearly six feet, increasing the storage capacity of the Los Vaqueros Reservoir, building an off-stream storage facility north of the Delta, or building a reservoir south of the Delta. (According to the ROD, construction of new storage projects would begin only after careful review and public comment, and investment in local groundwater management and conservation programs.)

Moreover, despite the program's apparent comprehensiveness, planners skirted the question of trade-offs among its elements and declined to address the question of "restore to what?" They also focused exclusively on the two large water projects while ignoring the 7,000 permitted diverters who get their water from the Bay-Delta watershed, even though the latter divert an amount nearly equivalent to the water that historically flowed through the system. Finally, although CALFED planners paid some attention to terrestrial habitat, they made no attempt to address land-use decision making within the Delta, despite its obvious implications for water consumption and destruction of wetlands.

### Implementing CALFED

Although they had concerns about CALFED's approach, many environmentalists initially held out hope for the program—and, in at least some respects, it delivered. Like the other initiatives described in this book, one of CALFED's main accomplishment was to attract money: over a ten-year period the program garnered \$3 billion in funding, nearly one-third of which it spent on habitat acquisition and restoration. In addition, as predicted by the optimistic model of EBM, CALFED improved coordination among water managers, allowed for real-time responses to newly acquired monitoring information, and enhanced scientists' understanding of fish movements. Furthermore, according to Judith Innes and her coauthors (2007), the collaborative processes undertaken under the auspices of CALFED built social and political capital among some former adversaries. Consistent with the pessimistic model, however, the program fell short in other respects: the promise of adaptive management was largely unrealized because agency officials refused to experiment with reducing water diversions and were unwilling to adopt performance standards that, in turn, would have facilitated testing hypotheses about the impacts of management. Also consistent with the pessimistic model, CALFED neither inspired managers to go beyond legally required environmental protection measures nor proved durable. Both federal and state water operators continued to manage at the edge of regulatory standards and evaded CALFED oversight and coordination when making decisions about pumping volume and water delivery contracts. The tenuous consensus among stakeholders that allowed for the ROD did not endure, and by 2007 the program was in disarray: environmentalists and fishing interests had filed several lawsuits, prevailing in most of

them, and the state was in the midst of a two-year “visioning” process for the Bay-Delta.

### **Building a Scientific Foundation for Decision Making**

A central aspect of CALFED implementation was the formation of a science program to furnish decision makers with neutral, policy-relevant advice. To spearhead the construction of CALFED's science base, the program hired Sam Luoma—a well-respected hydrologist with the U.S. Geological Survey who had extensive experience in multidisciplinary investigations—and asked him to establish a science board that would be independent of, but could furnish policy-relevant advice to, the multi-agency planning process. With Luoma's guidance, the science program instituted a variety of activities: it held annual conferences at which experts interested in the Bay-Delta could interact and present new findings; it sponsored an electronic journal, *San Francisco Watershed and Estuary Science*, which disseminated peer-reviewed science relevant to the Bay-Delta and its watershed; and it held public forums to air new findings on the two fish species of greatest political concern, salmon and delta smelt. With its abundant funding and inclusive, transparent, peer-reviewed system for distributing money, the CALFED science program succeeded in attracting scientists from academia and nongovernmental organizations, thereby providing an important corrective to formerly near-exclusive reliance on science generated by mission-driven agencies. It also defused some of the conflict that traditionally had surrounded agency-by-agency water management decisions.

Unlike most other EBM initiatives, CALFED's science program declined to construct a holistic model of the Bay-Delta system to use as a basis for decision making. According to Luoma (2005), such models are of limited utility and run the risk of being dramatically wrong, particularly for systems that have been as radically modified as the Bay-Delta. Instead, Luoma's approach was incremental and reflected his political sensitivity: he wanted to prevent negotiations from collapsing as a result of disagreements over science. The program did invest in several important scientific ventures. Program-sponsored scientists devised a preliminary set of performance measures by which to gauge ecosystem health. In addition, they conducted research on the delta smelt and on the impacts of climate change, yielding work that subsequently proved invaluable when environmentalists and others petitioned the state and federal governments for additional protections.

In response to policymakers' concerns, however, most of CALFED's initial research aimed to reduce uncertainties in managing flows, diversions, and fish populations in the Delta. The advantage of this approach was that it enabled the CALFED agencies to begin taking actions, particularly to restore anadromous fish populations. On the other hand, it also allowed policymakers to skirt the central question of what the Delta—which has been thoroughly transformed from a vast, shallow-water tidal marsh to a complex system of levees and deep-water channels—should look like in the future, and what sorts of policies and practices would bring about such a vision. It also meant that when the Delta's pelagic fish species, whose health reflects a complex interaction among multiple factors, began to crash in 2003, the science program had to scramble for a diagnosis.

### Habitat Restoration

Another aspect of CALFED's implementation, and one that yielded tangible environmental benefits, was its financial support of ecosystem restoration projects, at least some of which otherwise might not have garnered funding. From the outset—even before the ROD was signed—CALFED identified and began allocating money to a variety of “no-brainer” actions its agencies could take without conducting a lot of preliminary research, such as providing cold water upstream for salmon. These actions were “targets of opportunity,” in the sense that many scientists had been urging their adoption for years (Kier 2006). In pursuing restoration so aggressively, CALFED officials were banking on the notion that improving habitat would result in healthier fish populations, so that fewer, if any, cuts in water supplies would be needed. Moreover, they hoped restoration projects would create goodwill and credibility, making believers out of skeptics.<sup>12</sup> By the time the ROD was signed, the Ecosystem Restoration Program had already spent about \$250 million to fund 271 projects (CALFED 2000b); between 2000 and 2005, the program dispensed another \$550 million for habitat restoration. With that money, the CALFED agencies protected or restored 100,000 acres of habitat and built or improved 68 fish screens (CALFED 2005).

Among the most highly touted ecosystem restoration initiatives supported by CALFED was the restoration of anadromous fish habitat, a task for which there is no mechanism under the Endangered Species Act. For example, CALFED backed the removal of four small barriers along Butte Creek, a tributary of the Sacramento, to facilitate the spring-run

salmon migration. CALFED also promoted the dismantlement of diversions on Cold Creek and Clear Creek that impeded the movement of fall-run salmon. On Battle Creek, officials negotiated the removal of five Pacific Gas & Electric power-generating dams, retrofitted two other dams with fish ladders, and increased the volume of downriver flows tenfold (G. Martin 1999c). In addition to subsidizing in-stream modifications, CALFED funded a variety of watershed restoration projects to improve habitat for fish and wildlife. For example, the program gave a \$980,000 grant to the Feather River Coordinated Resource Management Committee to restore 2,000 acres along Last Chance Creek, a major tributary of the Feather River. The program also subsidized efforts to buy land along a 200-mile stretch of the Sacramento River in hopes of doubling the amount of streamside vegetation from 10,000 acres to 20,000 acres.

By 2005, when the state reviewed CALFED's progress, the Central Valley's salmon populations had rebounded in several streams. For example, in 2002 Butte Creek's spring-run salmon shot up to 6,000 from a low of ten fish a few years earlier (Zakin 2002), and the Sacramento River's winter-run salmon appeared to be recovering below the Shasta Dam. Some other species were also faring well: the Department of Fish and Game reported an increase in the Swainson's hawk population in 2004, increases in sandhill cranes, and stability in waterfowl populations over a 16-year period (LHC 2005). It is difficult to attribute these improvements directly to actions supported by CALFED, however. Bird populations began stabilizing prior to the program's inception, and salmon populations increased partly as a result of the Pacific Decadal Oscillation, not just changes in spawning habitat or the removal of migration barriers (Kier 2006; Luoma 2005).<sup>13</sup> Cutbacks in the salmon harvest, which are also independent of CALFED, have likely contributed to the trend as well (Kier 2006). Furthermore, some important habitat modifications for which CALFED got credit—such as the installation of an \$8.5 million variable-level intake device on the massive Shasta Dam, which enabled operators to maintain cold-water habitat below the dam—were funded by the CVPIA, not CALFED, and so likely would have happened anyway.

Moreover, it is difficult to assess progress toward ecological health and would have been impossible to manage adaptively because the program neither adopted performance measures nor adequately funded monitoring. CALFED's Ecosystem Restoration Program tried to establish an adaptive approach: following an independent review, the ERP devised a

systems model that integrated all the components of the ecosystem, which it anticipated would allow it to develop hypotheses about the impact of management decisions. But the agencies that would have had to implement the strategy proposed by the ERP found it too flexible, and could not, in any case, agree on performance measures against which to gauge progress. So the program resorted instead to a long list of fixed milestones that measured completed tasks, or outputs, not outcomes (Bobker 2005; S. Johnson 2005). An additional impediment to adaptive management was the profound unwillingness by both the wildlife and water-management agencies to experiment with the factor many suspect is the most important determinant of ecosystem health: the overall amount of water that is diverted from the system.

Finally, although CALFED deserves credit for improvements in anadromous fish habitat, a substantial fraction of the wetland acquisition and restoration projects undertaken since 1995 might well have happened even without the program. Efforts to restore wetlands around San Francisco Bay date back to the 1980s. The impetus for a more coordinated effort came in 1993, when the San Francisco Estuary Project released a report—prepared by the Association of Bay Area Governments, San Francisco State University, the FWS, and the EPA—that recommended devising a plan to restore the Bay’s tidal wetlands. In 1994 the state completed its purchase of 10,000 acres of Cargill Salt Co. land on the west side of the Napa River, using money from a settlement with Shell Oil Co. to mitigate for its 1988 oil spill (Barnum 1996). By the mid-1990s, when CALFED came on the scene, cooperative ventures were already acquiring acreage around the Bay as soon as it became available—from retiring farmers, ranches, the Army, the Catholic Church, private developers—and restoring it to tidal marsh (Kay 2001). In addition, in 1974 Congress established the Don Edwards San Francisco Bay National Wildlife Refuge, which by 2004 comprised 30,000 acres. All told, with or without CALFED, environmentalists aimed to restore about 60,000 acres of tidal marshes around the Bay, thereby bringing the total to 100,000 out of a historic 190,000 acres.

### **The Environmental Water Account**

A third aspect of implementation, and CALFED’s other highly acclaimed environmental achievement, the environmental water account, made the region’s water management more responsive to new knowledge and therefore, according to some, constituted the program’s most nota-

ble example of adaptive management (Luoma 2005; L. Snow 2005).<sup>14</sup> Certainly the EWA—with its emphasis on flexible, real-time decision making—changed the way state and federal agencies managed water. Biologists from the wildlife agencies and the operators from the CVP and SWP began sitting down together and making decisions about pumping based on when fish were near the pumps, and therefore most vulnerable to “take.” As a result of this process, Lester Snow (2005) points out, a whole generation of biologists and pump operators came to understand one another’s perspectives. The change in practice was striking: under a traditional Endangered Species Act-based approach, each year the wildlife agencies established seasonal pumping restrictions according to a biological opinion on the status of the endangered fish species. Once project operations hit the take limits set in those permits, they had to reconsult with the FWS or NMFS—a process that could result in a requirement to cut back or shut down pumping, potentially disrupting water supplies to users. By contrast, with the EWA as collateral, fishery agencies could call for more moderate and precisely timed pumping reductions—thereby simultaneously helping fish and water users (Innes et al. 2006).

On the other hand, between 2001 and 2007 the EWA was sharply constrained in its ability to respond to information suggesting it was delivering insufficient water for fish because it acquired far less water than originally anticipated. The EWA got off to a rocky start: in late March 2001 the SWP reported that more than 18,000 young salmon migrating from the Delta to the ocean had been sucked into its pumps and killed—far exceeding the “red light” limit of 7,000 smolts specified by CALFED (Brazil 2001). Then, in February 2002 the EWA’s baseline (tier 1) lost 200,000–300,000 acre-feet of environmental water after a judge struck down the Interior Department’s rule for allocating the CVPIA’s 800,000 acre-feet of water for anadromous fish. The ruling forced EWA managers to redo their calculations, models, and spreadsheets; more important, it seriously eroded the foundation of water availability on which the EWA was built. As a consequence, tier 2 water (the EWA), which was supposed to *supplement* tier 1 water, instead was used to compensate for shortfalls in water that regulators had expected would be available for fish protection (Swanson 2006).<sup>15</sup>

Despite these problems, a technical assessment by a CALFED review panel released in early 2005 concluded that the EWA had yielded several benefits. Reviewers commented that managers had developed complex criteria based on the dynamics of fish populations, rather than a single

indicator (fish taken at the pump), and that communication among agencies, as well as scientific knowledge, had improved during the account's first four years of operation. The panel speculated that fish probably had gained more protection than they would have under a traditional approach (Innes et al. 2006). Another review, sponsored by Environmental Defense, was more critical, however. Its authors argued that funding constraints limited managers' ability to adjust their pumping schedules in response to information suggesting problems in the Delta fisheries; therefore, the EWA provided reliable water supplies for users at the expense of the fish. The report pointed out that, although it met its target in 2000 and 2001, in subsequent years tiers 1 and 2 combined were underfunded by about 420,000–460,000 acre-feet annually (Rosenkrans and Hayden 2005). These shortfalls were attributable only partly to the accounting changes in the CVPIA allotment made in response to the court ruling. In addition, only about 29 percent of the expected 195,000 acre-feet of projected operational assets materialized, on average, and—because state and federal funding had dwindled—the EWA was not able to compensate by purchasing water from willing sellers. “As a result,” said the authors, “fishery agencies [were] significantly constrained in their ability to dedicate water at key times of the year to protect fisheries . . . as promised in the CALFED plan” (Rosenkrans and Hayden 2005, v). Making matters worse, CALFED's backstop measure—tier 3—had no assets to make up the shortfall, even though “The health of the estuary largely depends on a reliable set of environmental safeguards, including dedicated water supplies” (Rosenkrans and Hayden 2005, v).

### **Intensive Management and Environmental Stewardship**

In any case, a growing body of evidence suggested that manipulating the pumping schedules of the CVP and SWP was at best insufficient to remedy the Delta's problems, and at worst exacerbated them. In the early 2000s freshwater exports from the Delta increased markedly, reaching a record high of 6.3 million acre-feet in Water Year 2005 (Nelson et al. 2006). At the same time, the Delta's pelagic fish species hit new lows: in 2005, after three years of decline, surveys of the delta smelt detected the smallest population recorded in nearly four decades of counting.<sup>16</sup> Although 2006 was a wet year—the snowpack in the High Sierra was 170 percent of normal—the spring 2006 survey detected no recovery in smelt numbers (Boxall 2006a, 2006b). Some scientists suspected that increased winter pumping was partially to blame for the decline in delta

smelt and other pelagic species, several of which were dropping simultaneously. Pumping during winter had increased markedly, ostensibly to compensate for reduced spring pumping (Bay Institute et al. 2007); during the same period scientists documented an increase in the proportion of fish being killed by the pumps in winter (Swanson 2006; Thompson 2006). (A similar pattern emerged during the 1980s after winter pumping was increased.) “You can’t really deny that smelt have gone down while pumping has gone up, and the big crash took place when they changed the timing of the pumping,” said Peter Moyle, a fisheries biologist and delta smelt expert at the University of California at Davis (Boxall 2006b).

After conducting additional research, scientists were more confident about other export-related causes of the downturn in the Delta’s pelagic species. Some studies suggested that water releases from upstream reservoirs, which slow significantly in late fall, allowed saltwater from the Bay to intrude farther into the Delta, providing a “highway” for Asian overbite clams (*Corbula amurensis*), an invasive species that has infested the estuary. The clams, which arrived in the late 1980s, reproduce rapidly; they also voraciously consume the particular species of zooplankton that is the smelt’s main source of nutrients and whose population has declined sharply. A shortage of prey, along with the higher salinity in the lower Delta, forces smelt to search for food farther upstream, where they get sucked into the giant pumps and killed before their eggs are fertilized.<sup>17</sup>

In short, the CALFED solution of adjusting the timing of water releases may actually have harmed the Delta’s native species. Moreover, the program’s focus on manipulating pumping schedules allowed policymakers to elide the more fundamental questions of whether the Bay-Delta ecosystem could actually sustain such a high level of freshwater withdrawals. Some scientists doubted the ecosystem could recover as long as diversers continued to remove about half the freshwater from the system. Veteran Bay Area fisheries specialist Bill Kier pointed out that a study conducted in the 1980s of several Gulf of Mexico river deltas that examined biodiversity and fish abundance found that key species started disappearing when more than 40 percent of a river’s water was diverted (G. Martin 1999a). If increasing the flow of water through the Delta was essential to restoring endangered fisheries, then no amount of tinkering with the timing and location of withdrawals was going to stem the decline in the system’s biological diversity.

CALFED’s emphasis on marginal adjustments to the status quo also begged the question of whether native species that evolved in a variable

system could thrive in a static one. Bruce Herbold, a fisheries biologist with the EPA, explains: “[The Delta] used to be salty in the summer and really fresh all the way down to Suisun Bay in the springtime every year. And now it’s fresh all the time. It’s just stable” (Boxall 2006b). Tina Swanson, senior scientist at the nonprofit Bay Institute, points out that the overbite clam thrives in the Delta because export pumping has turned it into a freshwater system, and contends that if normal tidal forces were allowed to restore the system’s historically variable salinity levels, the invaders that displace native species would perish (Weiser 2005c).

Overwhelming evidence that exports were implicated in the Delta’s ecological decline did not spur support for precautionary measures, however; instead, those with strong interests in maintaining the status quo rejected the possibility that exports from the Delta would have to be reduced, and pointed out that scientists had not yet established a definitive causal link between pumping and fish declines. For example, in response to reports of the delta smelt’s demise, Tim Quinn of the MWD equivocated, saying, “There’s no evidence the pumping has had all that much effect. There’s no doubt there is something going on out there in the Delta, and we need to figure it out. It probably has something to do with the food chain, but nobody’s sure” (Weiser 2005a).<sup>18</sup> Maintaining the status quo level of exports was the best option, many water users argued, because of the Delta’s complexity and uncertainty about the relative contribution of other factors, such as toxic pesticides and invasive species, to the pelagics’ decline. Others, such as B. J. Miller, an engineering consultant to water contractors, asserted that factors beyond human control were largely responsible: “It’s possible that fall salinity is affected by outflows that are not manageable,” said Miller. “It’s not water project operations. It’s the weather” (Taughner 2006c). And stakeholders’ elected representatives continued to emphasize the risk to users posed by reducing exports. For instance, at a February 2006 hearing on the issue, Rep. Richard Pombo (R, Tracy) pointed out: “Whatever we decide to do will have a big impact on the delta, but it will also have a big economic impact on California” (G. Martin 2006a).

### **A Durable Plan?**

Furthermore, although CALFED “made progress in moving a highly polarized system toward a model of policy-making that is coordinated, communicative, and informed by a diversity of interests and options” (Innes et al. 2006, 33), stakeholders and agencies defected when shifts in

the political context seemed to create better options for them. Within two months of the ROD's issuance, some stakeholders began bringing serious political and legal challenges. In late September 2000, the Municipal Water District of Orange County, the California Farm Bureau Federation, and a coalition of rural northern California counties all filed lawsuits against CALFED, alleging that plans to acquire or flood farmland violated farmers' property rights and that delays in building water projects favored the environment at the expense of people (T. Perry 2000). Then, in the spring of 2002 the Westlands Water District initiated a series of lawsuits and petitions aimed at unraveling the CALFED agreement (Martin 2002).

Dissension among stakeholders was severe enough to threaten the program's funding: Congress balked at reauthorizing it, citing disputes within California over the program's direction. At water users' urging, in 2001 Sen. Dianne Feinstein introduced a bill that would provide money to enlarge two reservoirs and create two new ones, and in the House, Rep. Ken Calvert (R, Riverside) introduced an even more aggressive bill that would have bypassed CALFED altogether by preapproving a handful of water projects. Over the next two years, as Feinstein struggled to work out a package that the state's own congressional delegation could agree on, CALFED's federal authorization languished.<sup>19</sup>

Dismayed by congressional resistance, state officials tried to breathe new life into the struggling program. On September 23, 2002, Governor Gray Davis signed SB 1653, creating a new governing body: the California Bay-Delta Authority. The Authority's board included public members from major regions appointed by the governor, two at-large members appointed by the legislature, a member of the Bay-Delta Public Advisory Committee (which replaced the Bay-Delta Advisory Committee), the directors of six of the most important federal agencies, and the directors of six key state agencies. The hope was that the new entity could rein in recalcitrant stakeholders, such as the Westlands Water District.

Like its predecessor, however, the Bay-Delta Authority had no means of enforcing its will, and agencies continued to pursue their own interests when cooperation with CALFED would have impeded their ability to fulfill their traditional missions. Under the Bush administration, for example, the Bureau of Reclamation began operating the CVP without consulting other agencies, unilaterally sending more water to farms and less to the environment. According to Mary Nichols, secretary of the State Resources Agency, "We're finding that our partners at Reclamation

are not as interested in trying to coordinate... [T]hese agencies are more inclined to want to go it alone” (Robitaille 2003).

Even as evidence of the Delta’s collapse accrued, state and federal water managers continued to seek ways to increase exports. In July 2003 the Bureau of Reclamation and the state Department of Water Resources (DWR) met secretly with the MWD, the Westlands Water District, and the Kern County Water Agency to forge the so-called Napa Agreement—a deal to raise the amount of water sent south from the Delta by the SWP pumps by 27 percent, from 6,680 cfs to 8,500 cfs, which they anticipated would result in an average increase in annual exports of about 200,000 acre-feet (Weiser 2005a). Beyond additional pumping, the agencies proposed an Operations Criteria and Plan (OCAP) that would weaken temperature standards for salmon on the Sacramento River, even though just months earlier the Department of Fish and Game and NOAA Fisheries (formerly NMFS) had rejected a similar proposal after their analysis revealed a potential for serious impacts on the endangered winter-run Chinook salmon.<sup>20</sup> Disregarding its own biologists’ judgment, in late 2004 NOAA Fisheries issued a biological opinion on salmon and steelhead that allowed the OCAP to take effect (Weiser 2005b), and the bureau promptly began renewing long-term licenses with its 240 water users around the state. The DWR was similarly inclined: in July 2005 the *Contra Costa Times* disclosed that in two instances when biologists recommended temporary curtailments of water deliveries to protect the smelt, state water managers overrode that advice in deciding pumping levels (Taughner 2006b).

Unilateral moves by water managers aimed at increasing exports in turn triggered recourse by environmentalists to the adversarial practices of the past. In February 2005 a coalition of environmental and fishing groups sued the FWS, which in 2004 had issued a biological opinion saying that pumping increases would not harm the delta smelt (S. Young 2006). In August a similar coalition sued NOAA Fisheries over the biological opinion for salmon that formed the basis for the OCAP. In October 2006 the California Sportfishing Protection Alliance sued the DWR, charging it with lacking permits from the Department of Fish and Game required by the California Endangered Species Act (CESA) to operate state pumps. The suit followed a state Senate hearing in August 2005, which revealed the SWP had no permits or other formal documentation required by CESA. (The DWR claimed it had a set of agreements with state and federal regulators that comprised a “patchwork” of compliance.)

### **A Shifting Balance of Power Prompts New Thinking**

In response to the resurgence in conflict around water management in northern California, in the spring of 2005 Governor Arnold Schwarzenegger ordered two reviews of CALFED: a financial and a management audit as well as a governance review by a blue-ribbon panel, the so-called Little Hoover Commission. The Commission's report noted that CALFED enjoyed a lot of support when it provided money that stakeholders believed otherwise would not have been available, but once the program faced difficult policy choices and its funding dwindled, stakeholders began to doubt its value. "Process and structure," the commissioners commented dryly, "cannot substitute for leadership and authority" (LHC 2005, iii). In April 2006 the Schwarzenegger administration released a plan to reorganize CALFED again, this time along the lines suggested by the Commission (Boxall 2006c). The governor also initiated a two-year "Delta Vision" process, the aim of which is to articulate "a view of future conditions to which decision makers must aspire" (BRTF 2007). In February 2007 he announced his appointments to a blue-ribbon panel that would spend the year developing management recommendations for that process.

As the Delta Vision process got under way, a series of legal and regulatory decisions eroded the legal foundation on which California's water delivery system is based, added weight to the contention that CALFED was insufficiently protective, and shifted the balance of power substantially in favor of environmentalists and fishing interests. First, in the fall of 2005 California's Third District Court of Appeals delivered a stunning blow by rejecting the premise on which CALFED rested—that water exports would have to be increased to accommodate the state's forecast population growth. Instead, a three-judge panel unanimously proclaimed: "Population growth is not an immutable fact of life," adding that "Smaller water exports from the Bay-Delta region [could], in turn, lead to smaller population growth due to the unavailability of water to support such growth" (Taughner 2005a). In January 2006 a panel of six independent scientists assembled by CALFED concluded that NOAA Fisheries' October 2004 biological opinion for salmon was not based on the best available scientific information and failed to err on the side of caution in the face of uncertainty (Taughner 2006a). The Bureau of Reclamation quickly moved to request a reevaluation of the biological opinion. In late January 2007 NOAA Fisheries retracted the permits needed to build new tide gates in the South Delta that would have made

it possible to increase pumping under the state's proposed South Delta Improvements Package (Taughner 2007b).

For water managers, things went from bad to worse as the spring of 2007 wore on. In March 2007 Alameda County Superior Court Judge Frank Roesch ruled that, as the environmentalist–fishing coalition had alleged, the DWR was violating CESA by operating state pumps without a permit. He gave the state 60 days to comply with the law, or else he would require the state pumps to shut down (Taughner 2007d). In April the judge rejected pleas by state water officials and finalized his order, a decision the department promptly appealed. In May 2007 the environmentalist–fishing coalition again prevailed in court when federal Eastern (California) District Court Judge Oliver Wanger ruled that the FWS's delta smelt biological opinion was illegally lax.

In late May, shortly after Wanger announced his ruling, the DWR took the unprecedented step of shutting down its pumps for ten days. On June 9, however, water officials began ramping up deliveries again, ignoring the recommendations of the Delta Smelt Working Group, a team of biologists convened by the FWS. After hundreds of fish turned up dead at the pumps, environmentalists sued to cut off water deliveries altogether. Judge Wanger rejected their request, citing the immense economic damage that would ensue (Taughner 2007e, 2007f). In late August, however, he ordered a series of pumping cutbacks and other measures to protect the delta smelt. Judge Wanger's orders, which were expected to stay in place until the FWS issued a revised biological opinion, were less draconian than those proposed by environmentalists or the FWS, but far more severe than the DWR had hoped for: they threatened to curtail exports of as much as one-third of the 6 million acre-feet that is withdrawn from the Delta in a normal year (D. Walters 2007). According to Tim Quinn, now the executive director of the Association of California Water Agencies, "These reductions represent the single largest court-ordered redirection of water in state history" (Taughner 2007g).

## Conclusions

CALFED's landscape-scale focus produced effects consistent with the optimistic model of EBM. First, it brought scientists, managers, and high-level policymakers from state and federal agencies to a forum where they generated shared language and concepts. Second, it facilitated a more cooperative approach to water management than the one that

existed previously, in which water managers consulted only perfunctorily with the agencies charged with protecting fish and habitat. And third, it allowed for investment in restoration projects throughout the watershed, such as removing antiquated infrastructure, that may enable some ecological processes to reestablish themselves.

At the same time, efforts to garner consensus among stakeholders produced many impacts more consistent with the pessimistic model. To ensure stakeholder buy-in, planners simultaneously pursued several equivalent goals. An emphasis on "getting better together" limited, rather than broadened, their options, ultimately resulting in an even more intensively managed water system rather than one that would reduce the human impact and become, at least to some extent, self-sustaining. There was no serious discussion of limiting, much less reducing, withdrawals from the watershed; in fact, under CALFED the amount of water pumped out of the Bay-Delta system each year reached record highs. The results of CALFED's flexible, adaptive implementation were also consistent with the pessimistic model. Water managers, the main beneficiaries of CALFED's flexibility, did not exhibit stewardship but instead reverted to maximizing benefits for users when the political context allowed. Similarly, the most adaptive CALFED element, the EWA, consistently provided water for users, often at the expense of fish.

CALFED's intensive management approach imposed substantial risk on the Bay-Delta ecosystem, even as it provided a reliable water supply for water users. The most obvious consequence of relying on fine-tuning pumping operations is that natural variability, such as prolonged drought, may render the entire system unworkable (Boxall 2006c).<sup>21</sup> Experts have already documented changes in rain and snow patterns in northern California that are likely to threaten the state's water deliveries: tide gauges have recorded a sea-level rise of about seven inches at the Golden Gate during the past 100 years; snowmelt in the Sierra Nevada is starting a week earlier than it did before World War II; and more precipitation now falls as rain than as snow (Taughner 2007a). Under a worst-case global warming scenario devised by the California Climate Change Center at the University of California at Berkeley, the Sierra snowpack could be reduced by 90 percent from 2070 to 2090, and the average temperature may rise by 8 degrees Fahrenheit (Mooney 2006). Yet CALFED perpetuated an approach that strips the ecosystem of the resilience it would need to persist in the face of such dramatic change.

The outputs of CALFED's collaborative planning and flexible implementation made manifest the continuing dominance of water users in

decision making regarding the allocation of water. In the 1980s environmentalists gained considerable legal leverage over urban and agricultural interests by invoking the Endangered Species and Clean Water acts, as well as the state's public trust doctrine (see chapter 9). Voters demonstrated their support through their willingness to approve bonds to finance conservation and restoration of the state's aquatic ecosystems. Environmentalists have been less successful at making the case among the public for a fundamental change in how water is allocated, however. Thus there has been little incentive for elected officials to espouse environmental improvements that will impose costs on users and to employ the regulatory leverage necessary to bring about such a shift. In fact, in 2006 Governor Schwarzenegger was promoting a huge bond package that featured major new storage projects, as well as some version of a peripheral canal. Moreover, although experts repeatedly have pointed out that the Delta's levee system is extremely vulnerable to earthquakes and climate change, and that new development is eliminating long-range management options for the region, the state has declined to restrain development in the Delta. Instead, in late 2005 Governor Schwarzenegger fired all the members of the state Reclamation Board after they raised concerns about development in flood-prone areas, and replaced them with more pro-development members (Taughner 2006d).

Defenders of CALFED will object that, given the system's physical and political complexity, the program did about as well as it could have, and that only a promise to meet all stakeholders' demands allowed political officials to move forward. But the San Joaquin River settlement, announced in the midst of the two-year Delta Visioning process, makes clear that an outcome in which everyone gets all they want is not inevitable. The agreement among parties to an 18-year-old lawsuit over damage done to the San Joaquin River by the operation of the CVP's Friant Dam requires farmers to relinquish about 15 percent of their historic water deliveries—about 170,000 acre-feet. It also requires the Bureau of Reclamation to double water releases from the dam from an average of 116,741 acre-feet each year to about 247,000 acre-feet in dry years and 555,000 acre-feet in wet years. The goal of the agreement is to rewater two river segments, totaling 60 miles, that were dried up after the construction of the dam in the 1940s and, by 2012, to reintroduce a spring Chinook salmon run to those stretches (Grossi and Schultz 2006).

The settlement did make accommodations for farmers: they got limits on water losses and guaranteed price breaks, and they are allowed to

recapture water sent down the main channel as long as doing so does not harm fish. Furthermore, to quell the objections of the Modesto and Merced irrigation districts, which did not participate in the lawsuit, the introduced salmon will be treated as an experimental population, which frees property owners from concerns about having their land designated as critical habitat, and irrigation districts from liability for accidentally killing salmon. Nevertheless, the settlement retains an overarching goal of restoring the health of the San Joaquin's salmon runs, and water users who have become accustomed to the status quo will have to make do with less. Ironically, according to journalist Glen Martin (2006b), even though it stemmed from discussions pursuant to a lawsuit, "The agreement seems to have ushered in an era of good feeling in the San Joaquin Valley, a marked difference from the bitterness that characterized the past two decades."

