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CHAPTER (number)

Executive Summary

The Sacramento-San Joaquin River Delta is the grand confluence of California's waters, the place where the state's largest rivers come together in a web of channels--and in a maze of controversy. The Delta is one of those zones where the wants of a modern society come into collision with each other and with the stubborn limitations of a natural system. In 2009, seeking an end to decades of water warfare, the Legislature established the Delta Stewardship Council with a mandate to resolve long-standing questions. The first step toward that resolution is the document you have before you, the Delta Plan.

Though 90 miles inland from the Golden Gate, Delta waters rise and fall with ocean tides. The Delta is in fact the upstream, mostly freshwater portion of the San Francisco Estuary, the largest estuarine system on the west coast of the Americas, and one of California's prime natural assets. It is a major stop on the Pacific Flyway and the portal through which anadromous fish, including the commercially important chinook salmon, pass on their way to and from their spawning grounds in the interior.

Moved by gravity and tide, Delta waters also shift by human will. Their slow progress toward the sea is crosscut by another, artificial current headed not west to the coast but south to thirsty farms and cities. On the southeast edge of the Delta, near Byron, two sets of mighty pumps extract water for shipment as far south as San Diego. Two thirds of California's people and 4.5 million acres of the nation's best farmland receive some part of their water via the Delta.

In its own right the Delta is a magnificent agricultural region, where soils that once were the muck of a primeval marshland grow bountiful corn, alfalfa, tomatoes and many other crops. It is home to about 12 thousand people on farms and in small historic communities, and to about half a million in the larger cities that are pressing into the region from the fringe. More millions come to it for boating, fishing, hunting, birdwatching, even windsurfing on its 700 miles of channels.

Water, food, fish, recreation, livelihoods and living space: the Delta serves California in many ways. Increasingly, though, it is faltering under these demands. Ecosystem health, as measured especially by the abundance of wild salmon and other native fishes, has trended inexorably down.

The list of stresses begins, but does not end, with the withdrawal of water for human use, both at the Delta itself and from points higher in its watershed: a kind of tax that leaves the system in a condition of chronic drought. The specific, peculiar manner in which the last large gulp of water is withdrawn adds to the ecological cost. The continual introduction of alien aquatic species from around the world is altering the web of life, often at the expense of native and other valued species. Pollution from the vast and busy watershed does its share of harm.

In addition, the basic architecture of the Delta is in danger. A major levee break in 2004, under a clear blue sky, reminded us what may be in store as aging levees are pinched between rising sea levels on one side (due to the changing climate) and subsiding fields on the other (due largely to the oxidation that afflicts peaty soils under cultivation). Higher river flows in winter or spring, predicted results of climate change, will add to the pressure, and a great earthquake, sooner or later, will shake the region like a paint can on a mixer. Encroaching urbanization, meanwhile, puts more people and property on dangerous ground.

The Coequal Goals, the Delta Stewardship Council, and the Delta Plan

Since the middle 1980s, California has been looking for ways to secure the natural and human values of the

Delta while maintaining its place in the state's water plumbing. These efforts have generally started in hope and ended in impasse. In recent years environmentalists turned to the courts, using the blunt tool of the Endangered Species Act, to force curtailment of water exports at certain times. Southern California water purveyors urban and rural have complained of "regulatory drought."

In 2009 the Legislature made its latest, most determined bid to find solutions, passing the Delta Reform Act and associated bills. First and foremost, it declared that state policy toward the Delta must henceforth serve two "Coequal Goals":

- Providing a more reliable water supply for California, and
- Protecting, restoring, and enhancing the Delta ecosystem.

These goals, the Legislature added, must be met in a manner that

- Protects and enhances the unique cultural, recreational, natural resource, and agricultural values of the Delta as an evolving place.

By proclaiming the equal status of ecological concerns, the Legislature changed the terms of the conversation. In 2012, Congress followed suit, instructing the federal agencies that are importantly involved in the Delta to abide by the Coequal Goals.

The Delta Stewardship Council is the body entrusted with giving practical meaning to these big ideas. Publication of this Delta Plan completes its first assignment. The product of eight or more drafts, almost 100 public meetings, and nearly 10,000 comments, the Delta Plan pulls together in one place the known steps that need to be taken to improve the situation in the Delta: measures that, in one way or another, could affect almost everyone in California. The plan is to be revised every five years, or sooner as circumstances change.

The Delta Plan is driven by the three mandates of the Delta Reform Act of 2009: to improve the reliability of California's water supply; to care for the Delta environment; and to protect the Delta as a valuable (but not immutable) place. Each mandate yields two key themes.

- Water theme #1: We must shift toward efficiency in our water use and toward local self-reliance in our water sources, reducing the burden on the Delta and its watershed.

- Water theme #2: We must get much better at capturing and storing the surplus water that nature provides in very wet years, building reserves that can be drawn on in dry ones, so that the Delta can be spared.

- Ecosystem theme #1: We must guarantee adequate seaward flows in Delta channels, on a schedule more closely mirroring historic rhythms: what the plan calls natural, functional flows.

- Ecosystem theme #2: We must restore wetlands and riparian zones in the Delta for the benefit of fish and birds.

- Delta-as-place theme #1: We must restrict new urban development in the Delta to peripheral areas already definitely earmarked for such growth.

- Delta-as-place theme #2: We must floodproof the Delta, as far as possible, through better levee maintenance and by providing more places for swollen rivers to spread without harm.

This is *California's* plan for the Delta, prepared in consultation with, and to be carried out by, all state agencies in the field: the State Water Resources Control Board, ultimate arbiter of water rights and water quality; the Department of Water Resources, the state's water planner and also operator of the great State Water Project; the Department of Fish and Wildlife, responsible for the welfare of the living system of the Delta; the Delta Protection Commission, which oversees land use and development on low-lying Delta islands; and many more local agencies. Add to the list federal bodies like the Bureau of Reclamation, which runs the Central Valley Project; the Fish and Wildlife Service; and the National Marine Fisheries Service. Their cooperation has been promised, and it is vital.

The working parts of the plan are 71 *Recommendations* and 14 *Policies*. Recommendations call attention to tasks being done or to be done by others. *Policies* embody

regulations: legal requirements that those undertaking significant projects in the Delta must meet. See sidebar, right, for more on the mechanics of realizing the plan and pages x to y for a survey of all 85 provisions.

Providing a more reliable water supply for California . .

The Delta's contribution to the entire statewide water budget is smaller than many people think. The proportion drawn directly from the Delta, mostly through the pumps near Byron, is only about 8%. The bulk of California's water comes from local sources, and always has.

Nevertheless, the Delta supply is important to many regions. Southern California imports about 25% of its water from the Delta. The Tulare Lake Basin, the southern end of the Great Central Valley, gets 27% of its water from the Delta pumps. Even the San Francisco Bay Area takes 16% from those pumps. On a more local scale, several water suppliers rely entirely on the Delta, and others have become dependent on this one overtaxed source to a risky degree.

In addition to water pulled directly from the Delta, much more is drawn from the Delta's tributary streams before they come down to sea level. San Francisco Bay Area cities reach far inland to tap the Tuolumne and Mokelumne Rivers in the Sierra Nevada, taking 27% of their water needs from these sources. Parts of the Central Valley tributary to the Delta get all of their water from that watershed by definition, as do the people and farms of the Delta itself.

Sidebar: Carrying out the Delta Plan

The Legislature instructed the Delta Stewardship Council to "direct efforts across state agencies." This "direction" has three distinct aspects.

The Council is first of all a **coordinator**. Recognizing how many cooks are stirring the Delta stew, the Legislature set up an Interagency Implementation Committee. The heads of all the key action agencies will sit on that board, with the Council representative as Chair. Agency staffs will work with that of the Council daily.

Second, the Council functions as an **auditor**. Using specific performance measures contained in the plan, and guided by the Delta Science Program (see p. #), it will track and publicize progress toward plan goals, inquiring whether specific actions are producing expected results, and whether changes of course are indicated.

Third, on certain key questions, the Council can function as a **regulator**. The plan provisions that can trigger this authority are called Policies. To avoid premature encroachment on the work of other agencies, the Legislature devised an indirect path leading to Council intervention.

Activities subject to these Policies are called "covered actions," but the Council itself cannot declare an action to be covered. It is the proposing agency itself that makes this determination. Legal standards apply, however, and if an action is questionably deemed not to be covered, the Council or any other party can take the agency to court.

Once an action is agreed to be "covered," the proposing agency must make sure it meets the standards of the Delta Plan, filing a Certification of Consistency as specified in Delta Plan **General Policy 1**. If the agency says the answer is Yes but another party or citizen thinks it should be No, the opponent can then appeal to the Delta Stewardship Council. The Council itself may initiate the appeal. Its decision will be binding.

The Delta Plan addresses the reliability problem on three scales: California-wide; on level of the Delta watershed; and with regard to the areas that receive water from the Delta pumps.

California water planning is full of good intentions. If the laws and policies that are now on the books were consistently carried out, the state's water system—including that part that is tied to the Delta—would work much better. The Delta Plan calls on *all* water suppliers to obey the many laws and guidelines that exist, and on the state's regulatory agencies to push for compliance (**Water Resources Recommendation 1)**.

Whatever the outcome of some current debates, California's next real increment of water supply will not come from new engineering projects but from water conservation, recycling, local stormwater capture, and leak control. These measures can yield an amount of water larger than the total that is drawn from the Delta today. State agencies in charge of water matters should systematically promote these practices, and *all* state agencies should model them in their own water use. (**Water Resources Recommendations 6, 8, and 14**).

Zooming in a bit from the statewide picture, the Delta Plan next calls for all water users linked to the Delta—whether they take water from it directly, or tap the watershed—to reduce their draw. The State Water Resources Control Board should put on the brakes whenever it looks at a water use application that would tend to increase it. Water agencies are already required to write water management plans; these now should include "water supply reliability elements," discussing, among other things, how to deal with the cascading effects if Delta pumping were disrupted for as long as three years. In the event of multiple levee breaks, for example, mountain reservoirs might be called upon to send more water downstream to keep salt water from invading the Delta from Suisun Bay. (**Water Resources Recommendations 3, 4, 5 and 7.)**

The Delta Plan speaks most authoritatively to those water agencies that take water from the Delta via the pumps—the State Water Project, the Central Valley Project, and by extension the many agricultural and urban water districts that are the customers of these giants. Any agency that receives water from the projects must do its share, setting specific reduction targets and actually starting work on measures that wean it from the Delta. The great water projects are called on to write the corresponding provisions into their contracts when these are renewed or revised [**Water Resources Policies 1 and 2, WR Recommendation 2)**.

A Better System: Storing floods to ride out droughts (and give the Delta a break)

The measures so far mentioned will take pressure off the Delta while actually increasing California's developed water supply. The further key to both goals is to harvest and store the water that is available from Central Valley rivers in the wettest years, at the least environmental cost. The need is heightened by the fact of climate change, which stands to make wet years all the soggier, and droughts all the more severe.

There are few opportunities left in California for large new dams (or enlargements to old dams) behind which water could be stored. The Department of Water Resources and the U.S. Bureau of Reclamation have been studying the (dauntingly expensive) options. The Delta Plan urges the agencies to wrap up these studies, so that the state can decide the fate of these proposals once and for all (**Water Resources Recommendation 13).**

Vastly more water storage space exists right under our feet: in groundwater basins, or aquifers. That these are largely empty is a sign of past failure, but a possible advantage for the future.

California began its history with a huge supply of water pooled naturally in underground gravel fields and free for the taking via wells. In parts of the state, including most of the southern Central Valley, this endowment has been squandered, and groundwater levels have sunk, sometimes by hundreds of feet. One of the justifications for sending water south from the Delta has been to recharge aquifers, but not enough recharging has occurred. And the State last studied its groundwater situation in 1980—a third of a century ago.

The Delta Plan calls for a return to the conservative idea of using aquifers like bank accounts: to be filled up in wet times, in order that they may be drawn on in dry. It calls on the state to do the indispensable new groundwater study, on local agencies to write plans for sustainable groundwater management, and on the State Water Resources Control Board to stand ready to intervene in seriously overdrafted areas, if good local plans aren't forthcoming: leading perhaps to the

court procedure called groundwater adjudication. (**Water Resources Recommendations 9, 10, 11, and 14.**)

There is another tool for making the supply stretch further: the sale or trade of water between agencies, especially in times of shortage. Existing rules governing such transfers are found cumbersome by some and insufficiently protective of water rights and the environment by others. The State Water Resources Control Board should reformulate these guidelines by mid-2016 (**Water Resources Recommendation 15).**

A better system: Delta conveyance

As noted, many of the state's water agencies take their water from rivers at points upstream from the Delta. The two biggest ones, however—the State Water Project and the Central Valley Project—are different. Their straws are stuck into the Delta itself, toward its southern tip, and they affect the region not only by removing water but also by distorting flows. In many channels, water runs backwards at times, toward the pumps, not toward the sea.

This situation is bad for salmon, Delta smelt, and other sensitive and legally protected species. It provides an insurance policy, however, for Delta farmers. The water destined for export flows right past their islands, always available to irrigate their fields. Given the present system, the water in the channels must stay fresh enough to be drunk in San Diego—certainly fresh enough to irrigate asparagus.

Under what is called the Bay Delta Conservation Plan (BDCP), the Department of Water Resources and the federal Bureau of Reclamation are planning a kind of heart bypass, segregating the water meant for the pumps at a new river intake near Sacramento. The water corralled at this point would be sent to the pumps via a pair of tunnels. This arrangement would help cure the backward flows that harm fish; in conjunction with habitat improvement measures, it is supposed to bring endangered species far enough back from the brink to satisfy protective laws. Many Delta residents and environmentalists, though, fear that the new system will only allow more water to be shipped south, doing, on balance, more harm than good.

This Bay Delta Conservation Plan is not the responsibility of the Delta Stewardship Council, which contents itself with urging its completion (**Water Resources Recommendation 12**). Once the proposal is ready, the Council will review it to see if it meets the Coequal Goals and thus can be made an element of the Delta Plan. If the answer turns out to be no, the Legislature has stated, public money could not be spent on the program.

. . . and protecting, restoring and enhancing the Delta ecosystem .

The effort to improve the fortunes of the Delta ecosystem has two components that are vital: guaranteeing adequate flows from the feeder rivers into and through Delta channels, and restoring a portion of the wetlands and other habitats that have been lost. Three other components are merely very important: combatting harmful exotic species; improving the management of salmon hatcheries; and protecting and improving water quality.

Toward "natural functional flows"

As a result of withdrawals for human use, the flows out of the western edge of the Delta into the rest of the San Francisco Bay system average about half of what they were a century ago. The effects of this diminution are felt all the way to the Golden Gate; decades of research show that when less water feeds it from the east, the entire estuary's ecosystem falters.

Besides reducing the total quantity of runoff through the Delta toward the coast, we have changed the timing of flows, decreasing them at some times of year and increasing them at others. In a natural system used to wide variation, this is also a source of harm.

The minimum seaward flows to be maintained are set by the State Water Resources Control Board, according to year type (wet, normal, dry) and season. These required flows help fish; they also prevent salt water from the downstream bays from backing up into Delta channels. As a not-incidental side effect, the rules limit the amounts of water that can be sent south through the pumps.

The Delta Reform Act instructed the board to reconsider these flow levels, adopting binding new standards that will reflect a balancing of ecological with human needs. Science suggests that the new flows should be both higher and more variable than

today's, paralleling the ups and downs of the natural annual rhythm. As a later step the board is to issue comparable flow standards for the major rivers tributary to the Delta. The Delta Plan sets deadlines for these processes (mid-2014 and mid-2018). The completed regulations will become elements of the plan, and the Delta Stewardship Council can review any project that could affect Delta flows for consistency with them (**Ecological Restoration Policy 1**).

Habitat restoration

In its natural state, the Delta was no uniform sea of reeds but a vast mesh of habitats including tule marsh threaded with rivers and sloughs, perched lakes filled by floods and at very high tides, natural levees with big trees on them, and seasonal overflow basins behind the levees. Most of this mosaic has disappeared, converted to fifty large and many small leveed islands. Evidence of what was remains in agricultural soils of uncommon quality (and fragility).

The old scene will never return, but careful habitat restoration projects can help to reverse the region's ecological decline. Biologists have spent years locating the likeliest areas for such revivals. The Delta Plan incorporates the latest thinking, essentially the Conservation Strategy drafted in 2011 by the Department of Fish and Wildlife.

Since the heart of the Delta is now well below sea level, due to subsidence, the suitable restoration sites are mostly found near Delta margins. where the soil surface is still high enough to permit aquatic vegetation to take root. The plan outlines six zones: the Yolo Bypass, the floodplain west of Sacramento into which the Sacramento River spills in wet years; the Cache Slough Complex, where the Bypass merges into the body of the Delta; a nexus in the eastern Delta where the Mokelumne River and the Cosumnes River add their strands to the Delta's web; a zone in the southern Delta along the San Joaquin River; a collection of small tracts at the western apex of the Delta, where this narrows to meet Suisun Bay; and finally the Suisun Marsh, fringing that bay to the north. This fresh-to-brackish water marsh, the largest of its kind in the state, is mostly managed by duck clubs as seasonal wetlands, but opportunities for tidal restoration should be sought. The existing plan for Suisun Marsh, written by the San Francisco Bay Conservation and Development Commission, is 36 years old and does not take into account, for example, probable sea level rise.

The Delta Plan calls for a new look at Suisun Marsh; and it calls on several agencies to assist the Department of Fish and Wildlife in carrying out its Conservation Strategy. Among these is the Delta Conservancy, a public land trust established for such purposes in 2009. The Delta Stewardship Council can be appealed to, if necessary, to block development, or any other intrusion, that might interfere with a restoration site. (**Ecosystem Restoration Policies 2 and 3, ER Recommendations 1, 2, and 4**).

Much of the remaining good habitat in the Delta is found in strips along the water side of levees, and the Delta Plan looks to protect and widen these green margins. When levees are rebuilt or altered, the possibility of shifting them farther away from the water should always be explored. The growth of trees along the waterline should also be encouraged. However, authority over many levees lies with the Army Corps of Engineers, and the Corps prefers its earthworks "clean," naked of tall vegetation. Experts are divided as to whether or not this stripping makes the levees stronger; plainly it makes them all but useless for wildlife. The Delta Plan asks the Corps to exempt Delta levees from this rule. (**Ecosystem Restoration Policy 4 and Recommendation 3).**

Exotic species

One of the less visible forces to buffet the Delta ecosystem is the proliferation of nonnative aquatic species—fish, crustaceans, plants, and even the microscopic floating animals of zooplankton. Some of these were introduced deliberately; others arrived by random routes including the discharge of bilgewater from ocean-going ships and the dumping of goldfish bowls. Some of these intruders affect the system little, but other species, notably certain aquatic plants and filter-feeding clams, transform the web of life profoundly. The Delta Plan prohibits actions that could bring in new exotics or improve conditions for exotics that are here, and endorses the measures the Department of Fish and Wildlife is already planning to take against them. (**Ecosystem Restoration Policy 5, ER Recommendation 6.**]

Among the exotics are game species introduced in the 19th Century and well-loved by fishermen: striped, largemouth, and smallmouth bass. It has become apparent that these voracious game fish are helping to deplete salmon, Delta smelt, and other species in trouble. The Delta Plan asks the Department of Fish and Wildlife to change angling rules to permit heavier fishing and somewhat suppress the bass population (**Ecosystem Restoration Recommendation 5)**.

Hatchery Management

When dams on many rivers cut off spawning grounds for salmon and steelhead trout, hatcheries were built to compensate. Now there is worry that hatchery-raised salmon, less genetically diverse than their wild cousins, may mix with and reduce the fitness of the wild strains. Various solutions are proposed, including capturing wild fish to add their eggs to hatchery stock. The Delta Plan asks the Department of Fish and Wildlife and the U. S. Fish and Wildlife Service to put these ideas into effect (**Ecosystem Restoration Recommendations 7 and 8**).

Water Quality

Pollution from the watershed is bad for the Delta ecosystem and for water users. The Delta Plan urges the responsible agencies—the State Water Resources Control Board, the Central Valley Regional Water Quality Control Board, and the San Francisco Bay Regional Water Quality Control Board—to protect "beneficial uses" of water in the Delta and Suisun Bay. Various ongoing projects of planning, rule-making, and construction should be wrapped up on schedule. All agencies should look at water quality when weighing actions covered under the Delta Plan. Special attention should be paid to pollution that might interfere with restoration sites. (**Water Quality Recommendations 1-12**).

. . . in a way that protects and enhances the values of the Delta as an evolving place.

Because of its role in greater systems—the San Francisco Estuary, the state water plumbing—the Delta is a subject of statewide debate. The conversation can seem to take place over the heads of the people who actually live in the region; and it can seem to overlook the lasting values of the place that is: its thriving agriculture, the beauty of its countryside, its rich cultural heritage, and its recreational bounty. The Delta Plan strives to redress this balance without promising what is probably impossible: the retention of the landscape exactly as it is today.

Honorific labels do not protect valuable assets, but they can help us recognize them. The Delta Plan asks that the Delta be declared a National Heritage Area by Congress and that Highway 160, its north-south artery, be designated a National Scenic Byway by the U. S. Department of Transportation ((**Delta-as-Place Recommendations 1 and 2).**

Delta people fear that their concerns will be brushed aside as new water facilities and habitat restorations get underway. While deference cannot be guaranteed, the Delta Plan calls on the agencies to respect local plans in siting such projects, to minimize conflict when possible, and to buy land from willing sellers when they can (**Delta-as-Place Policy 2, DP Recommendation 4).**

The unique Delta landscape suffers from urban encroachment that is unwise, even unsafe, in this part of the world. The Delta Protection Commission, created in 1992 and strengthened by the Delta Reform Act of 2009, oversees development in the core area called the Primary Zone: local decisions affecting this zone can be appealed to the Commission and overturned by it. However, this authority does not extend to the peripheral Secondary Zone, where the development pressure is strongest. The Delta Plan tightens control further, steering new development to the 26,000 acres that are specifically earmarked for urbanization in local plans. Small housing developments that may occur outside these limits must meet high flood safety standards **(Delta-as-Place Policy 1, Risk Reduction Policy 2).**

A little more bustle might actually benefit the eleven small historic towns or settlements within the Delta known as the legacy communities. Most are spaced along the Sacramento River: Freeport, Clarksburg, Hood, Courtland, Locke and Walnut Grove, Ryde, Isleton, and Rio Vista. Knightsen and Bethel Island

are in Contra Costa County near the lower channel of the San Joaquin River. Planners at all levels should respect the character, and promote the vitality, of these places (**Delta-as-Place Recommendation 3).**

The Delta Protection Commission has written an Economic Sustainability Plan containing many ideas for the support of the region's farm economy, parks and recreation, and roads and other infrastructure. The Delta Plan adapts many of these as **Delta-as-Place Recommendations 5-19**.

Flood Risk Reduction

In its primeval state, most of the Delta was wetland and slightly above sea level. Since levees created the modern islands and cultivation began, soils have subsided deeply. Many Delta tracts are strikingly below the level of the water in adjacent channels; rising sea level will make the disparity worse. While the occasional levee break is part of Delta lore, multiple failures could bring disaster to the Delta landscape and economy. The Delta Plan has many provisions designed to minimize flooding, and several aimed at improving response when it occurs.

Subsidence can actually be reversed. Experimental plots show that soils can be deepened by growing tules in shallowly flooded fields, at a rate of a little over an inch a year. The tules also fix a lot of atmospheric carbon and thus do their bit toward slowing climate change. The Delta Plan encourages expansion of this work (**Delta-as-Place Recommendations 6 and 7**).

Levees need to be better maintained. Right now, the 1,335 miles of Delta levees are the responsibility of 25 local Reclamation Districts and, in some cases, of the federal Army Corps of Engineers. There is not enough money for all the needed maintenance, nor is there a mechanism for sharing costs among all who benefit from the work. The Delta Plan calls on the Legislature to establish a Delta Risk Management Assessment District to raise money for combined defenses. Special attention must be paid to levees next to channels through which water flows toward the pumps, and to levees protecting the two pipelines through which Sierra water crosses the Delta on its way to the San Francisco Bay Area. (**Risk Reduction Policy 1**, **RR Recommendation 2.)**

The state also participates in levee maintenance costs. The Legislature directed the Delta Stewardship Council to assess, island by island, the state of levees, the degree of subsidence, the value of assets to be protected, and the cost of long-term defense. The result, due at the start of 2015, will be a tiered priority list for the investment of state levee funds (**Risk Reduction Policy 1).**

To take pressure off the levee system, floodwaters need room to move and to spread without harm to people (and often to the benefit of plants, birds, and fish). Two such safety valves already exist at the Yolo Bypass and the Cosumnes-Mokelumne floodplain; a third such zone is proposed for the lower San Joaquin River at Paradise Cut. The Delta Plan urges expansion of the flood relief system, and requires that present or potential overflow areas be kept free of encroachments (**Risk Reduction Policies 3 and 4, RR Recommendations 4-7**).

Damaging floods will nonetheless come. The Delta Plan spells out some measures in aid of flood response and recovery, including, for instance, the piling of extra dirt on certain West Delta levees, to serve as a stockpile when breaches elsewhere require rapid plugging. Various agencies, public and private, should set aside funds for reaction and repair. Higher levels of private flood insurance should be required, and the state should gain immunity from lawsuits related to flooding. (**Risk Reduction Recommendations 1, 3, 8 and 9**).

The learning curve

Again and again this Delta Plan—the first iteration of many—must acknowledge what is not known: about California water, about the Delta ecosystem, and also about the cost of various actions and proposals that are on the table.

Gaps in water information

In talking of California water, we put trust in numbers: flows, usages, capacities, trends. But some seemingly solid and much-quoted figures are little more than guesses. By and large, we do not truly know how much water we are using, or how much we are saving through conservation efforts. We know less than we should about Delta inflows and outflows. We know little about groundwater except that certain water tables are sinking. What data is available is often

packaged in inscrutable ways. The Delta Plan asks all the agencies involved to provide or demand better information, and to communicate it better (**Water Resources Policy 2, WR Recommendations 16-19**.)

The Delta Science Plan

The Delta Reform Act says that the Delta Plan must be based on the best available scientific knowledge of our day. The Plan, moreover, must be open to change as knowledge changes—and as paper proposals meet the test of reality. The results of every action are to be closely monitored, so that corrections can be made in a timely way: a process known as adaptive management. The key ingredient here, of course, is the willingness to let new data disrupt old plans.

Though Delta knowledge has expanded hugely in recent years, it is often a challenge to draw conclusions from that data. Studies are done by different agencies for specific purposes and sometimes to justify predetermined strategies; findings can be hard to integrate. The Delta Science Program, a function of the Stewardship Council, will seek to overcome these gaps, linking the whole community of scientists at work. Guided by a top-flight Delta Independent Science Board, it will prepare, by the end of 2013, a companion to the Delta Plan called the Delta *Science* Plan (**Governance Recommendation 1**).

The Delta Science Plan will propose a collaborative structure for doing science in the Delta. It will suggest ways of improving communication, resolving conflicting results, and accommodating uncertainty. It will offer priorities: how to apportion effort between short-term practical questions, on the one hand, and research aimed at increasing long-term understanding, on the other. It will sketch a more integrated approach to monitoring, so that results from different settings can be compared, and consider how computer modeling of the intricate Delta system might be improved. The Delta Science Plan will be the start of a vital conversation.

Toward a financing plan

Just as we need to know more about the Delta's ecosystem and the state's water resources, so also we need better estimates of the costs of the work now proposed for the Delta or on its behalf and how those costs might be met.

This is not a matter of preparing a budget for the Delta Stewardship Council. The bulk of these expenditures will be always be made by other and larger agencies, using their own funding sources and categories. The need for an overview remains, and this Delta Plan discusses how the next Delta Plan might arrive at one: a sensible process that begins by inventorying what is being spent, by all agencies involved, that can be chalked up to furthering the Coequal Goals; goes on to assess what needs to be spent; and compares the two (**Funding Principles Recommendations 1-3**).

The long view—and the not so long

When the first Spanish explorers took their boats into the Sacramento-San Joaquin River Delta, they were feeling their way. They knew generally where they were headed, upstream toward the Sacramento Valley. They could see the channel they were in, as far as the next bend or junction of sloughs. Between the near and the far, though, were mysteries. Which waterways connected to others, which petered out in the marshes? Where was the real way through?

This first edition of the Delta Plan is a little like such an exploration. The destination is clear enough. We want a Delta ecosystem that works markedly better than it does now, as shown by an increase in native fish; and we want a Delta landscape that remains essentially itself while adapting gradually and gracefully to a future marked by climate change and sea level rise. We want an end to the endless wrangling about Delta flows and plumbing.

We are headed for a future in which California water systems rely less on the Delta—and work better as a result. Driven by cost, environmental concern, and sheer practicality, the water world is already shifting away from trust in distant dams and aqueducts and toward reliance on conservation, local sources, and groundwater storage. This trend is reflected in the fact, startling to many, that California's total water use has not climbed in recent years; in fact, it has slightly dropped.

The direction of travel is clear; and the next five years should answer many questions about the detailed route. The Delta Science Plan is already taking shape.

Just around the next bend, the State Water Resources Control Board will promulgate its new flow rules; a final decision on Delta conveyance looms beyond that. A dozen other specified studies and rule-making procedures, including the Delta Stewardship Council's own assessment of levees, will meanwhile be proceeding.

And what about tangible evidence of progress? In the first five years of the Delta Plan, the marks of forward motion may be as subtle as shifting shoreline features seen from a Delta boat. Here, though, are some markers to keep an eye out for.

- Some urban water districts tied to the Delta will be doing—measurably—more to conserve water and to capture such local sources as stormwater runoff.
- As new rules take effect, flows in Delta channels will look a good deal more like the natural ones.
- Several new habitat restoration projects in the Delta will be underway.
- Subsidence reversal planting will have expanded from the small pilot projects seen today.
- Measurably less acreage of Delta waters will be dominated by exotic waterplants.
- Stocks of wild salmon will be showing a rebound.
- The Paradise Cut floodway for the San Joaquin River will be a reality.
- No further Delta farmland will have been lost to urbanization.

The next iteration of the Delta Plan, due in 2018 or sooner, will be a little longer on information and a little shorter on question marks. A few more miles of the channel ahead will have come into view. New uncertainties, of course, will have arisen in place of old. The captains will no doubt continue to disagree.

But, just as it was in the old days, the route through the Delta is the way that must be found: the vital opening to the future well-being and continued development of the entire state.