



STATE OF THE SAN FRANCISCO BAY-DELTA ESTUARY

2006

Science & Stewardship

SAN FRANCISCO ESTUARY PROJECT
&
CALFED
OCTOBER 2005
STATE OF THE ESTUARY PROCEEDINGS

Opening Remarks

This Report describes the current state of the San Francisco Bay- Sacramento-San Joaquin Delta Estuary’s environment — waters, wetlands, wildlife, and watersheds. It also highlights restoration activities, research needs, and pressing issues we need to address if we are going to protect water quality, supply, and habitat.

San Francisco Bay and the Delta combine to form the West Coast’s largest estuary, where fresh water from the Sacramento and San Joaquin rivers and watersheds flows out through the Bay and into the Pacific Ocean. In the early 1800s, the Bay covered almost 700 square miles, and the Delta’s rivers swirled through a vast Byzantine network of 80 atoll-like islands and hundreds of miles of braided channels and marshes. Back then, almost a million fish passed through the Estuary each year and 69 million acre-feet of water crashed down from mountain headwaters toward the sea. But in 1848 the Gold Rush began and hydraulic mining plugged the rivers and bays with more than one billion cubic yards of sediments. Over time, farmers and city builders filled up more than 750 square miles of tidal marsh, and engineers built dams to block and store the rush of water from the mountains into the Estuary and massive pumps and canals to convey this water to thirsty cities and farms throughout the state.

Today’s Estuary encompasses roughly 1,600 square miles, drains more than 40% of the state (60,000 square miles and 47% of the state’s

total runoff), provides drinking water to 22 million Californians (two-thirds of the state’s population), and irrigates 4.5 million acres of farmland. The Estuary also enables the nation’s fifth largest metropolitan region to pursue diverse activities, including shipping, fishing, recreation, and commerce. Finally, the Estuary hosts a rich diversity of flora and fauna. Two-thirds of the state’s salmon and at least half of the birds migrating along the Pacific Flyway pass through the Bay and Delta. Many government, business, environmental, and community interests now agree that beneficial use of the Estuary’s resources cannot be sustained without large-scale environmental restoration. There is also a greater need than ever for increasing public awareness about the Estuary.

This 2006 State of the Estuary Report summarizes advocacy and stewardship efforts, and restoration and science recommendations drawn from the 44 presentations and 195 posters of the October 2005 State of the Estuary Conference and related research. The report also provides some vital statistics about changes in the Estuary’s fish and wildlife populations, pollution levels, and flows over the past two years, since the last State of the Estuary report was published.

The report and conference are all part of the San Francisco Estuary Project’s ongoing efforts to implement its Comprehensive Conservation and Management Plan (CCMP) for the Bay and Delta and to educate and involve the public in protecting and

restoring the Estuary. The S.F. Estuary Project’s CCMP is a consensus plan developed cooperatively by over 100 government, private and community interests over a five-year period and completed in 1993. The project is one of 28 such projects working to protect the water quality, natural resources and economic vitality of estuaries across the nation under the U.S. Environmental Protection Agency’s National Estuary Program, which was established in 1987 through Section 320 of the amended Clean Water Act. Since its creation in 1987, the Project has held seven State of the Estuary Conferences and provided numerous publications and forums on topics concerning the Bay-Delta environment. In 2001, CALFED joined the Estuary Project as a major sponsor of the conference. CALFED is a cooperative state-federal effort, of which U.S. EPA is a part, to balance efforts to provide water supplies and restore the Bay-Delta watershed.

TABLE OF CONTENTS

- Executive Summary 2**
- Vital Stats 11**
- Big Picture; Warning Bells. 27**
- The Role Of Science 37**
- Works In Progress 47**
- Science, Learned & Needed. 55**
- Work To Be Done 67**
- Bibliography. 85**

Executive Summary

Reprint of a December 2005 ESTUARY Newsletter article.

Amid the metaphorical popping of champagne corks at this year's "Celebrating Science and Stewardship" State of the Estuary Conference in Oakland's Henry J. Kaiser Convention Center, scientists and policymakers sounded a series of SOS calls to an audience of more than 700. The loudest cries for attention were over the Delta and the ways it is changing physically, politically, and ecologically, and how the future of the Central Valley—as ag land or urban sprawl—will affect the Bay-Delta Estuary.

The S.F. Regional Board's Larry Kolb kicked things off by asking whether Californians are as "clueless" in managing our water systems—and the Delta—as those who channelized the Mississippi River, cutting it off from its floodplains and depriving the wetlands at its mouth of sediment, thereby contributing to the damage from Hurricane Katrina. In both places, said Kolb, we are mismanaging water and marshes, building on subsided marshy soils—on floodplains—and then, in a vicious cycle, building ever bigger levees and dams to protect the homes and infrastructure behind them.

"We spend \$100 million per year explaining why agriculture is important. But we spend less than 10 percent of that telling people why oceans and estuaries are valuable."

Jerry Schubel, Aquarium of the Pacific

Other speakers following Kolb the first morning sounded more alarms—and called for action. Jerry Schubel, from the Long Beach Aquarium of the Pacific, told the crowd that while we've made huge strides with science, we need to make sure stewardship keeps pace. "Both scientists and citizens need to be keepers of the Estuary," said Schubel. Everyone—"all sizes, shapes, races, NGOs, scientists, and politicians"—needs to

get involved in making decisions about the Bay-Delta Estuary, said Schubel. "If you're not at the table," he quipped, "you're on the menu."

Lack of scientific understanding isn't the problem at this point, said Schubel, who called for a "compelling vision" and new approaches for managing Bay-Delta resources, including better communication with the public. "We spend \$100 million per year explaining why agriculture is important," he added. "But we spend less than 10 percent of that telling people why oceans and estuaries are valuable." Schubel also advised the crowd that we need to be flexible in managing water resources. But the bottom line, he said, is that we must build better collaborations among researchers, decisionmakers, and stewards.

"To protect the Delta, we need a new Sylvia McLaughlin, Kaye Kerr, and Esther Gulick."

Joe Bodovitz, former executive director, BCDC and California Coastal Commission

Stewards were also on the mind of Joe Bodovitz, the former—and first—executive director of both BCDC and the Coastal Commission, who began his talk by chronicling the sometimes-volatile political process that led to the creation of CALFED. Under former governor Pat Brown's reign—which Bodovitz termed the "golden era of California"—the State Water Project and lots of other infrastructure we benefit from today got built. But things are changing, he warned, stressing that as the state's population burgeons, the Central Valley will need more water and will play a more prominent role in water plumbing and politics. The most critical issue facing the Bay-Delta, said Bodovitz, is how much water Central Valley agriculture will keep or sell to urban areas.

Echoing Schubel, Bodovitz said another critical issue is stewardship. To protect the Delta, he said, we need a new Sylvia McLaughlin, Kaye Kerr, and Esther Gulick, the three Berkeley women who kept the Bay from becoming a parking lot. Saving the Delta is a much trickier proposition, said Bodovitz. Recalling how the three women got people to send bags of sand to

their legislators, he said, “People could understand that if we filled the Bay, things would be greatly changed. People got it—it was either going to be water or dry land.” But the Delta, he said, is “light-years more complex” and gets approached as a plumbing problem instead of as a landscape.

“People could understand that if we filled the Bay, things would be greatly changed. People got it—it was either going to be water or dry land. But the Delta is light-years more complex.”

Joe Bodovitz

One of the morning’s highlights—a preview of Ron Blatman’s upcoming four-part television documentary, “Saving the Bay”—showed exactly what stewardship can do. With historical and current images of the Bay and interviews with then-legislators and key environmental activists, the film chronicles how by the 1960s, almost one-third of the Bay had been filled, and how a 1959 Army Corps of Engineers report predicted that by 2020, 70 percent of the Bay would be filled for development. But then the three women who founded Save the Bay stepped in and stopped the fill.

On the conference’s second day, speakers focused on the disconnect between the Delta’s geomorphology and the state’s land use policies: As the Delta continues to subside, we continue to build more houses and other structures behind levees, partly in response to the Bay Area’s expensive housing stock. “The Delta is the number-one most-subsided landscape in the world relative to its size,” announced U.C. Davis’ Jeff Mount. Mount predicted that as urbanization continues to encroach upon the Delta—30,000 homes were approved in flood-prone areas in Stockton and another 8,500 in Lathrop—some of the ecosystem services the Delta has provided in the past will have to give, particularly if we continue our practice of serial engineering and particularly if we continue sprawling. “Once you start putting homes in the Delta, all bets are off,” declared Mount. Mount said we are mistakenly treating the Delta like a crime scene, where everything that

is going to happen has already happened. “The pace of [physical] change is rapid, yet we’ve got four CALFED programs wrapped around a static Delta,” said Mount. Today’s engineering is based on 1980s hydrology, he warned, predicting that South Delta improvement projects will adapt poorly to changing conditions. The Delta is warming up, and its hydrology and ecosystems are changing, he said. “If you raise sea level by three feet, the Delta ecosystem is going to be more like a Chesapeake Bay. In 15 to 20 years, we’ll have a whole different food web.” Mount said we need to define future probable states and take the long view, recognizing that some ecosystem services cannot be sustained over the long term. In response to moderator Tim Ramirez asking which ecosystem service will “get voted off the island,” Mount predicted that the loser will be farming.

The Department of Water Resource’s Jerry Johns followed Mount, taking more of a crime-scene approach. We need to act now to protect the infrastructure—high-pressure gas lines, water lines, and roads, among others—that crisscrosses the Delta, said Johns. “We need to take a comprehensive view and make ‘no-regrets’ decisions that improve flexibility.” But Johns also asked whether it is possible to “move forward” with pumping more water from the Delta when we don’t understand the recent decline in pelagic organisms. “Do we put off decisions on [water project] operations until we have more data, a new ROD?”

“The Delta is the number-one most-subsided landscape in the world relative to its size... Once you start putting homes in the Delta, all bets are off.”

Jeff Mount, UC Davis

Whatever we do, said the Central Delta Water Agency’s Tom Zuckerman, the solution needs to be “Delta-centric” and come from the people who live in the Delta. Zuckerman added to Mount’s concerns about the onslaught of urbanization. “We need to avoid making stupid, thoughtless decisions, such as putting people behind levees in tract houses,” said Zuckerman. “But how do we get politicians—the state government and the federal government—to focus on

the Delta? It really is entitled to priority. It's an environmental and recreational treasure." Zuckerman told the audience that we have a once-in-a-lifetime opportunity to preserve the standard of living and way of life in the Delta—an opportunity that will soon be lost.

Former Rio Vista mayor Marci Coglianese reiterated Zuckerman's concerns and added to them. "The Delta is no longer a remotely populated area," she said. "It's no longer a backwater filled with fish and stubborn farmers." Since 1993, said Coglianese, more than 94,000 residential units have been built in the Delta's secondary zone. "Every day, the Delta is being influenced by a Tower of Babel of governmental agencies," said Coglianese. "But there is no shared vision or acknowledgment of impacts. The time is ripe for a broader examination of all state policies affecting the Delta; we need a serious discussion of how state and local growth policies are putting development behind levees and in floodplains."

4 **"...we need a serious discussion of how state and local growth policies are putting development behind levees and in floodplains."**

Marci Coglianese, former mayor, Rio Vista

Although the Delta Protection Commission has made a laudable attempt to protect the inner core, said Coglianese, the legislature has not given it any real authority, and new conflicts are cropping up even there. Like Zuckerman, Coglianese thinks we have a "teachable moment" right now, after Katrina, in which we have the public's attention. Yet, she concluded, "The fundamental problem in the Delta is that the state government is not supplying the leadership needed to deal with hard problems. I urge the governor as he tries to refocus CALFED to bring together local governments, legislators, and interests who are talking to themselves right now." Solutions to the Delta's problems cannot be imposed on the Delta, said Coglianese. "But we need some unifying force to bring us together. Right now, we're a region without leadership. We need the state to help us out. Most of us don't even know where the floodplains are."

It takes scientists—not politicians—to delineate floodplains. Yet one conference speaker, MWD's Tim Quinn, said scientists should not be making policy. "Too often in California water, you have people sitting at the table crossing the line," said Quinn. "We also have scientists crossing the line. The *San Francisco Chronicle*, *Contra Costa Times*, and *Sacramento Bee* are not good places to publish your science." Quinn's comments aside, most conference speakers said there was an ever-increasing and more urgent need to communicate science to the public.

The science behind the recent decline in pelagic organisms in the Delta was a popular topic. Ted Sommer outlined the Interagency Ecological Program's efforts to identify all possible causes of the decline, from toxic algal blooms and new pesticides to the timing and amount of Delta pumping to impacts from exotic species. Posing another possible cause, Sommer cited problems with two species of zooplankton—*Pseudodiaptomus forbesi* and *Limnoithona tetraspina*. *Pseudodiaptomus*, which crashed in 2004, is a major food source for larval fish, said Sommer, while *Limnoithona*, which was relatively abundant in 2004, is a poor food source and possible predator of *Pseudodiaptomus*. The next day, S.F. State University's Wim Kimmerer explained that the *Pseudodiaptomus* population had a recruitment failure in recent years, which meant the loss of later life stages that would grow to adult organisms—and said there is no evidence that *Limnoithona* feeds on other copepods. He is trying to figure out why copepods crashed but not phytoplankton. Another culprit could be the invasive overbite clam, which may have decimated *Pseudodiaptomus* larval stages.

"The fundamental problem in the Delta is that the state government is not supplying the leadership needed to deal with hard problems."

Marci Coglianese, former mayor, Rio Vista

Many speakers suggested that poor water quality—particularly as a result of the huge increase in the use of pyrethroids by farmers—may have decimated pelagic organisms. If we are going to improve water quality

in the Delta, many folks think we can't do it without addressing water quality in the San Joaquin River. "It's not if, but when we restore the San Joaquin," proclaimed the Bay Institute's Gary Bobker. When Friant Dam was put in, the river was flat-lined, said Bobker, and the main stem cut off from the Delta. This has resulted in saltwater intrusion and poor water quality in the Delta, said Bobker.

Low flows in the San Joaquin have contributed to the problem of low dissolved oxygen in the water, particularly in the Stockton Ship Channel, the topic of U.C. Davis' Alan Jassby, who explained that other contributing factors include dredging of the channel, its geometry, and inputs of oxygen-devouring nutrients, such as nitrogen and phosphorus. Lawrence Berkeley Laboratory's Tryg Lundquist explained how real-time management of water quality in the San Joaquin could allow resource managers and farmers to take advantage of windows of opportunity for improving water quality by holding back polluted water and releasing it at times when there is less pollution in the river. USGS's Larry Brown described the river as the "most-invaded major river in the West," but said a surprising number of native fish species are surviving in it anyway.

U.C. Berkeley's John Dracup warned that global climate change could affect the river—and Northern California rivers overall—by putting more water in them earlier in the spring (which might tempt water purveyors to build more dams), and less later in the year when we need it more. The Friant Water Authority's Ron Jacobsma said that this year, more water was released from dams on the San Joaquin than "would have occurred in nature." Scott McBain, of McBain and Trush, delved into restoration challenges, describing the river's variable underlying geology and geomorphology. The river's slope and gravel pits are constraints, although not insurmountable ones, said McBain. His firm has restored other rivers that had been gravel-mined, he said, adding that some solutions—such as removing dikes and berms and allowing the river to re-establish a channel and floodplain in certain areas—would be simple.

The river's valley was the topic of the Great Valley Center's Carol Whiteside, who painted a picture of a rapidly disappearing landscape. The Central Valley's population is growing faster than California, the United States overall, and even Mexico, said Whiteside. "As

housing in the Bay Area and coastal regions gets less affordable, people continue to pour into the Central Valley." Plus, said Whiteside, there is a high rate of immigration from other countries—and a high fertility rate among Central Valley residents. Whiteside wondered why farmers and environmentalists are not partnering to save open space and ag land in the valley. But when a developer offers a farmer a million dollars for an acre, she lamented, ag land disappears. "I urge you to help us," she implored the crowd. "We have a chance right now to develop a strategic long-term view of the valley."

A panel discussion on CALFED and its role in the Delta wound up the talks on Day Two, with moderator Steve Ritchie questioning whether the state and federal agencies that make up CALFED are capable of resolving the thorny issues looming ahead. CALFED's new interim director, Joe Grindstaff, said he thinks people have forgotten how important it is to work together as an institution. "If we didn't have [CALFED], we'd have to invent it again," said Grindstaff. The other panelists—the Department of Water Resources' Les Harder, Gary Bobker, and the State Water Contractors' Laura King Moon—agreed, although Bobker suggested that maybe CALFED's structure needs to evolve. "Any program is about achieving your ends," said Bobker. "If we don't have clear and measurable goals, we don't know where we are." Bobker argued for a more independent science program than we've had in the past under CALFED, while King Moon said the program might need to become more strategic in its focus. Harder pointed out that under the current science program, our level of scientific understanding has increased exponentially.

And the science at the conference was extensive, both big picture and detail-oriented. The first day's speakers discussed how science will guide restoration around the Bay. U.C. Berkeley's Maggi Kelly told the crowd that by taking a landscape ecology approach—and applying a variety of spatial scales—we can decide which functions we are interested in maintaining and restoring in Bay wetlands.

One of the largest such projects—the South Bay salt ponds—was the topic of San Jose State University's Lynne Trulio, who explained how science is helping define goals and pin down uncertainties. "How much tidal marsh should we restore?" asked Trulio. "Adaptive

management will tell us how far we can go along the way. We will learn as we go—it's not trial and error, but it's based on an understanding of the system." Science will also guide how we monitor projects, said Trulio.

Stuart Siegel, next on stage, set forth several needs related to monitoring, which is often seen as not that important. In monitoring, said Siegel, we need to look for change, try to detect the outcomes of our actions by analyzing data, and convert that analysis to knowledge. We need to make information widely available, develop "lessons learned" and reference conditions, and solve problems related to wetland restoration—like mercury methylation, contaminants, and sediment supply, to name just a few, said Siegel. We also need to come up with science-based strategies for regional and sub-regional monitoring efforts, he suggested.

Thirty years of monitoring of 45 tidal marsh restoration projects (2,800 acres) implemented around the Bay since the 1970s gives us sufficient information to restore the 20,000 acres now in planning and design stages, said Phyllis Faber. The lessons learned on those projects helped form the basis of the *Design Guidelines for Tidal Wetland Restoration in San Francisco Bay*, published by Phil Williams and Associates and the Bay Institute with funding from the Coastal Conservancy. Faber said one thing we know for sure is that if we get the elevations right, "it is wasteful and costly to plant. Natural processes have fared better than highly engineered projects. We need to be more patient, to measure time for restoration in decades, not years."

PWA's Michelle Orr spoke of lessons learned in South Bay restoration projects. We now know that we do have enough sediment in the South Bay for tidal marsh restoration, said Orr, but we do not yet understand the sediment demands of mudflats.

The University of San Francisco's John Callaway talked marsh and mudflat too, examining whether elevation is a good predictor of tidal salt marsh plant distribution and concluding that while elevation is important, so are inundation by the tides and creeks and competition from other plants.

Another area we don't completely understand is the extent to which restoring tidal wetlands will benefit Bay food webs. The interactions between tidal wetlands and pelagic areas are not well understood, said the University of Washington's Si Simenstad. We do

know that the Delta is the "detritus mill" for the Bay, said Simenstad, with 30 percent to 40 percent of the organic matter it exports out of the system going to downstream food webs. Simenstad said we also know, from studying Suisun Marsh, that tidal marshes are highly productive, are critical rearing areas for fish and invertebrates, and provide refuge for native species.

Tidal marsh restoration is also important for non-aquatic species. PRBO researchers are studying how birds like song sparrows and common yellowthroats are responding to marsh restoration—and how landscape-level factors, vegetation, and hydrological and geomorphic processes limit their numbers and reproductive success. We also know that birds—songbirds in particular—respond rapidly to riparian habitat restoration. PRBO's Geoff Guepel showed a graphic illustrating the immediate and steady upward climb of bird density on the Sacramento River after restoration, and described how this year, the endangered least Bell's vireo and the locally extirpated yellow warbler returned to a newly restored site on the San Joaquin River. "Revegetation is working," said Guepel, who added that planting a habitat mosaic and a diverse understory is critical to restoring bird diversity. But he cautioned that without restoring floodplain dynamics and taking other conservation actions, nest success—especially in remnant forests—may remain low.

"The ecological value in intermediate-stage restoration sites is very high."

Nadav Nur, PRBO Conservation Science

For some species, like chinook salmon and steelhead in the Central Valley, restoration measures will need to be more drastic. NOAA's Steve Lindley described how his agency is developing viability goals for populations and evolutionarily significant units (ESUs) for each species. But he cautioned that without access to their prime spawning habitat—much of which is behind impassable dams—these fish will remain at risk of extinction.

Restoring habitat by removing dams is politically tricky but pretty straightforward from a fish's perspective—suddenly you have access to habitat that

you didn't before. But for other types of restoration projects, said PRBO's Nadav Nur, we need to develop success criteria that focus on evaluating young restoration sites, so we can enhance the values of those sites for the critters we are targeting for recovery and so we can take corrective steps if necessary. We do know that a site doesn't have to be mature to be valuable as habitat, said Nur. "The ecological value in intermediate-stage restoration sites is very high."

It is also important to evaluate restoration from the perspective of the most dominant species, cautioned the South Bay Salt Pond Restoration Project's Steve Ritchie. "We can't let endangered species run the show. We need to use every opportunity to educate folks and to monitor changes in community values and interests as well. We need to make sure restoration works for humans, as well as animals."

The S.F. Bay Joint Venture, by pulling in as many human stakeholders as possible, is trying to make sure that happens. The Joint Venture's Beth Huning gave an overview of wetland and riparian acquisition, restoration, and enhancement projects around the Bay, describing how building partnerships among businesses, private individuals, and nonprofits has been critical to the projects that have taken place so far. Huning emphasized the importance of acquisition. "Before we can restore, we need to protect," she said.

And to acquire more land for restoration, we need to convince the public of the value of restoration. Science alone isn't enough, said the S.F. Regional Board's Bruce Wolfe, echoing earlier speakers. We must also be able to report on our actions to the public in ways they can understand, said Wolfe. "Decisionmakers and the public want to know how we're doing, they want to know what we've done, and they want to hear the message in easy-to-understand terms. "'Restoring creeks' resonates better than 'minimizing the hydrogeomorphic impacts to riverine functions,'" said Wolfe, who added that his agency is committed to working with Bay nonprofits and scientists to identify what enhancement and restoration the Estuary needs, the performance standards needed to do that, and how best to track our progress as we move forward.

The Bay Institute's Anitra Pawley described her agency's attempts to track progress with its just-released second Ecological Scorecard. "Society is ob-

essed with performance measures," said Pawley. With a simple conceptual framework, the scorecard asks, in general, if we can fish from, swim in, and drink Bay-Delta water, explained Pawley. While there is an incremental upward trend in these criteria for the Central and South bays, said Pawley, the upper parts of the Bay—San Pablo and Suisun bays—are in serious trouble, with fish and other organisms declining and invasive species increasing. "We've done a lot of damage to the Bay, and it will take a while to reverse," she predicted.

What's really needed in monitoring the health of the Estuary is an approach linking ecology and toxicology, said Susan Anderson of U.C. Davis' Bodega Marine Laboratory. She described how she has measured the exposure of mudsuckers, a sediment-dwelling fish, to contaminated sediments in Stege Marsh. "They're not sexy, but they live in salt marsh mud and are directly exposed to the sediments being regulated. We can measure a lot of things in an efficient and humane way—we use every part of the fish." Anderson pointed out that just because we don't always measure the effects of contaminants on fish and invertebrates, that doesn't mean impacts aren't there. "Our contention is that it's not enough to go out and see marsh birds—we need to know their health."

"Our challenge is to put the Bay, Baylands, and watersheds back together again"

Josh Collins, San Francisco Estuary Institute

The health of the food web also affects humans, of course, particularly those who eat fish from the Bay and Delta. Cal EPA-OEHHA's Bob Brodberg chronicled the history of fish consumption advisories for the Bay-Delta and said that as new chemicals are found, they will be monitored extensively. Consumption advisories not only provide the public with information and choices, said Brodberg, but could also be used in setting cleanup and restoration goals. The current advisory for the Bay-Delta Estuary, said Brodberg, is that adults should eat no more than two meals per month of Bay sport fish, including sturgeon and striped bass caught in the Delta. Adults should not eat any striped bass over 36 inches, said Brodberg, and women who are pregnant, may become pregnant, or are nursing should not

eat more than one meal of fish per month—nor should children under the age of six.

Another restoration and monitoring link we need to make is that of watersheds to wetlands, said SFEI's Josh Collins "We have to embrace the idea that the Baylands really are the edge of the Bay," he said, adding that those places where streams and rivers meet the Bay have become a sort of no-man's land, falling somewhere between watershed science and Bay science. "Our challenge is to put the Bay, Baylands, and watersheds back together again," said Collins. "We need to reconnect with our watersheds." Yet this year's conference had little focus on the streams that flow to the Bay or their watersheds. Collins' take-home point was that we need to set riparian habitat goals—"force ourselves to just do it!"—as we have already done for wetlands.

The only other discussion of streams and watersheds occurred in a panel presentation about stewardship around the Bay—a first for the State of the Estuary Conference. Four people working and volunteering to improve habitat and water quality in and around the Bay described just how essential volunteers have become to maintaining and restoring wetlands, uplands, and streams. The Golden Gate National Parks Conservancy's Mike Lee calculated that more than 16,000 volunteers contribute 382,000 hours of support each year to his agency, dealing with visitors, working in native plant nurseries, maintaining trails, counting and banding birds, and handling other tasks. Mondy Lariz, with the Stevens and Permanente Creeks Watershed Council, said his organization has at least 80 full-time volunteers engaged in watershed stewardship, including water quality monitoring. And recently, 1,460 volunteers helped clean up 46 miles of creeks in Santa Clara County, said Lariz, removing 40,000 pounds of trash. U.S. Fish & Wildlife's Mendel Stewart said volunteers at the S.F. Bay National Wildlife Refuge complex are the equivalent of 19 full-time staff people, at a dollar value of \$470,000. And Save the Bay's Marilyn Latta concluded that nearly 30,000 volunteers have contributed 150,000 hours to work on habitat restoration with her organization over the past five years. "Without public education and community support, we will never be able to truly save the Bay," she said. "Stewardship is one piece of the solution." Volunteers cannot replace "large-scale construction" efforts in restoration, she added, but they can supplement and enhance it.

With help from volunteers—and from federal and state agencies, nonprofits, and local governments and businesses—we're making progress. The largest restoration projects ever undertaken on the Bay are underway. The Coastal Conservancy's Amy Hutzel gave a progress report on two large tidal marsh restoration projects in the North Bay—the Napa salt ponds, which began in Fall 2005, and the Hamilton Airfield. Napa is less subsided than Hamilton, said Hutzel, and will be restored primarily by breaching and lowering existing levees. Hamilton, which has subsided by about 10 feet, presents more of a challenge and will need seven million cubic yards of dredge material deposited on it to achieve a restorable elevation.

The South Bay is also gearing up, said Cal Fish & Game's Carl Wilcox, with restoration projects at Bair Island (1,700 acres of diked Baylands to tidal marsh), Eden Landing (650 acres of former crystallizers and salt ponds to tidal marsh, plus enhancing another 200 acres of managed ponds and restoring some sloughs), and the former salt ponds (15,100 acres acquired from Cargill in 2003), which are being managed under an initial stewardship plan.

“We have groundwater overdraft of one to two million acre-feet statewide. We cannot keep doing that kind of deficit spending.”

Kamyar Guivetchi, Department of Water Resources

Progress is being made not only on the ground but also at the policy level. The Department of Water Resources' Kamyar Guivetchi unveiled the California Water Plan 2005, which, for the first time, includes an implementation plan for using water efficiently, protecting water quality, and supporting environmental stewardship. "We have to wring every drop of water out of our water supply system," said Guivetchi. "We have groundwater overdraft of one to two million acre-feet statewide. We cannot keep doing that kind of deficit spending." Guivetchi proclaimed that in the future, we must have a better link between land use planning and water management, and that planning should be more inclusive of tribal and disadvantaged

communities. Another sea change for this plan, he told the crowd, is that key decisions about water are going to have to be made at the regional level—although not as islands unto themselves.

Amid the progress, new and old challenges lurk. Maurya Falkner with the State Lands Commission reported on the 2003 reauthorization of a statewide mandatory ballast water management law designed to reduce or prevent invasive aquatic species from entering the state's waters. Falkner said vessels have exceeded compliance requirements by 90 percent, but fouled ship hulls are still introducing invasives. SFEI's Andrew Cohen said that while the reports about compliance are reassuring, if you read the fine print, many ships are exempted and there is no good method of testing ships' ballast water at the end of a voyage. Cohen estimates that even when ballast water exchange does occur—more than 200 miles from shore as required—only 70 percent to 85 percent of the organisms are removed. Cohen agreed that fouled hulls are one of the biggest problems and added aquaculture to the list: "It's good at moving diseases and parasites and pests."

Another pest—of the vegetative kind—was the topic of the S.F. Estuary Invasive Spartina Project's Erik Grijalva, who reported on the most recent effort to control invasive spartina species. Between 2001 and 2003, said Grijalva, there was a 260 percent increase in non-native spartina hybrids with diverse genotypes that can start new colonies anywhere. "The greatest threats are to mudflats and restored tidal marshes," said Grijalva. "If we do something right now, we have a chance to control it." This year's treatment, after the marshes were surveyed for the presence of clapper rails, tackled 70 percent to 80 percent of the infestation, said Grijalva.

But the biggest challenges for the Estuary—and for restoration projects—will likely be meeting the economic and environmental challenges of the state's increasing population, said the Public Policy Institute of California's Ellen Hanak. The state's reliance on bonds to pay for public investments in infrastructure, land acquisition, park lands, restoration—and a host of other public benefits—is not sustainable, said Hanak, since the ratio of general fund debt to revenue may limit our capacity for new bonds in the near future. That bodes ill for restoration—state bonds have been its main funding source for several years. Funding will also be an ob-

stacle for nonpoint source pollution control efforts, said Hanak. Yet despite the woeful state of the state's piggybank, most Californians are quite concerned about coastal pollution, toxics in soil and water, and polluted runoff in our rivers and lakes, according to an Institute survey. And most people surveyed agreed that even with the large state budget deficit, we should continue to fund environmental programs at the current level.

Adding to the doom side, the Coastal Conservancy's Nadine Hitchcock warned that although the Conservancy and the Wildlife Conservation Board have acquired more than 100,000 acres around the Bay, there is almost no money left for new projects. Politicians frequently see funding for ecosystem restoration as competing with funding for traditional engineering projects, said Hitchcock. Despite these setbacks, Hitchcock said, we need to do more restoration projects in disadvantaged communities, like the Conservancy-funded restoration of Yosemite Slough in San Francisco's Hunter's Point. "We have many more competing needs with limited funds," concluded Hitchcock. "We need to develop a regional vision for the landscape and pursue local and regional funding. There's a horse race between people acquiring land for preservation and people acquiring it for development."

“We need to develop a regional vision for the landscape and pursue local and regional funding. There’s a horse race between people acquiring land for preservation and people acquiring it for development.”

Nadine Hitchcock, California Coastal Conservancy

The Department of Water Resources and the Coastal Conservancy recently acquired the former Dutch Slough dairy farm in eastern Contra Costa County—at the center of the “horse race.” That site will be restored to tidal marsh instead of being covered with 4,500 houses. “All of our restoration efforts will be relatively futile if we are unable to stem the tide of urbanization in the Delta,” said the Natural Heritage

Institute's John Cain, one of the project's managers, sounding again the warnings from earlier in the conference. The most important thing we can do now, said Cain, is to acquire land. "Restoration can wait, but the time for acquisition and preservation is now," said Cain, who thinks we should expand the Delta Protection Commission to protect the secondary zone in the Delta.

"Restoration can wait, but the time for acquisition and preservation is now"

John Cain, Natural Heritage Institute

There is a lot of work to be done, especially around land use issues—the ghost in the cellar we've never quite faced. Yet it is not too late for the Bay Area to lead the way to a more sustainable future, said Rainforest Action Network founder Randy Hayes, now with the City of Oakland. "San Francisco, Berkeley, and Oakland were named as among the top 10 'green cities' in the country," he told the audience. "But we're at best light green. We can work toward medium and deep green. We need to work toward an ecological U-turn, to start a paradigm shift that sets the tone for the entire country."

"We need to better explain, in economic terms, why protecting the natural environment is important to solving other problems."

Will Travis, BCDC

Not only did there seem to be a general consensus among conference speakers that we need better land use policies and communication with the public, but there was also a consensus that we cannot rest on past accomplishments. We need to keep on saving the Bay, as Save the Bay founder Sylvia McLaughlin said in a recent interview in the *San Francisco Chronicle*. In his rousing conference wrap-up, BCDC's Will Travis described how McLaughlin told him that sometimes

there can be too much science—that she saved the Bay because she had "never seen anything so beautiful." We need to remember those reasons, said Travis, when communicating with the public.

Dismayed at the lack of discussion of the environment and the Bay at a recent Bay Area Council dinner he attended, Travis told the Estuary conference crowd, "We need to make the case for the Bay in the language most people understand—that of economics." If we sit around speaking science among ourselves, he warned, we will fail to play the role we need to play in political decisions about where the predicted one million new California residents will live and work, how to develop affordable housing for those residents, and how they can avoid spending most of their lives in traffic jams. "We need to better explain, in economic terms, why protecting the natural environment is important to solving these other problems," said Travis.

According to the Joint Venture Silicon Valley's Russell Hancock, the Silicon Valley is starting to think about how the environment benefits its economy, which, he said, is slowly improving in a more sustainable way, without another flash-in-the-pan dot-com boom and bust. "The best way to compete [with other regions] is to provide a fabulous place to live," said Hancock. As Travis put it, with the Bay, we have the "equivalent of a national park in our front yards," where we can swim, fish, sail, and enjoy wildlife. "The decision to save the Bay in 1965 is responsible for our economic prosperity today," Travis reminded the crowd. "[The Bay] is probably the best fringe benefit any Bay Area employer can offer. We need to keep reminding them of how much it's worth."

"With the Bay, we have the equivalent of a national park in our front yards, where we can swim, fish, sail, and enjoy wildlife."

Will Travis, BCDC
