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ESTUARY

THE PRICE OF OIL

Photo by Chris Clarke

The Cosco Busan spill claimed the lives of at least 45 species of birds, ranging from the pelagic northern fulmar and parasitic jaeger to the shore-bound fox sparrow. Some were hit harder than others. First impressions that most of the oiled birds were surf scoters are supported by preliminary data from the International Bird Rescue Research Center. As of November 20, according to UC Davis spokesperson Sylvia Wright, more than twice as many surf scoters had been brought in alive as the next most frequent species, the western grebe. The scoters also headed the list of species found dead, followed again by western grebe.

The top ten species found alive also included eared, horned, and Clark's grebes, greater and lesser scaup, and ruddy duck, common loon, and common murre. All these birds forage by diving from the surface of the water (grebes, cormorants, and murres are fish-eaters, while the three ducks eat benthic mollusks and other aquatic invertebrates.) Other foraging guilds—for example, plunge-divers like terns and pelicans—appear to have been less affected. The main exceptions: western gulls and northern fulmars, significant numbers of which were found dead.

The surf scoter is one of the most abundant birds in San Francisco Bay in fall and winter; over 75% of the North American population congregates here. But local Audubon Society Christmas Bird Counts report higher totals for greater scaup than for scoter, along with substantial numbers for ruddy duck and bufflehead. Location may account for some apparent patterns in the spill. Southern Marin had the highest CBC numbers for western grebe, which ranked second to surf scoter among spill victims; eared grebes, concentrated in the South Bay, had fewer spill casualties.

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INSIDE

SOILED

Shortly before 8:30 a.m. on Wednesday, November 7, the cargo ship Cosco Busan—en route to South Korea from the Port of Oakland—ran into a support post for the Bay Bridge, gashing its fuel tank and sending 58,000 gallons of oil into San Francisco Bay. Initial reports by the shipping company put the size of the spill at 400 gallons. Twelve hours later, local officials learned the results of an initial investigation by state and federal agencies—that the spill was over 100 times the size first reported.

When those first oily drops hit the water, no booms were in place around the ship. So swirling Bay currents spread the oil far and wide—hitting shorelines from San Francisco to Berkeley to Richmond to Marin—affecting birds, fish and other wildlife throughout the Bay and as far out as the Farallons.

The spill couldn't have come at a worse time: thousands of migratory birds spend their winter months in the Estuary. Three weeks after the spill, the official tally of oiled birds (dead and alive) totaled close to 3,000, with potential bird mortality as high as 22,000 (see sidebar). More than half of the birds accounted for died from exposure to the oil.

Pictures of oiled ducks and other birds appeared on page 1 of local papers, and these images drove many people, like Nancy Powell of Albany, to action. She decided on November 9—a Friday—to walk north along the Bay from Emeryville to see if there was oil to clean or birds to save. She found six oiled birds in Berkeley, across from Shorebird Park. No one was tending to them, so she stood there to protect them. While she stood by the birds, more concerned people showed up, including a kayaker who ran up from the water carrying an oiled bird. Nearby, officials were busy discussing the proper way to wear a Hazmat suit. Powell noticed that authorized bird capture teams that were hastily being assembled (consisting of state and federal employees) were poorly equipped. "They had a few trainees, no nets. No towels to put in boxes to take the birds anywhere," says Powell. "They borrowed nets from the Shorebird Nature Center, and they were able to catch a couple of birds on that beach."

Powell had seen a spill on the Bay ten years ago, and she had helped cleaning oiled birds. So she had experience, and serendipitously, she found other would-be volunteers that morning at Shorebird Park with backgrounds in wildlife rescue and a strong desire to do something. The volunteers bought over $500 worth of fishing nets and towels from local stores, and spent the day helping rescue birds in Berkeley. The group also recruited drivers to take birds to the Cordelia wildlife center. Later, the unofficial group (warned that they could be arrested) moved to Albany, where they rescued birds and transported birds being caught by homeless people.

When the group arrived at Hoffman Marsh on the stretch of shoreline curving between Point Isabelle and the Richmond Inner Harbor the third day following the spill, they found oiled birds on the rocks and beaches being chased by dogs and their owners, but no one taking charge of the situation—not even to do crowd control.

"A Richmond fire truck was there, and he said, 'Yeah, I really think this trail should be closed off, but I don't have the authority to do it,'" said Powell, who, along with other members of her group, again took matters into their own hands. They organized a bird-rescue network with people handling tasks such as closing off the shoreline, taking reports of oiled birds along the shore, and catching and transporting birds. Over the course of a week, says Powell, her group rescued over 50 birds.

"The person running the Oiled Wildlife Care Network command center kept trying to tell me, 'You know, there is unauthorized collection of birds going on,'" explains an incredulous Powell. "And the message I kept sending back was that 'you get authorized people out here to cover this waterfront, and we are gone immediately.'"

Powell and others working the Richmond shoreline those first days after the spill say there were a few authorized people on the waterfront in Richmond—but only one or two people in a truck with no cleanup—or bird capture—equip-

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THE PRICE OF OIL, CONTINUED

Other variables may include how susceptible different species are to bunker oil. Compared with crude oil, little is known about the toxicity and persistence of bunker oil, although it has been shown to damage the reproductive systems of laboratory mink. It varies chemically from batch to batch; the exact content of the Cosco Busan's fuel is not yet known. One study found that major oil spills in western Europe doubled the winter mortality of common murres, whether the culprit was crude or bunker oil.

Endangered species affected by the spill include marbled murrelet, western snowy plover, and brown pelican. Several Important Bird Areas, including Richardson Bay, East Shore Wetlands, and Brooks Island were impacted; Brooks Island's breeding Caspian terns were not home.

UC Davis researchers headed by Michael Ziccardi and Greg Massey are using the catastrophe to learn more about care and survival of oiled birds. They plan to analyze blood samples to determine the best predictors of survival and clarify the causes of anemia in spill victims. Up to 30 birds will be equipped with external radio transmitters so their travels and survival can be monitored once they're released.

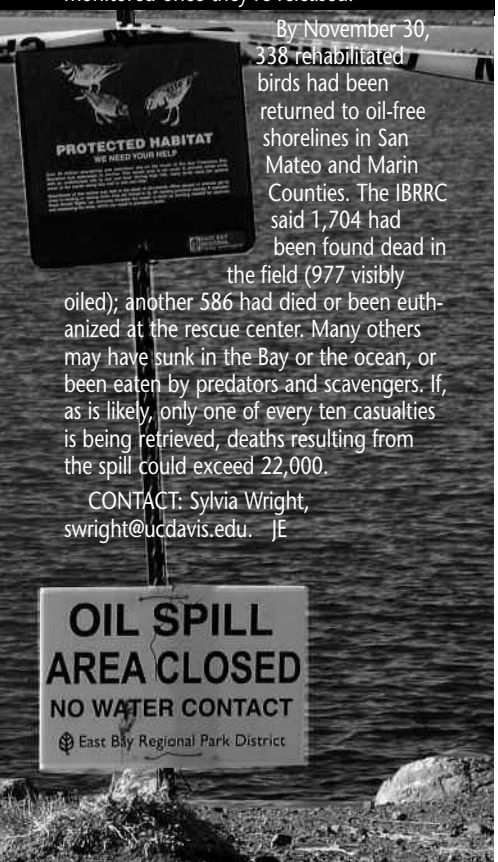


Photo by Kristi Coale

By November 30, 338 rehabilitated birds had been returned to oil-free shorelines in San Mateo and Marin Counties. The IBRRC said 1,704 had been found dead in the field (977 visibly oiled); another 586 had died or been euthanized at the rescue center. Many others may have sunk in the Bay or the ocean, or been eaten by predators and scavengers. If, as is likely, only one of every ten casualties is being retrieved, deaths resulting from the spill could exceed 22,000.

CONTACT: Sylvia Wright, swright@ucdavis.edu. JE

SOILED, CONTINUED

ment. In some cases, agency representatives were lost and needed directions—and offered little in the way of help. Late Saturday afternoon, a truck of workers from the Contra Costa Hazardous Materials Program came on their own authority to clean the county beaches and boom off the shoreline.

"They are real heroes in my book," says Powell. "Because the Coast Guard apparently told all of the local agencies to wait for direction from them and Contra Costa said, 'Nope.'"

But because this was the third day after the spill, some of the work of the county hazardous materials workers had little effect—booms they were able to put into the Bay actually hemmed in the oil along the shoreline. Powell and others say these workers were frustrated at not hearing sooner about the extent of the spill. And they were hamstrung by a lack of proper equipment. "They actually wanted to boom off the Richmond marsh, but they couldn't get a boat," says Powell.

The California Office of Oil Spill Prevention and Response ("OSPR")—under the aegis of Cal Fish & Game—created a map of the Bay showing the areas hardest hit by the spill. Richmond, which, at 32 miles of shoreline, is the city with the longest coastline on San Francisco Bay, is identified on the map as among those areas. Hot spots included Brooks Island, home to a bird sanctuary, and Barbara and Jay Vincent Park, one of the locations where Powell and her fellow volunteers worked. With the exception of two bird capturers from International Bird Rescue who showed up on Monday and her grassroots group, says Powell, no one from state or federal agencies rescued birds in Richmond that first weekend.

The experiences of Powell and the others in Richmond is a microcosm of the situation elsewhere. The Environmental Water Caucus' David Nesmith reported a similar fiasco along the Oakland shoreline. "It's a scandal to have all of this human infrastructure potential [volunteers] out there and to not have used it. I think OSPR completely screwed up on this." Local officials including Berkeley Assemblywoman Loni Hancock also wanted to know why events unfolded the way they did; Hancock convened the first hearing looking into the spill in Emeryville on November 15, nine days after the spill.

Present at this hearing was Greg Hurner, deputy director of OSPR. He brought a four-inch thick binder and recited chapter and verse from it regarding the procedures followed by the agency, the gallons of oil recovered, the numbers of skimmers on the Bay, and even the amount of boom deployed. Still, none of that placated Hancock. What she wanted was accountability.

Photo by Ron Sullivan

"So my question to you, really, would be ... in your best professional judgment, what went wrong?" Hurner replied, "I'm not saying that anything went wrong."

Members of the packed audience gasped and shook their heads in dismay at his response. Hurner was not alone in this assessment. Four days later, at a hearing in San Francisco's Presidio, a U.S. Congressional delegation that included House Speaker Nancy Pelosi (D-San Francisco) and Congressman George Miller (D-Martinez), U.S. Coast Guard Rear Admiral Craig Bone deemed the cleanup effort, "one of the most successful cleanups I've ever experienced." Sylvia Wright, with the Oiled Wildlife Care Network at UC Davis, said that "While questions remain to be answered about the spill response itself, there is no doubt that the wildlife rescue effort was as successful as it could possibly have been, thanks to long-range planning and advance training of 1,000 wildlife rescue individuals from throughout the state." Pelosi did not agree. "The people we represent are not satisfied with this response," she said.

Nor were some of the authorized wildlife responders on the shoreline who spoke anonymously out of fear of losing their jobs. Said one, "I really, really, really don't want to be left in the field again in California with only one dipnet for equipment with 20 miles of shoreline to patrol with hundreds of oiled birds everywhere I look. Fish and Game has million of dollars to care for these birds, and I get one lousy dipnet?"

As ESTUARY went to press, Hancock was holding another hearing and Pelosi pledged that Congress would continue its probe; five Assembly members have drafted new spill legislation while five senators have demanded an independent audit of Cal Fish & Game. Unified Command—a joint agency made up of the Coast Guard, Cal Fish & Game, and O'Brien Group, the firm hired by the shipping company to deal with the spill—began cleaning the Richmond Shoreline on November 15, nine days after the accident. KC

CONFERENCE WRAPUP: A GREENER BLUE?

The theme of this year's State of the Estuary conference was "A Greener Shade of Blue," and the conference returned a mixed verdict on whether or not the Estuary and its watershed are in fact "greener." On an unusually rainy October morning, Oakland city council president Jean Fong welcomed a crowd of nearly 600 people to the Scottish Rite Center on Lake Merritt's shores, reminding them that water quality and restoration are a priority for Oakland, which was recently named the country's fifth-most-sustainable city and has passed Measure DD, which provides $200 million to restore Lake Merritt and Oakland's creeks. Following Fong, ABAG's Henry Gardner, the Bay Area Council's Jim Wunderman, NRDC's Barry Nelson, Delta Vision Blue Ribbon Task Force's Phil Isenberg, BCDC's Will Travis, and Redefining Progress's Michel Gelobter brainstormed about the role of the Delta in the future of the Bay Area.

"How can we balance social justice, sustainable development, and the environment while moving forward with the Bay-Delta?" asked Gardner. "Many cities granted conditional use permits in the communities closest to the Bay in low-income and minority communities to support a variety of business activities. That had a devastating impact on some of those communities, conditions that persist today."

Wunderman spoke of the Bay's importance, both as a draw for tourists, with 260,000 area jobs devoted to tourism, and as a major attractor of new residents. He also spoke of the Port of Oakland's importance as the fifth-largest port in the United States and as a provider of blue-collar jobs. "The Port of Oakland has tremendous expansion capabilities consistent with the environmental sustainability of the Bay," Wunderman declared. "It's underutilized as a transportation mechanism." Wunderman assured the crowd that the business community sees the health of the Bay-Delta as critical.

BCDC's Travis jumped right to climate change. He predicted that all of the Bay previously lost to fill will eventually be reclaimed by Bay waters. Other manifestations of climate change will include more frequent storm surges, heavy rains, high tides, and high winds, plus extended droughts and wildfires, he warned.

"[Climate change] will have profound local impacts. We need a plan that anticipates that." But the devil is in the details, he admitted. "How do we plan a region and a Bay that will surely get bigger? We are going to have to build a lot of levees that are big enough and strong enough to hold back floods around the airports. We also need to take a hard look at where it might be most cost-effective to remove existing developments and replace them with wetlands, which absorb floods and sequester carbon." Also on Travis's to do list: "abandon any future plans to develop low-lying areas." Said Travis, "We need a plan for the Estuary that is bold and audacious. We've got to stop talking about how to restore it to the way it was; we need to design for different elevations, chemistry, species, to do proactive management. The issue is not whether we are playing God—we are already doing that—but how to get it right."

Isenberg addressed the Estuary's political geography. "Why are the Bay and Delta two different political regions despite being connected? I say it is a pure artifact of notions of regional self-importance—it's human nature that each of us is the center of the universe." Isenberg told the largely Bay Area crowd "your strength is your weakness. You agreed on what it meant to save the Bay, playing to the strength of regional importance." But now, the forgotten Delta must take center stage, said Isenberg. The Delta Vision Task Force was charged with creating a plan to protect and improve the Delta ecosystem, said Isenberg, while at the same time protecting and improving the state's water supply system. "The Delta ecosystem is going to hell. Not one person or organization has said that the Delta is in good shape. [The Delta issue] is collectively much more than the Bay Area because it's the transfer point of all the water that comes in. Where should the state go on the question of the ecosystem?" Isenberg pointed out that it is not just the swimming pools of Southern California and Coachella Valley taking water from the Delta; it is also—and has been for a long time—the Bay Area. "It can't be 'our water projects are good, and theirs are bad.'"

"The issue is not whether we are playing God—we are already doing that—but how to get it right."

NRDC's Nelson presented himself as the "panel historian," taking the crowd through key dates in the Bay's history and how its role has changed from when it was discovered by Europeans to mining and commercial interests to the building of the Central Valley Project, which he christened "the dawn of the golden age of the hydraulic frontier. We built the highest dam in America, the most elaborate plumbing system, and the largest pumps on the face of the planet. It was an astonishing accomplishment." But the frontier has closed, said Nelson. There are alternatives—cheaper ones—to pumping more water, he said. "We could divert less, invest in recycled water, and save energy and greenhouse gases. We need to ask ourselves whether we are entering the era of sustainability or collapse."

Redefining Progress's Gelobter drew parallels between Hurricane Katrina and New Orleans and the potential for similar disaster in the Delta if we don't take action to prevent it. If we were to be pro-active in fixing the Delta, said Gelobter, "we could be a model for the world." The panel session concluded with Gardner asking what the business community can do to help protect the Bay and Delta. Wunderman responded that we need to focus on better integrating transit and development. "We made a mistake," said Wunderman. "We screwed it up by not having the proper balance between housing and public transit. But we're beginning to get it. It's time to focus on the urban core and develop a transit system that supports it. We have to figure out how to overcome the resistance to change that is inherent in the business community."

The late morning and afternoon sessions were devoted to presentations on important changes in the Estuary and how they will be managed. The S.F. Regional Board's Tom Mumley suggested that with new pollutants constantly emerging and possibly affecting water quality, the state should consider adopting a "California product stewardship council" that would require manufacturers to adopt a "cradle-to-cradle" approach for their products in order to reduce waste and pollution. The Board's Richard Looker built on that theme, pointing out how many societal benefits have a parallel environmental impact: controlling pests can equal aquatic toxicity; preventing fires can lead to PBDEs in the Bay and its wildlife; health and beauty products not removed in wastewater treatment can disrupt endocrine and other functions in fish; the products and processes leading to economic health have often led to long-lived environmental contaminants.

Another emerging challenge for Estuary resource managers is climate change (and associated sea level rise). The SFPUC's Michael Carlin discussed how urban water managers are trying to cope. "The San Francisco water supply is going to be rain dominated instead of snow dominated," said Carlin. The SFPUC plans to diversify its water sources, he said, by becoming part of a Bay Area-wide regional desalination project, by relying more on groundwater, and by using graywater to flush toilets.

U.C. Berkeley's Matt Kondolf also discussed the impacts climate change will have, particularly on the Delta, which he warned could be "New Orleans East." "We have created the same

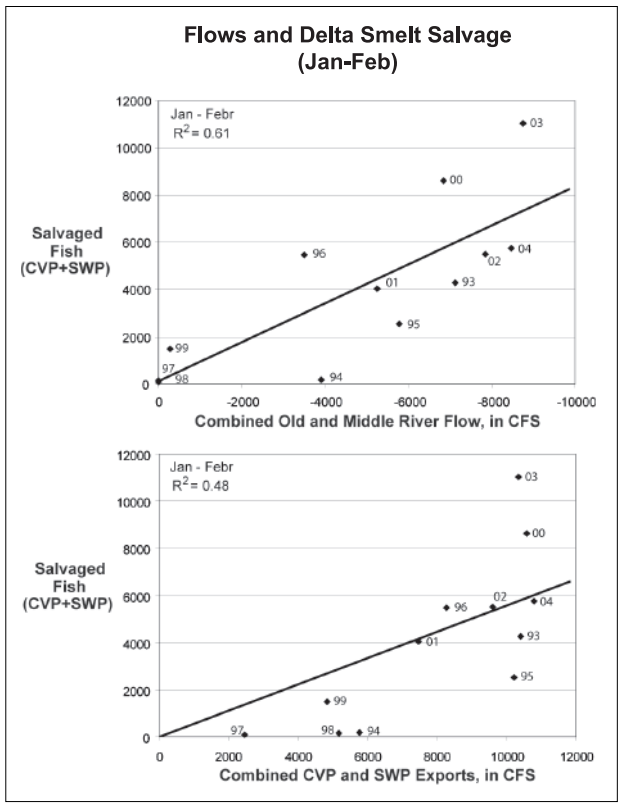
conditions for a similar disaster in California," he said, describing how levees raise the flood stage. "The Delta region is growing faster than Mexico. Housing below sea level will inevitably flood."

SFEI's Josh Collins said scientists need to come up with a new set of tools for simulating habitat response to climate change, in order to make choices among scenarios. "Tracking change is not enough," said Collins. "With the increased rate of change, wetlands won't be protected. Wetlands should be viewed in their watershed context. There's a logical progression from watershed-based wetland planning to protection."

One positive change in Estuary management, according to BCDC's Steve Goldbeck, is the progress made in using dredged spoils for beneficial uses—i.e., wetland restoration projects. Since the Long Term Management Strategy (for dredged materials) was implemented in 1993, said Goldbeck, the volume of material disposed of in the Bay has been reduced by 50%. "Our long-term goal is to have no more than one million cubic yards per year of in-Bay disposal," said Goldbeck. "We are halfway there."

And Cal Fish & Game's Susan Ellis described another positive change, exemplified in how her agency responded rapidly to the quagga mussel invasion. "We had a unified response using incident command with state and federal agencies, Metropolitan Water District, the City of San Diego, and a multi-state quagga team. We have them contained in Southern California right now."

The afternoon session focused on important changes to aquatic resources and wildlife—fish, mammals, and birds—in the Estuary. DWR's Ted Sommer reviewed the state of the latest science on the "pelagic organism decline" (POD) of Delta and longfin smelt, threadfin shad, and striped bass. Probably the most pressing—and as yet unanswered—question is whether Delta smelt have dropped below critical population levels. As far as the cause of the decline, said Sommer, scientists are asking themselves where anything has changed in the Delta, and how and why. In 2007, there was increased toxicity in the Delta from contaminants and toxic algae that moved into core Delta smelt habitat, a decline in recruitment and habitat quality, reduced food availability due to invasive species, and increased mortality. There was also more smelt mortality at the pumps in recent winters when pumping increased to the point of creating negative flows in Old and Middle rivers, said Sommer. "At this very moment, scientists from all over the world are trying to figure [the POD] out," said Sommers.



U.S. EPA's Bruce Herbold built upon Sommer's talk, telling the audience that "scientists have found a lot of what caused the POD, but that's not going to solve the problem. Everything else is secondary to the fact that there are not many fish out there." Herbold said that genetic diversity in the smelt population may be so low at this point that the viability of their offspring is affected. Another problem is that their fall habitat has shrunk and moved eastward. Why? "We've stabilized flows," said Herbold. "They used to be very variable." Herbold suggested that the Delta has become more like a lake. "This means less estuarine fish. The POD may have been a tipping point—from a variable estuarine system to a steady state/lake-lagoon type of system."

Fish & Game's Kathy Hieb broadened the focus from the Delta to the Pacific Ocean, describing how changes in ocean temperatures and nutrients are affecting the Estuary's aquatic critters. In warm water years, Dungeness crab have poor embryo and larval survival, while Pacific herring, which go back and forth between the Bay and the ocean to spawn and rear, respond poorly to El Niño years. "They prey on zooplankton," said Hieb. "When the ocean is warmer, there are less zooplankton." With warmer ocean temperatures, Hieb predicted, there will be poor recruitment of cold temperature species, and migration to the Bay of more warm water tropical species. She also predicted more "dead zones" from toxic algal blooms, caused by the increase in nutrients resulting from warmer water.

U.S. Fish & Wildlife's Joelle Buffa switched the focus to mammals, discussing the state of the endangered salt marsh harvest mouse and harbor seals at South Bay refuges. Buffa described how managers have taken various actions, including acquiring land, removing fill, reintroducing tidal action, and conducting other water management activities, to aid the mouse. In one instance, they created a "mouse pasture," transplanting mice from a proposed development site and tracking them afterwards. "We learned that the mice do colonize new habitats, and that salinity is important [to encourage pickleweed growth]," said Buffa. "Translocation can be successful where the population is low and where you create high tide refugia."

USGS's John Takekawa presented an avian perspective on the Bay—which, because there are so many species of birds with such different lifestyles—is complicated. "If you don't have long-term data, it is very hard to make sense of complex phenomena," said Takekawa. He and his colleagues are now studying the movements of individually marked birds. One surprise was that the South Bay's Colma Creek, surrounded by industry, is one of the most important spots for clapper rails in the entire Bay. With multiple restoration projects taking place around the Bay, said Takekawa, resource managers need to keep looking at all of the projects from a bird's eye view to evaluate their effects. He added that migratory birds responded quickly to South Bay salt pond restoration, with overall numbers increasing at the ponds. "But will mudflat values be decreased?" he asked. "A small change in the elevations of mudflats could make a different to shorebirds if we start having sea level rise. Their time for foraging could be decreased, along with a corresponding decrease in population."

The morning session of Day Two refocused on the Delta. The CALFED Science Program's Michael Healey said that as sea level rises, new development will need to be better planned to reduce the risk of flooding. "The Delta of the future is not going to be the same as today," said Healey, echoing Travis's comments about the Bay. "We need to plan and design for a Delta that will deliver the services we value." Healey also stressed the need to "monitor and massage" what's happening in the Delta. "There are no right or wrong solutions; just better or worse. We need to take a much more adaptive approach. As soon as you impose one solution, the system changes in response, and you have a whole new set of problems to deal with."

The Public Policy Institute's Ellen Hanak gave an overview of the Delta's value to society—water supply, agriculture, ecosystems, infrastructure,

recreation, and hunting, among others. With the housing market slowing down at least temporarily, said Hanak, there might be a short-term opportunity to make changes in the system. "There's the real possibility that we could encounter big problems in the Delta before a new management strategy is in place. There's a two-thirds risk of a catastrophic failure over the next 50 years, with earthquakes and sea level rise. What this means in terms of those services is that the 'bowls' [described by PWA's Phil Williams, see below] in the Delta would be filled with water coming from the Bay. We would have to shut down the pumps for a while. We can't go back to the Delta of 150 years ago, but we can't stand still either," said Hanak. "The Delta's fragility is California's central water management challenge." Hanak concluded by predicting that "everyone will not get better together in the Delta of the future."

USGS's Dan Cayan told the crowd that sea level rise in S.F. Bay has followed the historical patterns of global sea level rise, predicting that "we can expect both a drier and a more hazardous water future, and a saltier Bay-Delta environment compared with the historic environment." Cayan also predicted that a sediment deficit will probably be a characteristic of the future Delta and said that warming temperatures are approaching lethal limits for fish. "For some fish species in the Delta, an increase of a couple of degrees could catapult the situation into catastrophe."

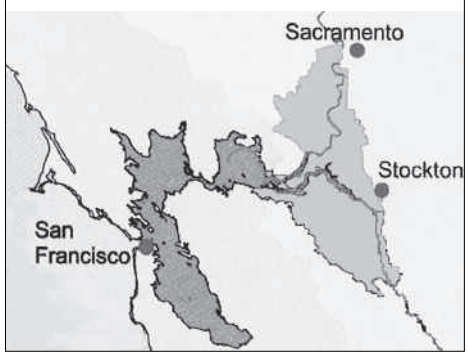
DWR's Ralph Svetich described the ongoing Delta Risk Management Strategy study examining the fragility of the Delta's levees. Phase 1 examined the risk to Delta levees from earthquakes, floods, sea level rise, subsidence, and a combination of all of those occurrences. An independent review panel was critical of the report, and a revision is pending. Phase 2 will evaluate individual risk reduction strategies based on risks found in Phase 1. So far, said Svetich, the preliminary phase 1 results show a risk of island inundation in flood events, with a high probability of failure for western and central Delta islands, a finding that closely matches U.S. Army Corps models.

The Suisun Resource Conservation District's Steve Chappell reminded the audience of the importance of Suisun Marsh, the "forgotten link" between the Bay and Delta. Chappell described the river otters, salt marsh harvest mice, short-eared owls, Suisun thistle, and other native and non-native species, including fish, that live in and around the marsh, and the many migratory waterfowl and diving ducks that use it. Chappell also described the programmatic CEQA/NEPA process underway for a Suisun Marsh management plan that includes some tidal marsh restoration. "Opportunities are better in Suisun Marsh for restoration than in the Delta," said Chappell. "It is not as subsided." Of course all restoration is predicated on willing sellers, stressed Chappell. "Salinity intrusion is a big issue," said Chappell. "As are mercury and carbon. We have to consider those in plan implementation."

Following on the carbon theme, USGS's Roger Fujii described how a pilot project at Twitchell Island flooded tules to encourage decomposition, and rebuilt subsided soils at the same time. As the tules die and decay, the marsh sequesters carbon dioxide at higher rates than agricultural fields. With microbial decomposition offset by biomass accretion, the land surface builds back up. Fujii reported elevation gains of up to four inches per year. By increasing accretion rates to nine inches per year, the Delta's accommodation space (the "huge hole" described below) could be reduced by 70% in five years, said Fujii. The amount of carbon dioxide sequestered would equal the reduction in emissions if all the SUVs in California were swapped for Priuses, said Fujii.

The afternoon session broadened the focus to the question of how to integrate restoration into managing watersheds for flood protection, recreation, water supply, and a laundry list of other beneficial human uses. First up was PWA's Phil Williams, who stressed that any management actions taken to improve the Delta will also affect the rest of the Estuary. "We've created a massive hole—up to 20 feet below sea level—on 340,000 acres of farmland behind levees in the Delta," said Williams. "I don't believe we've fully grasped how this will affect physical processes and how that will affect the rest of the Estuary." That huge hole is subsiding about six times faster than sea level is rising, said Williams, which means that, in a "doomsday" scenario, a large portion of this volume could end up in tidal waters. "The whole tidal Estuary could get a lot bigger," said Williams. "The area of San Francisco Bay would be doubled, but just as important, the physical processes—the tides, the movement of saltwater and sediment that sustains the Bay—could be significantly altered."

The Doomsday Scenario: An Estuary Twice as Big



PWA

U.C. Berkeley's Mark Stacey moved south, to the salt pond restoration project, discussing its possible effects on the rest of the South Bay. In a study of the island ponds adjoining Coyote Creek, Stacey found that as more water moved up the creek through the breaches into the ponds, there was an increase in the tidal prism, but the effects of the changes were different across different phases of the tides. "When you open up the restoration sites to tidal action, it dissipates the funnel effect that characterizes the far South Bay, which could change the inundation regime for high marsh habitat," said Stacey. A decrease in amplification is good for diminishing flooding, but bad for marsh habitat. And because sources of sediment for the restoration project are "down Estuary," the restoration sites are not going to capture much sediment, said Stacey. There is very little sediment coming in directly from the watershed; instead the sediment that does reach the restoration sites is likely to be coming from the far South Bay via recycling by tides and winds.

Moving to the North Bay, the Sonoma Land Trust's John Brosnan discussed the realities of trying to integrate watershed and wetlands restoration planning. Brosnan said his agency is trying to achieve the goals set forth in the Baylands Ecosystem Habitat Goals Report and the CCMP. Yet, using the ongoing Sears Point Restoration Project as a case study, he showed how constraints like flood protection, invasives control, remediation, multiple users, sea level rise, and physical infrastructure—in this case Highway 37 and a rail line—are not only splitting up the landscape, but also "dictating what we can and can't do with integrating wetlands and tidal wetlands." Having a rail line there triples the cost of restoration, said Brosnan. "Once the agricultural levees are taken down [for restoration], we have to build bigger, stronger levees for the railroad and Highway 37 because of sea level rise." Despite "huge buy-in" from neighbors, ranchers, and farmers, said Brosnan, "the highway and railroad [which refuses to help defray the costs] are driving the outcome."

SFEI's Letitia Grenier stressed the need to give wildlife conservation equal stance with flood protection and clean water supply. "It's all part of the same goal," said Grenier. "Wildlife inhabit landscapes. What we do in the Bay affects the whole flyway. There are four to five million birds coming through here. How can we act on a landscape scale to keep them here?" Our modern landscape has seen a huge loss of connectivity, she said. "We have the tools to plan for providing better connecting habitat for wildlife, but we lack a common vision. We haven't really specified what our wildlife goals are. Instead, we are stuck waiting for a crisis. How can we invest earlier in landscapes for wildlife?"

Citizens Committee to Complete the Refuge's Arthur Feinstein offered a pragmatic perspective

of wildlife conservation around the Bay. "What's not to be thrilled about?" asked Feinstein. "We have over 100 species of wildlife and plants listed as endangered or threatened. No Bay Area species has yet been delisted." As solutions, Feinstein suggested that we need to focus on habitat diversity, links between habitats, bigger areas of habitat, and freedom from human harassment. Public access has had a negative impact on wildlife, said Feinstein, citing birders who harass the birds they are watching and boaters who disturb resting ducks on the Bay, as well as development near sensitive areas, such as the least tern habitat at the old Alameda Naval Air Station. "Once you get people into wild areas, even urban areas, you're going to lose your diversity," said Feinstein. "Even in very dense areas, if you keep people away, there are nice wildlife effects. If we want full environmental restoration and large diverse habitats," concluded Feinstein, "we also need to control *us*."

Coastal plant ecologist Peter Baye addressed the fact that many of our tidal marsh restoration projects have not included rare plants that could be collected from remnant sites and propagated, helping to ensure their survival as species. One example is a rare salt marsh owl's clover that still exists in Whittell Marsh near Point Pinole. "Almost none of these rare species are finding homes in tidal marsh restoration sites," said Baye. "Even where there are well-developed marsh plains and channels, 30 years later [these restoration projects] still support only the most common tidal marsh species." Discussing the restored Muzzi Marsh, Baye pointed out that no uncommon species have dispersed from nearby Heerdt Marsh, the oldest prehistoric marsh in the area, to colonize Muzzi. Baye ended with a series of recommendations for encouraging diversity, including designing restoration marshes more creatively.

Creativity has been critical in restoring the Napa River, according to Napa County Flood Control's Richard Thomasser, who described the history of this multiyear, multi-stakeholder, multi-objective effort. After the Army Corps presented a plan to channelize the river in concrete in the 1960s (and again in the 1990s), the community demanded that any plan for flood control also be a plan for a "living river" that would connect the river to its historical floodplain. As a result, the consensus-based project includes a geomorphic channel design that will restore proper sediment transport balance, and the creation of 650 acres of wetlands. Five major bridges are being made higher and longer to free up hydraulic constrictions, and to span the channel and the new marshplains, said Thomasser; two bridges were completely rebuilt. "The river and habitat now have some room to move."

The S.F. Regional Board's Bruce Wolfe gave an overview of his agency's efforts to protect both rivers and marshes. "We're better regulating development of upland areas," said Wolfe. "We are now trying to manage flows better than we have and the changes in runoff patterns that development causes." Wolfe said his agency no longer takes water quality-based effluent limits from a national list, but instead tackles them on a statewide and regional basis. "TMDLs are really watershed plans," said Wolfe. "We are now looking at wetlands and streams as a physical unit. Wetlands are really the deltas of riparian systems." Another change at his agency, said Wolfe, is recognizing that riparian zones have many benefits.

"Their fight upstream is both mysterious and inspiring. Returning these wild creatures provides something to us as well."

The Coastal Conservancy's Steve Ritchie built upon the "deltas" idea. As the salt pond restoration project nears the end of its five-year planning process, said Ritchie, "what about the ponds' connection to local watersheds?" But making that connection might be complicated. "It's flood protection with restoration, not just a fun little restoration project," said Ritchie.

Perhaps the most poignant example of trying to integrate restoration into watershed management and water supply was that of the long-term efforts to restore steelhead to Alameda Creek, the focus of the afternoon session. The National Marine Fisheries Services' Maura Moody started off by describing the recovery plan being drafted for Central California Coast salmon and steelhead. The Center for Ecosystem Management and Restoration's Andy Gunther said that the creeks that connect to the Bay are under increasing pressure. "Choosing restoration will require that we conduct experiments on how to restore steelhead trout. Their fight upstream is both mysterious and inspiring. Returning these wild creatures provides something to us as well," said Gunther. The lifecycle and impact these fish have had over time, said Gunther, give them the cultural status of "charismatic megafauna. Steelhead can drive ecosystem management: They use an entire watershed in their lifecycle. They can help preserve the landscape for future generations," said Gunther.

The Alameda County Water District's Eric Cartwright described some of the physical barriers that will need to be addressed to restore passage for these fish. "The question is how to provide passage through the flood control channel while keeping the existing benefits the channel provides," said Cartwright. When the Army Corps built the channel, it did not provide for fish passage, said Cartwright. However, the Water District has decided after conducting several studies that the District can remove the lowest rubber dam and keep it out of the channel permanently. At the upper rubber dam, the District will build a fish ladder and install fish screens at several intake structures. Other challenges include funding and instream flows.

The Alameda Creek Alliance's Jeff Miller gave an historical overview of steelhead presence in the watershed, describing how Calaveras Dam, built in 1925, cut off access to the best habitat. The watershed also supported coho and Chinook salmon at one time, said Miller, and remnant steelhead runs persisted until 1964. Today, steelhead are still trying to make it up the creek, despite its obstacle course. But attitudes have changed during the last two decades, and during the last decade, 27 fish were successfully caught and moved upstream by volunteers, dramatizing the need for fish passage improvements. "The visibility and persistence of these fish in showing up every year has galvanized us," said Miller. The Alliance now has more than 1,500 members and more than 15 agencies cooperating in restoration. Genetic analysis of landlocked fish and anadromous fish below the dams show that their genes are closely related. "The biggest question is whether there will be enough water left in the stream," said Miller. "Right now, none of the agencies releases flows for fish. The draft EIR [for the Calaveras Dam replacement] does not allow for minimum flows for fish. We're hoping to work with the SFPUC to address the impacts of these dams." LOV

POLLUTION: CAN WE CLEAN IT UP?

First off on Thursday morning, the Marine Mammal Center's Denise Greig described her studies of Bay harbor seals and emerging contaminants. "They eat at the same trophic level humans do," said Greig. "PBDEs in San Francisco Bay seals increased between 1989 and 1998. They also have mercury, lead, PCBs, and DDT in their bodies." Between 1989 and 1998, the PBDE levels were higher even than those of contaminated Baltic Sea seals, said Greig, adding that PCB concentrations in healthy Bay seals appear to be decreasing, while DDT metabolites are increasing. "So even though those contaminents are banned now, they get stirred up from the sediment, are present in harbor seals, and passed from mother to pup," explained Greig. The latest worry is

PFOS—perfluorooctane sulfonate—another flame retardant. "We only have a small sample so far, but the levels are high compared to Artic polar bears and ringed seals," said Greig.

Greig was followed by Collin Eagles-Smith, who described the risk to Bay birds from mercury. Eagles-Smith examined mercury concentrations in surf scoter, American avocet, black-necked stilt, Forster's tern, and Caspian tern adults, chicks, and eggs, finding mercury concentrations to be highest in Forster's terns, followed by stilts, Caspian terns, scoters, and avocets. Risk to hatching success is greatest in the South Bay, and 58% of breeding Forster's tern adults and 46% of their eggs exceeded toxicity thresholds established for other birds, raising the question of whether population impacts might be occurring. "This is striking and concerning," said Eagles-Smith.

Kevin Kelley from CSU Long Beach moved from birds to fish, describing the results of his studies on Pacific staghorn sculpin and shiner perch. He has found PCBS, PAHs, and chlorinated pesticides in the livers of both species, as well as evidence of endocrine-disrupted states. "Endocrine disruptors serve as biomarkers of environmental perturbations," said Kelley. "We have indeed seen endocrine disruption in the Bay in different fish species. We consistently find impairment near publicly owned treatment works sites," said Kelley.

Tracy Collier of NOAA and Sandie O'Neill of the Washington Department of Fish & Wildlife described their agencies' collaborative work on toxics in Puget Sound, pointing to the need for a biological observation system for toxic contaminants. "If you just look at the sediment community profile relative to other estuaries and bays, Puget Sound is not that contaminated," said Collier. Yet biologically based monitoring has shown contamination of the pelagic food web, including PCBs in herring, said Collier. "You would not have predicted that from sediment and water measurements."

Steve Bay, of the Southern California Coastal Water Research Project Authority, wrapped up the session on the biological effects of pollution. Bay showed how his project uses a "multiple lines of evidence" approach to integrate chemistry, toxicity, and benthic fauna data to provide an overall assessment of sediment conditions in California. Most of S.F. Bay fell into the "possibly impacted" category. "We were surprised; we were expecting to see 60% of Bay sediments as having 'little or no evidence of impact,'" said Bay. "Instead, a very high amount turned out to be possibly impacted." Eighty percent of monitoring stations showed significant sediment toxicity, said Bay.

Midday, talk turned to trash, specifically to the overwhelming plastic problem in the Estuary, its creeks, and the ocean. Moderator Larry Kolb estimated that the number of plastic bags—a frequent visitor to the Bay and its creeks and stormdrains—being used by the public averages out to one bag per person per day. In the Bay Area, with seven million people, said Kolb, if only one in 1,000 people uses a plastic bag, that would still amount to 7,000 bags per day. Save the Bay's David Lewis described the overall potpourri of trash in the Bay. "It's not from ships, but from us," said Lewis, adding that only 20% of water-borne trash comes from boats. Lewis said big sources of trash in Bay creeks are overflowing or inadequate trash receptacles and direct littering and dumping of household garbage. But Lewis emphasized that the biggest problem is plastic. "Ninety percent of it will take years or decades to decompose; when it reaches the ocean, cold saltwater tends to preserve it."

Possible partial solutions include Governor Schwarzenegger's newly formed Ocean Protection Council (tasked with tackling trash) and Coastal Cleanup Days (in 2006, more than

The Guadalupe River in San Jose, flowing with plastic

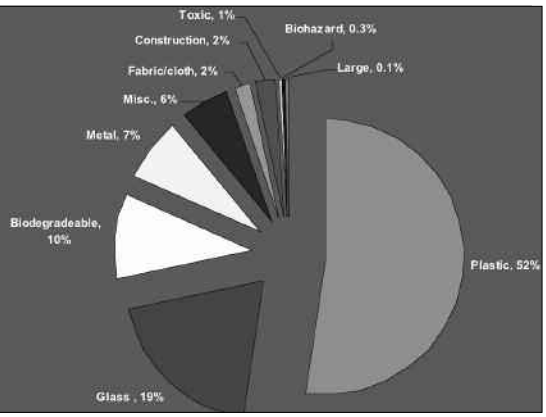
686,000 pounds of trash were removed from the Bay shoreline in a single day). Save the Bay is using ad campaigns to try to change people's behavior while some cities are implementing source reduction, banning plastic bags and Styrofoam food containers. Lewis would like to see the S.F. Regional Board implement stronger stormwater permits regarding trash. Trash separators and booms will work but not unless they are mandatory, said Lewis. "The Water Board could require significant trash reduction. Save the Bay has presented thousands of petitions asking the Board to do so." Lewis also described "end-of-pipe" capture nets used in Southern California that help divert trash before it ends up in the ocean. Lake Merritt is one of the few places around the Bay where vortex separators (mechanical devices) are being used to collect trash. The lack of effort to do so elsewhere around the Bay "should be an intense source of shame," said Lewis.

Lewis was followed by Nute Engineering's Steve Moore, formerly of the S.F. Regional Board, who, while working there, designed and undertook a "trash rapid assessment" study to examine the sources, patterns, and amounts of trash in Bay Area waterways. With Board co-workers, Moore surveyed 26 creeks around the Bay, from Petaluma to San Mateo, looked for longitudinal patterns in the watersheds they surveyed, and performed return surveys to determine the trash return rate. Oakland's Peralta Creek scored the lowest of all of the sites, polluted with human waste and syringes. "We had to stop out of concern for our own health at one point," recalled Moore. On 93 site visits, Moore's team picked up more than 25,000 pieces of trash, or three pieces for every foot of stream. Half of the trash was plastic, followed by glass and paper. The highest trash deposition rates were found in both wet and dry weather. "We have to address trash in the dry season, too, not just after the first flush," said Moore. "It's either being tossed, washed, or blown in." Not surprisingly, the worst sites tended to be located at the bottoms of watersheds that receive runoff from an entire water- or pipe-shed. "As the low point in the landscape, these streams are sticky places," said Moore.

"It shows you that if you care about the Bay, you have to care about the creeks. Streams are the likely main pathway of floatable plastic to marine waters, and our trash levels are not improving but perhaps getting worse," said Moore, who added that he found trash in watersheds across all socioeconomic strata. "We need to invest in structural or other solutions and address it in a systematic way," concluded Moore. "Trash is today's sewage."

The next trash talker, the City of Oakland's Leslie Estes, described herself as a "visitor from the real world." Oakland has a toolbox of strategies for dealing with trash, Estes explained, from anti-littering programs in schools where street sweepers interact with kids, to "adopt a spot" cleanup programs with citizens, to enforcing penalties for illegal dumping, conducting clean creeks campaigns, and hiring kids to go out and pick up trash. The city recently banned non-biodegradable takeout containers and established an "excess litter" fee for all food facilities. It tried to implement a plastic bag ban like San Francisco's but was sued. It has also installed a boom across the mouth of Damon Slough (a trash "hot spot") and is targeting other known polluters upstream of the slough, like the Oakland Coliseum and flea market. But nothing is simple, says Estes. To install the boom, they had to build a road to service it and buy a truck to hold a crane. After the first flush, says Estes, as much as 6,000 pounds of trash is removed from the boom, an act that requires several days of cleanup. The city received $4.5 million from Measure DD to install structural controls at Lake Merritt. "This is our jewel, and it's trashed," said Estes. " The city is also installing drain inlet baskets (which need frequent maintenance) and stormwater separators in various watersheds. But these projects, says Estes, "are a big deal and mean big construction." Oftentimes, construction interferes with underground utilities, and being an old, built-out city, Oakland is full of

S.F. REGIONAL BOARD TRASH RAPID ASSESSMENT RESULTS



Steve Moore

surprises in that regard, said Estes. Her conclusion? "We would like to find the key answer but I believe the solution is a combination."

Estes was followed by Mark Cuneo of Santa Monica, who, after assuring the largely Bay Area audience that, unlike the stereotype of a Southern California water-sucking city, Santa Monica plans to be 80% independent from imported water by 2010, described his city's efforts to tackle stormwater pollution. Santa Monica only receives 14 inches of rain per year, but, surrounded on three sides by Los Angeles County, it receives plenty of trash in runoff. Ballona Creek and the Los Angeles River have been put on the 303(d) list of impaired waterways due to trash (their mouths have had trash booms installed), and a trash TMDL has been put in place. "If you can avoid litigation over TMDLs and regulations, you're way ahead of the game," he advised. Over the past 10 years, Santa Monica has spent $120 million installing catch basin insets and screens, and a state-of-the-art stormwater treatment plant. In dry years, the city also "boards over" storm drain inlets to keep trash out. "But trash doesn't magically disappear out of these things; we have to do the maintenance," said Cuneo.

The afternoon session segued from trash back to other pollutants and what to do about them. SFEI's Lester McKee reported on our state of knowledge about pollutants in the Bay, citing PBDEs here as among the highest in the world. Pollutants in stormwater continue to prevent the Bay from achieving better water quality, said McKee, and though recent TMDLs call for significant reductions in mercury and PCBs, we do not have enough information about where the highest concentrations occur and how they cycle through the urban environment. However, he added, recent, first-of-their-kind studies have demonstrated that PCBs probably linger in greater concentrations in older industrial areas in the Bay Area, a clue that can tell regulators where to focus.

Alameda Countywide Clean Water Program's Jim Scanlin spoke of the challenges in trying to comply with the new TMDLs for mercury and PCBs. To do its part in reducing total mercury inputs to the Bay by 50%, Alameda County would need to reduce its mercury inputs by 78 kilograms per year; similarly it would have to reduce PCBs by about nine kilograms per year. "Can we get there from here?" asked Scanlin, adding that his agency has found frequent street sweeping to be more effective than is generally thought at removing mercury.

EBMUD's Gayle Tupper described her agency's successes in working with dental offices to install amalgam separators that remove mercury, and in collecting mercury thermometers from residents, hospitals, and schools. Seventy-five pounds of mercury was collected from East Bay residents in take-back events last year, said Tupper. An ongoing challenge is the pharmaceuticals that make their way into the Bay after being flushed or dumped down drains. "We're looking for ways to control these substances and raise awareness to convince people [the substances] shouldn't go down the drain," said Tupper.

Concluding the pollution session, UCLA's Mike Stenstrom told the crowd that "for better or worse, TMDLs are the driving force" behind cleanup efforts. He described modeling tools and data being used to evaluate alternatives for meeting TMDLs in the upper Ballona Creek watershed. Because so many heavy metals and other urban pollutants lodge in sediment, said Stenstrom, "we ought to be looking at getting sediment out of stormwater." To that end, he described some of the low-tech, green, "biofiltration" solutions that places like Seattle have implemented using vegetation—swales and stormwater planters (aka "infiltration trenches"), among others. LOV

RESTORATION: DIVERSE ECOSYSTEMS AND CHALLENGES

Assessing progress on the Baylands Ecosystem Habitat Goals, Carl Wilcox of Cal Fish & Game recalled a colleague's optimism in 1995: "We'll do this in six months and 50 pages or less." Four years and countless meetings later, the goals—a biologically based vision for ecosystem restoration—launched a new era in Bay conservation, providing guidance for the S.F. Bay Joint Venture, the South Bay Salt Ponds Restoration Project, and county-level Habitat Conservation Plans. Next step: linkage with anticipated Subtidal, Upland, and Streams Habitat Goals, and with CALFED's Ecosystem Restoration Program.

NOAA Fisheries' Korie Schaeffer gave an update on the process of establishing goals for managing and restoring S.F. Bay's "hidden" subtidal habitat. "The focus will be on habitats we want to see more of or in better condition," she said. Her group is factoring in human stressors. "We can't just wave our arms and come up with some goals without realizing past impacts are still active," she said. A final goals document is expected by December 2008.

Nancy Schaefer of Land Conservation Services, Stuart Weiss of the Center for Earth Observation, and Ryan Branciforte of GreenInfo Network discussed another goal-setting project, this one for upland habitat. Phase 1 involves identifying how much land in what kind of condition will be needed to conserve the Bay Area's upland biodiversity, racing against urban sprawl. Vegetation mapping is already completed. Weiss said goals include preserving 90% of globally rare habitat and allowing room for ecosystems to change. He foresaw partnerships with private landowners, including ranchers. "In grassland, a moderate amount of grazing is really the key to management over large areas," he said.

U.S. Fish & Wildlife's Eric Tattersall took on the contentious subject of habitat conservation planning. "If regional HCP is done the right way, we end up preserving large functioning ecosystems," he said, while project-by-project approaches lead to fragmented habitat. Tattersall described recently permitted plans in Santa Clara County and east Contra Costa County, and a pending plan in Solano County. "Every successful plan has a political champion who can bring it to fruition," he concluded.

Turning to the past, SFEI's Robin Grossinger looked at historical ecosystems as guides to restoration. "The historical landscape may be even more directly relevant than we had realized," he said. "Our society took over this landscape quite suddenly. We didn't ask for the owner's manual." Using old maps and written records, Grossinger is attempting to identify the wet and dry places, the intermittent streams, and the overlooked "B-side" habitat types, like sycamore alluvial woodland. Remnant seasonal wetlands in Santa Clara and Napa counties "are tiny fragments of former perennial wetlands. If you're interested in wetland restoration, historic wetlands show you where to look."

If ecological history can be obscure, the future of estuarine environments is up for grabs—with climate change a prime source of uncertainty. PWA's Jeremy Lowe said S.F. Bay's marshes have handled historic sea level rises well. "But sea level rise will accelerate. Will the marshes keep up?" he asked. As the waters rise, mudflat and marsh systems tend to move landward—if enough sediment is available. In the long-term, we may need to recharge mudflats with dredge soil. Lowe discussed tradeoffs between leaving levees in place for wave protection and reconnecting marsh and mudflat, and possible engineering fixes.

Naomi Feger of the S.F. Regional Board and Roger Leventhal of FarWest Restoration Engineering titled their joint presentation "Sediment—the Good, the Bad and the Buried." Feger presented case studies of three remediation efforts using

dredged material: Hamilton Marsh, Peyton Slough, and the Peninsula Sportsmen's Club (the last a lead-shot contamination site). Leventhal noted some "regulatory discomfort with using fill at all; it's not a normal mouse-hugging kind of wetland project." But he argued that if you know your contaminants, dredged sediment can benefit restoration with "no net degradation." He said economic constraints must be overcome in order to increase beneficial reuse of sediments and reduce ocean disposal.

Next up was San Jose State University professor emeritus Howard Shellhammer, now with H.T. Harvey, who has spent 50 years studying the endangered salt marsh harvest mouse. He discussed small mammals—the mouse and the elusive salt marsh wandering shrew—in tidal marsh restoration projects. The shrew may or may not still exist in the Bay's marshes; if it's there, it will benefit from mouse conservation measures. Both need mature marshes with internal escape cover and high marsh tidal refugia, but very little high marsh remains. Reducing the slope of outboard dikes to allow for high marsh development would help, as would connectivity between mouse habitat sites.

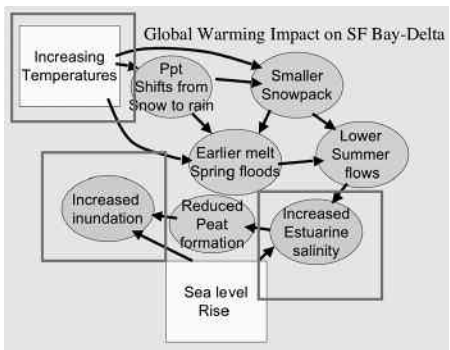
PRBO Conservation Science's Nadav Nur reviewed birds as indicators of marsh restoration success, measured by demographic metrics: reproductive success, recruitment of juveniles, survival of adults, emigration, and immigration. He said local-scale data is important. "There's concern that restoration sites are ecological traps—sinks, not sources." Nur documented different patterns for different bird species. Mature marsh sites had a 1,500% higher density of salt marsh common yellowthroats than restoration sites. However, song sparrow nestling survival rates were highest in some of the restored marshes. Biologists are also looking at demographics of California clapper rails, great blue herons, and upland songbirds.

Christy Smith of the San Pablo Bay National Wildlife Refuge reported on tidal marsh restoration and enhancement projects at Tolay Creek, Tubbs Island, and Cullinan Ranch, each presenting its own set of challenges. At Cullinan Ranch, for example, partial or full restoration would require new levees to protect Highway 37 from flooding. Smith stressed adaptive management ("measure three times, cut once") and the need to keep restoration partners involved.

Smith's South Bay counterpart, Clyde Morris of the Don Edwards S.F. Bay National Wildlife Refuge, looked back on seven restoration projects spanning 20 years. "It must have been really fun back in the 80s to restore things," he said. "You didn't worry too much about permits, and plans were something you did on the back of an envelope." But he's seen things improve—with the South Bay Salt Pond Restoration, "for the first time in my career we're doing adaptive management instead of knee-jerk management." Still there have been surprises, like the challenge of dealing with dissolved oxygen. "You don't always know what you don't know," said Morris.

In his talk on restoring Delta ecosystems, Stuart Siegel of Wetlands and Water Resources called this huge area "a case study in complexity." Manmade changes—diking islands, shortening channels—complicate the goal of maintaining "viable populations of desirable species. In the Delta, we don't say 'native'; there are some non-natives people like to have, like striped bass." Climate change introduces further complexities. "Wetlands can move up gentle slopes as sea level rises, but not with levees," Siegel said. He sketched ideas emerging from current planning efforts, including new floodplains and "green" levees.

When S.F. State University's Tom Parker took the podium, it was late in the day. "When I go to conferences, usually by this time I'm out drinking somewhere," he quipped. But his message was no joke: global climate change imperils the Estuary's marshes. Temperature increase may decrease primary production; inundation and flooding will increase, with restored marsh sites inundated more than natural sites. Rising salinity



Tom Parker

will reduce species diversity. "Given temperature and salinity increase and marsh accretion rates failing to keep up with sea level rise, what's the scenario?" he asked. "The winner is pickleweed," which occurs now in a variety of salinity and inundation conditions. But it's more sensitive to salinity in poorly drained sites. So an increase in salinity and inundation will significantly reduce wetland productivity, "especially in pickleweed, the one species most likely to expand under those conditions."

Closing the restoration session, Peggy Olofson of the Invasive Spartina Project reported on the ongoing war against aggressive hybrid cordgrass strains (see ESTUARY, October 2007). She called for the development of best practices for regional agencies. "Monitor and remove it—just monitoring has gotten us nowhere," she said. "Don't open a new marsh too early near existing hybrid Spartina. And be careful with equipment and dredge sediment." JE

LAND USE: MAKING CONNECTIONS

That land-dependent creatures—and the farms and other upland areas they inhabit—are in some way related to estuaries was once a foreign concept. But now, said U.C. Davis's Jeff Loux at the land use session of October's conference, "It's self-evident that water and land use planning are linked." And as the state's population grows, that link will need to tighten, requiring multiple agencies—city planning departments, utilities districts, water agencies, and transportation departments—at local and regional levels to work together more closely.

"The region will add five more Oaklands by 2035," said the Joint Policy Committee's Ted Droetthoom, commenting that growth will have to be planned much more carefully to mitigate the additional traffic and its effects on air and water quality. Regional bodies like ABAG are finally looking into the nexus among air quality, land use, transportation, and water quality. "Our land use patterns will dictate the need for better transit," said ABAG's Dave Burch.

Municipalities and regional bodies are trying to focus growth in specific areas to direct planning and investments into "priority development areas," said ABAG's Ken Kirkey. A key element of priority development areas is proximity to transit, so that driving can be reduced to create what Cities 21's Steve Raney called a "low-miles community."

The projections for the Bay Area's growth mean that managers and policymakers will need to get creative about where to put people and how to make those living places more sustainable, the topic of a panel discussion in the afternoon session. "We want to make it so that people get to as much as they can on foot," said the Greenbelt Alliance's Marla Wilson. To accomplish that, cities must build compactly and have walkable streets and neighborhoods, and they need to write these ideas into their general plans. "That gives elected officials the will to do it," said Laurel Prevetti of the City of San Jose.

Prevetti noted that in the 1970s, San Jose officials drew a line around the city, indicating its boundary for growth. That forced later administrations to recycle land—developing infill on grayfields like underused parking lots. Much of the development of the 1970s and 1980s also resulted in office parks—large buildings surrounded by huge parking lots. One way that nature has been brought back to such environs, said Prevetti, is through greenways and restored urban streams.

The topic of creek restoration brought insight from the S.F. Regional Board's Ann Riley, who described how creeks can be creatively integrated into cities, such as in San Luis Obispo. When it comes to restoring streams in cities, said Riley, one of the most common problems is negotiating for more room for the stream—

continued back page

Lady Linchpin Retires

"Esssssssssstuary...." says a sultry-voiced woman over the radio, daring her man to define it. "A rare middle eastern spice? Formal evening attire?" he offers, led on by the suggestiveness of her tone. This 1988 public service announcement to enhance local awareness of what an estuary is—the radio diva soon douses her man in a cold shower of fresh and salt water explanations—was one of Marcia Brockbank's earliest products as public outreach manager for the San Francisco Estuary Project. At the time, the project's umbrella agency, the U.S. EPA, commented that the PSA "wasn't serious enough." But Marcia's irreverent sense of humor is one of the things everyone will miss most when she retires at the end of 2007 after 20 years as champion of the Estuary. "She's a gem," says one former co-worker. "She's done so much and taken credit for so little," says another.

Hired in 1986 to organize a public education program and stakeholder committees to craft a consensus-based plan for estuarine protection, Marcia and her team are single-handedly responsible for the fact that few people in the California water worlds stumble over the word "estuary" any more, let alone think it has something to do with horses. She came to the Project after producing a number of environmental and political spots for Channel 2 and the League of Women Voters, working as a technical editor, and having three kids. In 1994, she took over management of the entire project and went on to work harder and longer on championing the CCMP, the management plan for the Estuary completed in 1993, than anyone could have imagined.

"Hardworking" is the first word most people use to describe Marcia, followed closely by "dedicated." She has always answered her own phone, usually returns calls or emails within hours, and never fails to ask about the kids. At the eleventh hour of any interminable meeting, she can always muster a twinkle in her eye, a wide smile and a good joke, not to mention a knowing look that hints at the wisdom she's gathered in all these years of educating the community about the Bay and Delta.

"There were a lot of people who thought the Project would not continue after it finished the CCMP in 1993," she says. "The Bay-Delta Accord was signed the following year, and CALFED was launched with much support and hoopla from the state and feds. Since then, in all honesty, the hardest thing has been to keep the interest of stakeholder groups and agencies in implementing the CCMP—keeping it among their priorities. I've been able to do it through personal contact, making sure that people understand how the CCMP is valuable to them, and not saying 'no' when people ask for help."

Marcia's investment over the years—not to mention the hard work of her staff, the Implementation Committee and Friends of the Estuary—all paid off in 2007, when the Project undertook to update the CCMP. "What's been amazing is that over the last 18 months, we've seen phenomenal involvement from many different interests and agencies. We've had 85 people working on 6-7 different committees attending constant meetings to hash out what needed to be changed," she says. "The willingness of people to go through the process once again is striking, to meet numerous times and use their professional judgement and passion to fight the necessary battles and come to agreement. Clearly the values and goals that we so eloquently reached back in 1993 and then again in 2007 remain important."

Tom Graff, winner of the Jean Auer award, and Marcia Brockbank at October's conference.

Asked about her own personal passion, Marcia points to freshwater flows. She became interested in the flows issue when following the 1980s Bay-Delta hearings, and hoped, in her words, to "have some sort of role in seeing that come to a worthwhile end." Now 20 years later, she sees enormous progress on dredging, wetlands restoration, public awareness about not dumping in storm drains, and creek activism, but not on flows. "We can't just stand by and let the Delta become a freshwater lake, we'll lose all our estuarine species and diversity," she says.

As for her retirement, Marcia says no single thing inspired the decision. "For many years I've been trying to build a place for SFEP and the CCMP and I think we're pretty much there. But I see lots of things that need to be done, and it feels like the right time to turn things over to someone else. I think it's healthy for an organization to have someone new come in with a different vision and skill set."

With her new free time, Marcia plans to join some boards, work with her

local creek group, spend more time with her grandkids, and read all her back issues of *The New Yorker*. Looking back, she says the most rewarding thing about her experience has been the growth of her personal understanding of the science, and of what it means to have a healthy estuary. "I think I've had some small role it trying to make that happen, make a better place for future generations that live around the Bay. I don't really know if that will really be the outcome, but I sure hope it will." —ARO

Amy Zimpfer, USEPA:
"In the early days, she was the critical third leg in the Estuary Project's 3-legged stool—1/3 science, 1/3 process and planning, 1/3 public outreach. Her outreach brought credibility with the public to our project, and almost everything she started—ESTUARY newsletter, the non-profit friends, the educational campaigns, are still going strong today. She was never afraid to take a stand on something, but she would express it in a way that made people listen and give thought to her views long after the exchange, a unique skill. She's one of the most gracious and hard-working people I know."

Richard Morat, USFWS:
"People would fall on their sword for Marcia—she has built tremendous social capital in the Bay and watershed community. She has been genuine to all, whether with individual stewards or in the boardrooms of NGOs. She's a good listener, yet a warrior with many of us in mission. After a recent trip to India, she gave many "partners in mission" small figures of Ganesh, "the Hindu remover of obstacles"... Telling huh?"

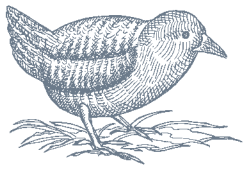
Will Travis, BCDC:
"I don't know of any other institutionalized arrangement—in this case the CCMP—so personified by one person. Marcia has been the driving force, the master architect, the kibutzer who keeps us going, and the charmer who keeps us all working together."

David Lewis, Save the Bay:
"Marcia's patient stewardship of the Estuary Project is the number one reason its work enjoys such broad support among an enormous group of diverse partners who care about the Bay."

Arthur Feinstein, Citizens Committee to Complete the Refuge:
"For a non-regulatory document, the CCMP has had more impact than most because it was so inclusive and had so much buy-in, and this gave the agencies the freedom to move forward and do good things. Marcia played a key role in bringing everybody together as years went by, in keeping the collaborative element of the CCMP alive and the working atmosphere comfortable and functional."

Rainer Hoenicke, SFEI:
"During the early phases of the National Estuary Program, few had heard of, let alone were familiar with, using stakeholder processes in environmental planning and decision-making. Marcia was instrumental in demonstrating how meeting process and content can and should be appropriately balanced to get people with various backgrounds to arrive at tangible outcomes. Later, those of us who were looking for what to emulate and what to avoid in establishing the Santa Monica Bay Restoration Project finally just relied on Marcia for guidance. Our motto was: 'When in doubt, just call Marcia at SFEP.' "

Steve Ritchie, Coastal Conservancy:
"Marcia was non-threatening in a way that wasn't trying to advance Marcia Brockbank, as in not trying to climb to some higher position or achieve some special reputation. She never had any hidden agenda, she just wanted to do the right thing. She made the Estuary Project a safe place where we could talk and try to work things out. She was also always able to maintain the right ties with the right people at EPA to keep SFEP tied to its origins."



Larry Kolb, retired, SFRWQCB:
"Marcia is one of those rare people whom everybody respects, everybody likes, and everybody enjoys working with. In all her achievements, Marcia has been utterly modest, unassuming, and always reluctant to accept credit."

Sam Ziegler, USEPA:
"She was a role model for me back when I was relatively new in my career. The cool thing was that she could have been my mother, but she wasn't—here she was doing this great environmental work, and she was totally dedicated and competent, and in many ways mirrored the things I wanted to achieve, which was to stay committed to what you believe in. To believe that you could make a difference. She was, and remains, a total inspiration."

Ellen Johnck, Bay Planning Coalition:
"Marcia is the emblem and spirit of the SFEP. That spirit means keeping the flock together to take care of the Bay—she kept the momentum going by being persistent, diligent, and organized. This was no mean feat, as all the participants come from different walks of life and are busy in their own jobs. But she carried us all with great aplomb and verve."

Ann Riley, SFRWQCB:
"I first met Marcia when working for non-profits trying to restore little loved urban creeks, and what astonished me about her was she was extremely concerned about getting seed money to citizen groups in a user-friendly way that was responsive to their needs. This was a foreign concept back then for those of us working to get grants from larger agencies —a light in the wilderness. Now that I work in the same building I see that she's here on weekends, here at night, bears an incredible workload without complaint, and always says 'yes' if you ask her for help. She's created a standard that none of us can ever hope to attain."

Leo Winternitz, Delta Vision:
"Marcia is a great lady, classy and charming. She has always been a joy to work with. And she obviously has a passion for her work, which makes her very effective. I will miss her."

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Editorial Office: PO Box 791
Oakland, CA 94604
lowensvi@sbcglobal.net

Estuary Web site at
www.estuarynewsletter.com
To subscribe to/questions about ESTUARY:
(510)622-2499

STAFF

Managing Editor: Lisa Owens Viani
Associate Editor: Kristi Coale
Page Design: Bobbi Sloan
Contributing Writers: Joe Eaton

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Ideas, questions, feedback?
Send to lowensvi@sbcglobal.net

which often means negotiating for fewer parking spaces in conjunction with development or redevelopment. Even a small reduction in the number of parking spaces can often make a critical difference for a city stream. Riley's lesson: "Don't accept a plan as given."

But one given is that cities have infrastructure—like stormdrains—that greatly affects their watersheds, so planners are finding ways to reduce pollution through greener solutions. The SFPUC's Rosey Jenks spoke of her agency's efforts to reduce the number of impervious surfaces that carry pollution to watersheds. When roads are repaved, for example, their impermeability can be reduced so they can act as filters. Jenks also described how green roofs—like the new one at the California Academy of Sciences—are helping reduce runoff.

The idea of green building is currently popular among architects and developers, noted Paul Okamoto of Okamoto Saijo Architecture. But more needs to be done in light of global climate change. Three design concepts should be integrated into green building. First is the 2030 Initiative (a standard where all buildings shall be carbon-neutral by 2030), which has already been adopted by the U.S. Conference of Mayors and American Institute of Architects. Second is analyzing intensity of transportation as part of a green building analysis. "We need to understand how much energy is spent on transportation due to the location of buildings and our current land-use patterns," said Okamoto. Third, buildings should incorporate the design concept of "passive survivability"—i.e., storing rainwater—in which buildings are still functional when services like electricity, water, and sewer are interrupted.

Phil Bobel of the City of Palo Alto discussed how the South Bay is starting to use less freshwater and more recycled water for irrigation. Palo Alto and other cities have been testing ecoroofs, cisterns, and permeable pavers. Said Bobel, "What's innovative about this? The Babylonians were doing cisterns."

The NRDC's Kristina Ortiz said lots of little gadgets that might not seem so innovative, incorporated into planning, can collectively save a lot of water. One big consumer of water is the toilet: New dual flush models can save gallons. Ortiz noted that people need to become as attuned to conserving water as they are to energy. EBMUD bills now include a water budget that not only presents consumption, but also provides climate information to show customers how to cut down on landscape watering. "It's the low-hanging fruit, but it helps," said EBMUD's Richard Harris.

Michele Pla of the Bay Area Clean Water Agencies explained that using more recycled water lowers the need to treat water, brings down energy consumption, and curbs pollutant loads to the Bay. "We're at the end of the road of the system of using water once and spending a half a billion dollars to treat and put it back," said Pla.

Linda Fiack of the Delta Protection Comm-ission compared the Delta and its water supply to the country cows that provide milk for city folks. "Most people don't know where their water comes from," she noted. "The Delta is that cow in the country." But regional and county planners do know where their water comes from, and they're planning for it now. Fiack explained how five Delta counties of Contra Costa, San Joaquin, Sacramento, Solano, and Yolo—all revamping their general plans—are including a Delta element. And Benicia mayor Elizabeth Patterson, who said her city has integrated watershed restoration into its general plan, wrapped up the session by describing the importance of connecting small grassroots watershed groups with movers and shakers. "We need to get their ideas to where the power is." KC