

## HANDS ON

The Estuary Project is getting its hands dirty—at the end of September, we co-sponsored a Coastal Cleanup Day at MLK Marsh with Save the Bay, and a pharmaceutical take-back event at Jack London Square with the Telesis Institute. At those events, we collected hundreds of bags of trash and meds that might have otherwise ended up in the Bay.

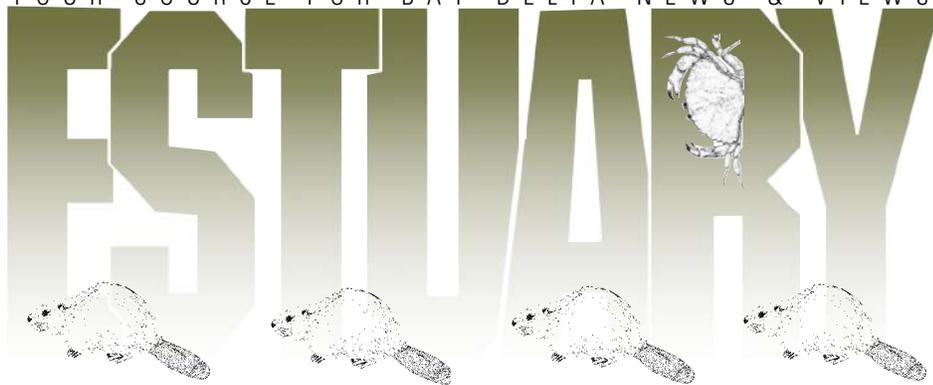


Photo by Adrienne Miller

Another major focus of the Estuary Project right now is climate change; we are working with the Bay Conservation and Development Commission to launch the EPA-supported Climate Ready Estuary Project (see [www.sfestuary.org](http://www.sfestuary.org) for more details). The Estuary's wetlands play an important role in climate change by sequestering greenhouse gases—our cover story describes just how critical certain types of wetlands are at doing that job and why it is so important to preserve them, as well as some of the innovative research taking place in the Delta to create more wetlands to sequester more CO<sub>2</sub>. Wetlands are also featured in "Mercury Clues," page 5, with some surprising new findings about methylmercury. "Climate Watch/Focus on Fish" on page 2 also describes new research, on the impacts of climate change on the Estuary's fish.

One worry about a changing climate is, of course, whether we'll have enough fresh water for wetlands, for wildlife, and for people. A provocative new award-winning documentary—FLOW: How Did a Handful of Corporations Steal Our Water?—features Pacific Institute's Peter Gleick and builds a case against the growing privatization of the world's dwindling fresh water supply—a must see for all of us.

—Judy Kelly, SFEP Director



## CARBON SINK OR BOMB?

As climate change threatens to devastate the world's perennially challenged wetlands—and in so doing release unprecedented quantities of greenhouse gases—scientists in the Delta are working to turn a subsided island into a "carbon-capture farm" that will trap atmospheric carbon dioxide and rebuild lost soils. "Farmers just can't continue farming the way they have done," says the U.S. Geological Survey's Roger Fujii, noting that long-standing practices have caused so much land subsidence that many Delta islands are now more than 20 feet below sea level and protected only by fragile levees. Microbial oxidation of the peat soils also releases carbon dioxide into the atmosphere.

Next spring, funded by a \$12.3 million grant from the state Department of Water Resources, scientists from USGS and UC Davis plan to create new wetlands on 300 acres of a subsided western Delta island by planting tules, and letting cattails and other wetland plants grow. As these plants die and decompose, they will leave behind material that compacts into new peat soil, rebuilding the land and shoring up the levees. During a pilot project on two seven-acre plots, scientists recorded elevation gains of more than 10 inches from 1997 to 2005.

Although the original purpose of the project was to mitigate for subsidence, says Fujii, "we figured out that it could also sequester a lot of carbon," which is taken out of the air as the plants grow, and then trapped in the resulting peat. The

hope is that the project will create a model that farmers can replicate on other subsided islands, allowing them to continue generating revenue from their land through emerging California carbon markets. According to the USGS, if California converted an area the size of all the subsided Delta farms to carbon farms, the benefits could be the equivalent of turning all the SUVs in California into small hybrid vehicles. As tantalizing as all this sounds, some scientists not affiliated with the project are skeptical, and note that carbon capture farming will involve some tradeoffs.

"You can manipulate a wetland to get it to sequester a lot of carbon, but generally the goal of wetland restoration is to create a healthy environment for fish and wildlife, which means you have to have oxygen rich areas," says Jon Kusler of the Association of State Wetland Managers. "But if you want to create a wetland that's going to store carbon, you need anaerobic conditions."

Fujii emphasizes that the carbon-capture wetlands are not intended to provide wildlife habitat. "This is a highly managed system, a farm crop," he says. "It is not going to provide tidal habitat for fish, although it will provide some habitat for birds." He adds, however, that years down the road, when the new peat soils have brought the margins of the island up to sea level, the scientists hope to breach the levees so that the wetlands are tidally connected. "That would provide much more habitat."

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## CLIMATEWATCH

## FOCUS ON FISH

"The San Francisco Estuary is one of the least studied estuaries," says SF State University's Tom Parker. With more scientists on the East Coast, there's more data on the Chesapeake. Parker is in the process of changing that. With funding from CALFED and the National Institute of Climate Change Research, he heads a team that hopes to clarify how the Estuary's food webs work, and how its pelagic fish will be impacted by climate change.

The three-year project, which was launched last summer, grew out of previous IRWM studies. "With sea level rising so quickly and the potential of dikes to break in the Delta," says Parker, "we felt that we needed to focus on these issues right away." Other participants include John Callaway of USF, Vance Vredenburg and Mike Vasey of SF State, Lisa Schile and Maggi Kelly of UC Berkeley, and Drew Talley of the University of San Diego.

Estuarine wetlands are considered crucial to the life cycles of pelagic fish. But not all wetlands are equal: salt marshes are lower in plant species diversity and productivity than freshwater marshes. What will happen to that linkage when rising seas change the Estuary's salinity, inundate tidal habitats, and alter plant communities?

The researchers are measuring primary productivity and decomposition at six sites: two salt-marsh, two brackish, and two freshwater locations. They will use carbon, nitrogen, and sulfur isotopes to track nutrients from marsh plants through the food web. Parker says the goal is to determine whether fish are using wetlands resources rather than pelagic resources. Once they've identified existing food web resource flows and incorporated them into spatial models, the researchers will plug in different climate change scenarios to predict how variations in salinity, sea level, and sedimentation rates will affect the size and stability of fish populations.

What's the payoff for resource managers? "I would suspect we'll find that an increase in the salinity of the Bay-Delta system will impact the composition and productivity of the pelagic system," Parker says. "The conclusion: we have to protect freshwater flows through the Delta."

## CONTACT:

Tom Parker, [parker@sfsu.edu](mailto:parker@sfsu.edu) JE

## CARBON SINK OR BOMB? CONTINUED

Another major issue is that wetlands also produce methane, a global warming gas at least 20 times more powerful than CO<sub>2</sub>. "The conditions that reduce methane, i.e. oxygen rich environments, are counter-productive to carbon sequestration," says Kusler. Indeed, says Fujii, the Delta project will include 50 acres of research cells, where scientists will evaluate and search for ways to mitigate for such unintended consequences. "We will be looking at how we can manage the system to minimize the production of methane, as well as nitrous oxide (N<sub>2</sub>O)," he says. The project will also investigate the production and transport of dissolved organic carbon and methylmercury to determine whether the carbon capture farm can be managed to control adverse effects.

Scientists caution that projects such as the one in the Delta will do little to offset the potentially catastrophic carbon release resulting from damage to wetlands around the globe, including mangroves, lagoons, peat bogs, and tundra. "Wetlands have already sequestered huge amounts of carbon, so the real issue is the protection of those carbon stores," says Kusler. Although untold wetland areas have already been lost to agriculture and development, wetlands still account for approximately 6% of the Earth's land surface, and scientists estimate that they store as much as 20% of the world's carbon, much of it in Arctic permafrost. Were that carbon to be released into the atmosphere through wetland destruction, it would contribute powerfully to global warming. "There is no question that protecting existing wetlands worldwide is critical," says Kusler.

Although wetlands certainly continue to face all of their historical challenges, global warming itself may be the biggest and most formidable yet. Changes in precipitation patterns, sea level rise, and warmer temperatures all have the potential to either destroy wetlands entirely, by flooding them or drying them out, or change them from one type to another.

Northern peat bogs, 30 to 50% of which are now located in regions of permafrost, are the biggest concern. They are estimated to hold approximately 450 gigatons of carbon, while the atmosphere itself currently contains about 750 gigatons, according to Nigel Roulet of McGill University. (By comparison, "industrial anthropogenic"—human caused—sources release 7 to 8 gigatons per year.) "What happens to all that carbon when the permafrost melts is the million dollar question," he says.

The permafrost's low temperatures, along with the saturated conditions, inhibit the decomposition of plant material and the attendant release of CO<sub>2</sub>. As temperatures increase, decomposition and CO<sub>2</sub> release would be expected to increase. "Above the Arctic Circle alone, warming could release two-thirds as much CO<sub>2</sub> as is currently released by all other sources," says Eugene Turner of Louisiana State University.

Another big unknown is whether the peatlands will stay wet enough to maintain the anaerobic conditions required to effectively sequester carbon. "The Northern latitudes are expected to get wetter, but also warmer, so the real question is whether the precipitation increase will be enough to offset the increase in evaporation due to warmer temperatures," says Roulet.

One thing scientists do know is that as the permafrost melts, methane is emitted in the areas that get wetter. "In the peat bogs of northern Canada the saturated zone is about 20 cm below the surface," explains Roulet. "Organisms that live in the soil eat methane, so these bogs accumulate a lot of carbon and do not emit much methane. When the permafrost melts, the hydrology changes and in some areas the water level rises above the sediment and creates ecosystems that are ideal for producing methane."

There is no question that methane is increasing, according to Roulet. "Since 1996 or so, methane concentrations in the atmosphere had seemed pretty stable," although times higher than historical levels, he says. "But about 18 to 24 months ago it started to increase again, and there is some evidence that much of it is coming from north of 55 degrees." At one research site in northern Sweden, scientists recently found methane emission levels 1,000 times higher than when the site was studied in the 1970s. And scientist are certain—based on the methane's isotopic signature—that the increasing worldwide levels have biogenic sources.

In spite of the rise in atmospheric methane, scientists seem much less disturbed by it than by the potential for the release of carbon—possibly because methane persists in the atmosphere for only 10 to 12 years, whereas carbon circulates for 100 to 120 years.

"We are only just beginning to appreciate the carbon storage benefits of wetlands," says Turner. "But it is clear that in terms of the world's carbon budget, it is essential that wetlands be preserved."

CONTACT: [rfujii@usgs.gov](mailto:rfujii@usgs.gov);  
[nigel.roulet@mcgill.ca](mailto:nigel.roulet@mcgill.ca) CHT

## ENVIRONMENT

### LEAVE IT TO THE BEAVERS

The Martinez beavers may be California's best-known non-cartoon rodents. They turned up two years ago in a stretch of Alhambra Creek between Marina Vista Way and Escobar Street at the edge of the downtown district, not far from where the creek enters the Carquinez Strait, and went to work. The beavers' domain now includes a lodge and three dams. Martinez residents and visitors gather in the evening to watch the founding pair and their two yearlings and four kits. If you missed this summer's Beaver Festival, you can still buy T-shirts with a "Martinez—Dam Cool" logo. The beavers also have their own web site ([www.martinezbeavers.org/wordpress/](http://www.martinezbeavers.org/wordpress/)), maintained by the support organization Worth a Dam.

The welcome is not universal, though. Downtown merchants and other property owners, having funded their own flood control project a decade ago, are worried about the beavers' effect on the creek's capacity. City officials first considered exterminating or relocating the rodents, but were forestalled by public opposition. Other management options are now on the table. Meanwhile, wildlife-watchers have seen other creatures moving into the habitat the beavers created.

The North American beaver (*Castor canadensis*) is a change agent in riparian habitats, and considered a keystone species by ecologists. Beaver construction projects have a broad range of impacts, altering the shape of stream channels, flow regimes, composition of plant and invertebrate communities, nutrient cycling, and water chemistry. Beaver ponds increase the interface between soil and water, favoring wider riparian zones. Although fisheries managers have no love for beavers, one study found that juvenile salmonids grew faster and larger in beaver ponds than in open channels.

Particularly in the West, beavers have become partners in stream restoration efforts. Their dams have been shown to counter the effects of erosion caused by overgrazing. In the last half-century, beavers have been reintroduced to many water-



Photo by Cheryl Reynolds

sheds from which they were extirpated during the fur-trapping era.

Martinez merchants and officials were looking more at the costs of the beavers' presence than benefits. Downtown Martinez is historically flood-prone, and a 2007 report from Phil Williams & Associates (PWA) claimed the original dam, at a height of six feet, would increase the risk of flooding. There was also concern that the beavers were burrowing into and destabilizing the creek banks.

The California Department of Fish and Game said a depredation permit was the only beaver-removal option, although the city continued to push for authorization to relocate them. "In the meantime, there was a public upwelling of support for the beavers," recalls Mitch Avalon with the Contra Costa Flood Control and Water Conservation District. "The community didn't want to hear about killing or relocating the beavers; they wanted to keep them."

Psychologist Heidi Perryman, founder and president of Worth a Dam, lives a few blocks from the dam site. She began filming the beavers and writing articles for the local newspaper. At a City Council meeting in November 2007, Perryman discovered fellow beaver advocates from all over Contra Costa County, from affluent suburbanites to homeless people. "I realized it's not just me," she says. "People really cared about them."

Although Cal Fish and Game eventually offered to approve relocation, the city, faced with public reaction, backed away. (Efforts to relocate "problem" beavers have had mixed results. At Lake Skinner in Riverside County, two beavers died in traps, another in captivity, and some of the survivors ended up in zoos.) Skip Lisle, a consultant from Vermont, recommended a device called a Beaver Deceiver (or Castor Master) to curb the creatures' dam-building compulsion. "The sound of running water is a biological trigger," explains Avalon. "They think there's a leak, go nuts, and start patching the dam. The Beaver Deceiver, which controls the pond depth, is a pipe with an inlet on the upstream side of the dam and an outlet far enough downstream so they don't hear the running water." When the pipe was installed in January, the dam was lowered to three feet; the beavers have maintained it at that height ever since. The city also deployed anchors and cables that will allow emergency removal of the dam.

Perryman and Avalon were appointed to a Beaver Subcommittee to review options for co-existence. The group also included council members Mark Ross and Lara DeLaney, Igor Skaredoff of Friends of Alhambra Creek, attorney Al Turnbaugh, and others. "Our mission was to put together a report to inform the city council,"

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## BULLETIN BOARD

### PEEP TREATS

Hundreds of thousands of western sandpipers migrate through San Francisco Bay every year. Japanese, French, and Canadian researchers in British Columbia recently learned that these shorebirds are fueled by a diet of diatoms and bacteria. High-speed photography captured them scooping up bites of the biofilm that covers tidal mudflats. Although previous studies had indicated that the sandpipers fed on small crustaceans, clams, and worms, the researchers estimate that biofilm can account for half of a migrant's daily energy requirements. In the Bay, the birds may have to compete for this resource with an exotic biofilm-grazing mollusk, the Japanese mud snail. JE



Photo by Tom Grey

### GOPHERS GONE

Tomato fields in the Kellogg Creek watershed and east Contra Costa Delta drainages are no longer being gobbled by gophers, thanks to some feathered pest control agents. Through a grant from the Department of Fish and Game's Contra Costa County Fish and Wildlife Committee, the Contra Costa County Resource Conservation District helped a large grower install 22 barn owl boxes: within months, half of the boxes were occupied by owls and the gopher population greatly reduced. Says the RCD's Carol Arnold, "Word of mouth works well among the farmers in East County, so I'm hoping more farmers will want the boxes since they have been so successful." LOV

### TRASH TRIAGE

Twenty-three waterways that flow chock-full of trash into the Bay may violate the federal Clean Water Act, according to Save the Bay's hot-off-the-presses third annual

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**TRASH CONTINUED**

Bay Trash Hot Spots list. The hot spots range from the north to south Bay, and are found in urban communities of all socioeconomic levels. "We need to act now to stop trash from polluting the Bay and killing its wildlife," says Save the Bay's David Lewis. "This is a problem we can no longer ignore...cities and counties should be doing much more to solve the trash problem." Many, if not all, of the water bodies on the list will likely end up on the S.F. Bay Regional Water Quality Control Board's 303(d) list of impaired water bodies, which could lead to additional regulation. "The public will have an opportunity to comment on the 303(d) list recommendations prior to the Board hearings, which may take place later this year," says the SF Bay Water Board's Naomi Feger. [www.saveSFbay.org/baytrash](http://www.saveSFbay.org/baytrash) **LOV**



Damon Slough, Oakland, with trash boom

**RENEGADE RAFTER**

Six years ago, the North Atlantic brown alga called knotted wrack (*Ascophyllum nodosum*) was discovered growing in the intertidal zone near Redwood City. It was a floating form, a prime candidate for dispersion by rafting. Although the Redwood City population was eradicated, *A. nodosum* turned up again this summer along 400 meters of shoreline at Bay Farm Island, Alameda. Volunteers led by Natalie Cosentino-Manning and Andrew Chang of NOAA hand-removed the invader in July and August work sessions. The alga is believed to have reached San Francisco Bay as packing material for shellfish and bait worms from New England. No other West Coast beachheads have been reported. **JE**

Photo by Steve Lonhart

**PLANNING****FAN PLANS**

You can see them best from an airplane—the cone- or fan-shaped deposits at the foot of California's steep mountain sides, formed as rivers and streams wandered wildly downhill, spraying the landscape with clay, silt, sand, and gravel, or when wildfire-and-rain-induced landslides dumped their debris into the channels that traverse the hills. Some alluvial fans are recent; others prehistoric—a Columbian-era mammoth tusk was unearthed in one on Santa Clara Valley Water District land a few years ago. Many alluvial fans and their channels, especially in southern California, have been lined with concrete and dammed by huge debris basins, requiring million-dollar-per year maintenance budgets. Despite their unstable soils and role as wildlife corridors, alluvial fans are popular places to build on, with breathtaking views and landscapes.

While obvious from a plane, alluvial fans—and the risks of building on them—were almost invisible to California planners and developers until recently. That is all changing, through the efforts of the Alluvial Fan Task Force, which arose out of DWR's Floodplain Management Task Force in response to a series of alluvial fan disasters in southern California. One of those occurred on Christmas 2003 in San Bernardino, when a 20-foot wall of mud, rocks, and trees blasted down Waterman Canyon, sweeping 16 people to their deaths. In addition to the human toll, there are other costs to cities and counties in the paths of alluvial fans. "In 2004, nothing else happened in San Bernardino except cleaning up from fires and debris flows. Not a pothole got filled; nothing got done," says CSU San Bernardino's Water Resources Institute's Susan Lien Longville, who served on the Floodplain Management Task Force and is now coordinating the Alluvial Fan Task Force for DWR. Los Angeles County alone spends \$9.3 million per year maintaining debris basins, according to Longville.

While she was on the Floodplain Task Force, says Longville, "we realized that alluvial fans and

floodplains were not well understood, particularly at a time when developments are increasingly moving into remaining fans." Another reason the elusive landforms are finally getting attention, she explains, is because more planning is starting to take place on a watershed and regional basis. "[Planning for] alluvial fans is really a watershed approach. We know more building is going to occur on these areas and that we need to take a proactive approach. If we're going to develop in these areas, let's have our eyes

wide open and look at their hazards, risks, long-term costs, and ecosystem values." The task force's goal, says Longville, is essentially to do better watershed planning based on the principles of sustainable development. Its end product will be an interactive Internet database called the Sustainable Development Tool, which will provide a suite of local planning tools to users: helping them to identify the presence of alluvial fans and their potential associated hazards; identify project design considerations and ecological values and resources of a

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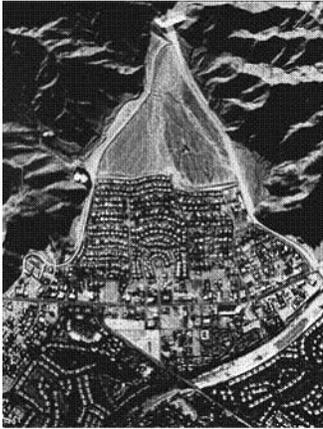
**"If we're going to develop in these areas, let's have our eyes wide open and look at their hazards, risks, long-term costs, and ecosystem values."**

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site; evaluate potential consequences, costs, and benefits, and development strategies; and integrate alluvial fan data and multiple objectives into actual projects that foster sustainable development practices. Another outcome will be a model ordinance that will be shopped around to local governments.

Identifying hazards, costs, and resource values—isn't this part of the CEQA process? Says Longville, "In CEQA there is no requirement to take a watershed approach. This toolkit will act as a foundation for CEQA, provide tools to use in the CEQA process. It's more of a methods-based ordinance vs. a prescriptive approach. The question is, how are impacts going to be mitigated? If you're using some of these tools and you're going to mitigate, it will be evidenced in the mitigation measures. Developers want to know from the beginning, 'what do you want, don't keep changing the rules on us.' Local governments are not always the best at telling them. If you begin at a better point and acknowledge what it is you are looking for, the output is going to be better and process more predictable for all of us."

DWR's Maria Lorenzo-Lee says the task force hopes to have its final products completed by the end of the year; the model ordinance is currently being reviewed by legal staff. While the ordinance will be implemented on a voluntary basis, the work of the task force could ultimately lead to additional policy recommendations and/or legislation, says DWR's Ricardo Pinada. DWR is developing an outreach plan, but Pinada, Lorenzo-Lee, and Longville feel that because local governments have already participated so heavily in the process, getting buy-in won't be difficult. "We've had seven meetings hosted by local county supervisors and water districts focused on alluvial fans in their areas," says Lorenzo-Lee. "A lot of the task force members are developers. They want to know a safe way to build. They've been at the table the whole time, and they're still here."



A developed alluvial fan. Photo courtesy of DWR

One such stakeholder is Innovative Land Concepts' Paul Quill from Coachella Valley. Quill sees future development on fans having "a lot less structural development and flood control, and a lot more open space dedicated for that purpose. Right in your back yard, you might have 500 yards of open space that serves as flood control, but with natural landscaping and habitat for bugs and bunnies and hiking and bicycling trails." In Coachella Valley, says Quill, people want recreational opportunities—to be out in nature close to home—so open floodways and open space instead of concrete channels and basins could be one way to accommodate development on fans and also encourage ecotourism. As innovative as all of this might seem, says Quill, other places like Maricopa County, Arizona, have been working on better planning for alluvial fans for years.

Joan Taylor, the Governor's appointee to the Coachella Valley Mountains Conservancy, an-

other stakeholder, says the task force's efforts have been "monumental and are raising the important issues. But we'd like to see them lay down the law. There's more to alluvial fans than meets the eye: they're not just mounds of sand; they're moving and shaking. A lot of them should never be built on."

While most of California's alluvial fans occur in the southern part of the state, there are other places where they can be found, including Napa Valley and parts of the South Bay. "We do have alluvial fans in the Bay Area, but they may not be as obvious or ubiquitous as in southern California," says the S.F. Bay Regional Water Board's river and stream advisor A.L. Riley. "I hope that the policies that come out of the task force will inform the stream protection criteria that will be adopted for the Bay Area, northern California, and eventually state-wide by the State Water Board."

CONTACT: Susan Lien Longville (909) 537-7684; Ricardo Pinada (916) 574-1475 LOV



Photo courtesy of SFEI

## WETLANDS

### MERCURY CLUES

New studies of Bay tidal marsh songbirds, sediment, and small fish are giving researchers some clues about which wetlands produce the most methylmercury—the more toxic form of mercury that can bioaccumulate in waterbirds and other wildlife. Says SFEI's Jay Davis, "In three different studies, we found this common thread—that wetlands that are less frequently inundated tend to produce more methylmercury. We can't pin it exclusively to frequency of flooding, but three different indicators picked up a similar trend."

In the South Bay, SFEI's Letitia Grenier studied tidal marsh song sparrows in 2007 along Alviso Slough and found that mercury concentrations in sparrow blood were lower farther from the Bay where the marsh is more subsided and probably inundated

more frequently. Groundwater pumping that took place decades ago in the San Jose area probably caused the marsh to be at lower elevation and have more inorganic sediment, says Grenier. This finding is somewhat counterintuitive, she adds, because the sparrows with lower mercury farther from the Bay were closer to the New Almaden historic mercury mining district, which drains to Alviso Slough.

In a CALFED-funded study of wetlands along the Petaluma River, SFEI's Don Yee, with collaborators from USGS, found that methylmercury concentrations were greatest in the high marsh, where drainage is slow and plants supply lots of organic matter, which encourages sediment bacteria to generate anaerobic conditions enhancing

methylmercury production.

And as part of UC Davis's Biosentinel Mercury Monitoring Program for CALFED,

## TECHNOFIX

## BALLAST BLAST

There's more than one way to rid a ship's ballast tank of potentially harmful aquatic organisms. Discharging untreated ballast water risks introducing still more exotic species to already invaded estuarine ecosystems like San Francisco Bay. Previous approaches have used chemicals, ultraviolet light, and ultrasound to kill hitchhiking creatures. Dorin Boldor, a biological and agricultural engineer at Louisiana State University's Agricultural Center, has a promising new idea: microwave radiation.

Boldor, who has worked with microwave treatments that destroy pests in dry agricultural commodities, was intrigued when a colleague suggested an application to ballast water. "It was just a question of scale," he says. "Can you make it cost effective?" With funding from NOAA's Ballast Water Technology Program, Boldor developed a prototype.

He and associates at LSU came up with a continuous microwave heating system that treated temperatures lethal to microalgae, oyster larvae, and larval and adult brine shrimp. "A temperature of 55-60° C is enough for most practical purposes," Boldor explains. Brine shrimp eggs require more heat, up to 75-80° C.

In Boldor's system, a 5,000-watt microwave unit fitted to the ballast tank's exit valve heats the water as it's pumped out. At the same time, a heat exchanger cools the hot water and reheats incoming water. There's no environmental release of hot water or chemicals. He also says microwave treatment is more thorough than ultraviolet light and doesn't require prior filtration of the water, and enforcement is easier than with other treatment technologies.

He envisions the microwave source as being either on board ship or in port: "For smaller ships, the best way is to have a barge type of system. A barge would pull up while the ship waits for a berth, and take up ballast water for treatment. You don't have to transport the water over long distances."

"We did most of the research proving that it works," Boldor says. "It's now a question of demonstrating it at a large scale and finding someone to invest in the demonstrated technology." He's hoping for another round of NOAA funding, or support from the shipping industry.

CONTACT: Dorin Boldor, DBoldor@ag-center.lsu.edu JE



## BEAVERS CONTINUED

says Avalon. "There was not consensus on everything." Subgroups addressed flood prevention, bank stability, water quality, and habitat values. The final report, delivered in April, identified possible engineering fixes, including installing a bypass pipe, widening the flood terrace, building a flood wall, and redirecting the overland flow of floodwater. Avalon calls the beaver question "a challenge and an opportunity. There are options that would just solve the beaver problem, and others, like overland relief, that would have system-wide benefits whether the dam is there or not."

At the same time PWA weighed in with a second report, reflecting the reduction in the main dam's height and proposing excavation of an expanded floodplain between the creek channel and Castro Street. Another consultant, geotechnical engineer William Langbehn who was hired by a downtown property owner, claimed damage to the creek bank from beaver burrows and seismic risks from soil liquefaction along the stream channel. Langbehn concluded relocation would "not only benefit the adjacent affected property owners but also in the end the beavers themselves." (Although beavers do burrow, Heidi Perryman suspects muskrats may be the main culprits at Alhambra Creek. In any case, she says, wire mesh or riprap could prevent burrowing.)

City Engineer Tim Tucker says his department is reviewing the subcommittee report, evaluating the costs of design, construction, administration, and inspection for various options. Some, such as the bypass pipe, which would need to be about 8 feet in diameter, don't appear to be technically feasible, according to Tucker. Meanwhile, the city attorney's office is working on liability issues. "Within two months we'll go to the council with a comprehensive report," Tucker anticipates. "It's not finalized yet; we're still dealing with significant issues. Relocation is still an option if the city would be at tremendous financial risk without insurance coverage."

Meanwhile, the Martinez beavers go about their business. According to Avalon, Lisle said he had never seen a colony "so complacent about being observed in an active human environment." Perryman says they react to threats in the water "but don't worry so much about threats on land." She's seen them slap their tails to discourage visiting

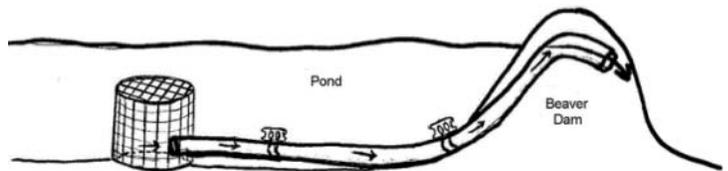


Illustration of beaver deceiver by Heidi Perryman



Photo by Cheryl Reynolds

otters from getting too close to the kits. The changing beaver-pond community may, among other things, solve any muskrat problem: "Our muskrat population took a nosedive," she says, "and we wondered what happened until we saw the mink"—a known muskrat predator. More birds are frequenting the beaver pond: a resident pair of belted kingfishers, common yellowthroats, song sparrows, green herons, scaup. Western pond turtles, a state and federal species of special concern, bask on its banks. Steelhead have been spotted in the creek.

Perryman hopes the city will decide to find a way to live with the beavers, but she is worried about flood control efforts: at press time, city crews had removed vegetation from the creek bank downstream from the dam. More worrisome yet, the city is seeking a CEQA exemption to perform emergency creek work, including possibly removing the beaver dam. Says Perryman, "They still want to get rid of them, but we've been a stone in the river blocking that." She's sure of one thing: "Any city that's smarter than a beaver can keep a beaver." See [www.martinezbeavers.org](http://www.martinezbeavers.org)

## CONTACT:

Heidi Perryman, [hdshnrk@comcast.net](mailto:hdshnrk@comcast.net);  
Mitch Avalon, [ravalon@pw.co.contra-costa.ca.us](mailto:ravalon@pw.co.contra-costa.ca.us);  
Tim Tucker, [ttucker@cityofmartinez.com](mailto:ttucker@cityofmartinez.com). JE

# PLACES TO GO & THINGS TO DO



## CONFERENCES, WORKSHOPS EXHIBITS, & TOURS

**OCT**  
SAT-WED  
**11-15**

**COASTAL AND ESTUARY HABITAT RESTORATION CONFERENCE**  
TOPIC: 4th National Conference on Coastal and Estuarine Habitat Restoration  
LOCATION: Rhode Island Convention Center, Providence  
SPONSOR: Restore America's Estuaries [www.estuaries.org/?id=138](http://www.estuaries.org/?id=138); (703)524-0287

**OCT**  
TUESDAY  
**14**

**CALIFORNIA COLLOQUIUM ON WATER**  
TOPIC: Gary Wolff, Vice-Chair of California State Water Resources Control Board, on Successes and Failures in California Water Regulation  
LOCATION: 112 Wurster Hall, UC Berkeley  
SPONSOR: Water Resources Center Archives  
<http://www.lib.berkeley.edu/WRCA/ccow.html>

**OCT**  
WED-FRI  
**22-24**

**5TH BIENNIAL CALFED SCIENCE CONFERENCE**  
TOPIC: Global Perspectives and Regional Results: Science and Management in the Bay-Delta System  
LOCATION: Sacramento Convention Center  
SPONSOR: CALFED Bay-Delta Program <http://science.calwater.ca.gov/conferences/>; (510)622-2304.

**OCT**  
FRIDAY  
**24**

**ABAG FALL GENERAL ASSEMBLY**  
TOPIC: Regional Water-Land Use Planning: The Delta Connection  
LOCATION: Oakland Marriott City Center  
SPONSOR: Association of Bay Area Governments  
(510) 464-7922

**OCT**  
SUN - WEDS  
**26-29**

**NATIONAL TRANSIT AND LIVABILITY CONFERENCE**  
TOPIC: Rail-Volution 2008  
LOCATION: Hyatt Regency Embarcadero, San Francisco  
SPONSOR: Rail-Volution, a coalition of transportation agencies and other groups  
[www.railvolution.com](http://www.railvolution.com); (800)788-7077 for registration

**NOV**  
WEDNESDAY  
**5**

**EDAW SCIENCE SEMINAR**  
TOPIC: John Calloway, University of San Francisco, on Impacts of Climate Change on San Francisco Bay-Delta Tidal Wetlands  
LOCATION: 2022 J Street, Sacramento  
SPONSOR: EDAW  
<http://www.edaw.com/ClimateChange/ClimateChange.pdf>;  
[ClimateChange@edaw.com](mailto:ClimateChange@edaw.com).

**NOV**  
THURS-FRI  
**6-7**

**CALIFORNIA WATER POLICY CONFERENCE**  
TOPIC: Crisis = Opportunity  
LOCATION: Pasadena Hilton, Pasadena  
SPONSOR: Public Officials for Water and Environmental Reform  
<http://www.cawaterpolicy.org/>

**NOV**  
WED-THURS  
**12-13**

**RIVER TOUR**  
TOPIC: San Joaquin River Restoration Tour  
LOCATION: Tour begins and ends in Fresno  
SPONSOR: Water Education Foundation  
<http://www.watereducation.org/tours-detail.asp?id=845>; (916)444-6240

**NOV**  
THURS-FRI  
**13-14**

**CLIMATE CHANGE SUMMIT**  
TOPIC: Climate Change: Managing Risk and Uncertainty  
LOCATION: Long Beach Hilton, Long Beach  
SPONSOR: Water Education Foundation  
<http://www.watereducation.org/doc.asp?id=852>; (916)444-6240



## HANDS ON

**OCT**  
SAT-SAT  
**4-11**

**NO DRUGS DOWN THE DRAIN CAMPAIGN**  
LOCATION: Statewide  
SPONSOR: Multiple local, regional, state, and federal agencies  
<http://www.nodrugsdownthedrain.org>

**OCT**  
SATURDAY  
**18**

**NEW BAY TRAIL LOOP PREVIEW HIKE**  
LOCATION: Richmond (Wildcat Creek marsh)  
SPONSOR: Trails for Richmond Action Committee  
<http://www.poinrichmond.com/bay-trail/calendar.htm>

**OCT**  
SUNDAY  
**26**

**UCC-TOBERFEST 2008**  
TOPIC: Urban Creeks Council's annual brew bash.  
LOCATION: Joaquin Miller Community Center, Oakland  
SPONSOR: Urban Creeks Council  
[kristen@urbancreeks.org](mailto:kristen@urbancreeks.org);  
(510)540-6669

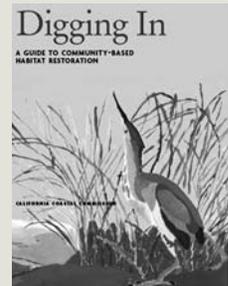
**NOV**  
SATURDAY  
**8**

**OILED WILDLIFE RESCUE TRAINING**  
TOPIC: Introduction to the fundamentals of wildlife rescue  
LOCATION: Shorebird Park Nature Center, Berkeley shoreline  
SPONSOR: WildRescue  
[www.wildrescue.org/](http://www.wildrescue.org/) (831)869-6241

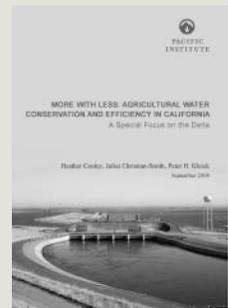
## NOW IN PRINT & ON LINE

*Climate Change: Charting a Water Course in an Uncertain Future* by Michael J. Wallis, Michael R. Ambrose, and Clifford C. Chan. Journal of the American Water Works Association, June 2008. <http://www.awwa.org/publications/AWWAJournalArticle.cfm?itemnumber=36471>

*Digging In: A Guide to Community Based Habitat Restoration. 2008.* California Coastal Commission. <http://www.coastal.ca.gov/publiced/UNBweb/digging.html>



*More With Less: Agricultural Water Conservation and Efficiency in California.* September 2008. Pacific Institute for Studies in Development, Environment, and Security. [http://www.pacinst.org/reports/more\\_with\\_less\\_delta/index.htm](http://www.pacinst.org/reports/more_with_less_delta/index.htm)



*River Futures: An Integrative Scientific Approach to River Repair*, edited by Gary Brierley and Kirstie Fryirs. Island Press, June 2008. [http://www.islandpress.org/bookstore/details.php?prod\\_id=1183](http://www.islandpress.org/bookstore/details.php?prod_id=1183)

*State of the Estuary Report 2008: A Greener Shade of Blue.* <http://www.sfestuary.org/pdfs/soe/SOE-2008.pdf> or call 510/622-2304 for hard copy



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

## Estuary Web site at

<http://www.sfestuary.org/estuarynewsletter.html>

To subscribe to/questions about ESTUARY:  
(510) 622-2499

## STAFF

Managing Editor: Lisa Owens Viani  
Associate Editor: Joe Eaton  
Contributing Writer: Cariad Hayes Thornton  
Page Design: Bobbi Sloan

ESTUARY is your news source on Bay-Delta water issues, estuarine restoration efforts, and the many programs, actions, voices, and viewpoints that contribute to implementation of the S.F. Estuary Project's Comprehensive Conservation and Management Plan (CCMP). Views expressed may not always reflect those of Estuary Project staff, advisors, or CCMP committee members. ESTUARY is published bimonthly.

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## MERCURY CLUES CONTINUED

Darell Slotton's research team developed a wide-ranging, regional monitoring program that tracks methylmercury concentrations in small fish throughout the North Bay, Delta, and Central Valley. This program found a common thread across the whole region: all of the sites that showed significant spikes in methylmercury uptake by fish could be linked to the occasional flooding of soils that had dried out, says Slotton. Conversely, the UC Davis work found that small fish in newly restored, deeper, tidal wetlands that remain inundated and did not experience periodic drying-out, including Napa Marsh and

parts of the North Delta, had low methylmercury concentrations compared to small fish from surrounding areas.

Says Davis, "We're still learning a lot about methylmercury every year that passes. These were some fundamental discoveries leading to the hypothesis that methylmercury production may be greater in less-frequently inundated wetlands." Are there any implications for wetland restoration? Says Yee, "There's going to be some risk of methylation inherent in the nature of a productive marsh; we don't have an action

plan for preventing that and may have to weigh benefits of productive restored wetlands against possible methylmercury risks. But since newly-restored marshes are often at lower elevations and are more saturated than higher, older marshes, they may methylate a little less and pose less of a methylmercury threat in the short term. In the meantime, maybe we can learn to better control mercury sources such as atmospheric emissions and watershed runoff to the Bay."

CONTACT: [jay@sfei.org](mailto:jay@sfei.org), [Igrenier@sfei.org](mailto:Igrenier@sfei.org), [dgslopton@ucdavis.edu](mailto:dgslopton@ucdavis.edu) LOV

