

**WALKING THE TALK**

Is it possible to prepare for something as daunting as climate change? SFEP, as one of six estuary projects selected recently by the U.S. EPA as pilots, with the Bay Conservation and Development Commission as lead partner, is going to try. With BCDC and other partners, SFEP will work with the EPA to complete a vulnerability assessment for climate related impacts and produce an adaptation plan for the Estuary.

While climate change is a priority of the newly revised CCMP, an ongoing program area we're continuing to focus on is pollution prevention and reduction. On September 20—Coastal Cleanup Day—we'll assist Save the Bay in cleaning Martin Luther King, Jr. Shoreline Park of trash, one of the Estuary's most troublesome and ubiquitous pollutants. Later in the month, we'll celebrate National Estuaries Day with an information table at Jack London Square in Oakland on Sunday, September 28 from 10 am-2 pm.

With pollution prevention and cleanup in mind, this issue of ESTUARY highlights some lesser known pollutants, some of them from unexpected sources, and most of which we don't yet know enough about (see Canary in the Caulking, Silver Washout, WaterWorry columns, pages 2, 4 and 5).

On page 3, some Estuary thinkers share their thoughts about the state of the Estuary on the 15th anniversary of the CCMP, in an excerpt from the just-published 2008 State of the Estuary report. Hard copies can be ordered from the Estuary Project or downloaded at [www.sfestuary.org](http://www.sfestuary.org) (see page 7 for details).

And to further the CCMP goal of restoring wetlands and watersheds, SFEP continues to work with its many partners around the Bay. One exciting potential new source of funding for wetland restoration, open space, and other Estuary-related activities is the new Bay Area license plate developed by the Bay Area Open Space Council and the Coastal Conservancy—see the story on page 6. The license plate's slogan—Nature Within Reach—captures in three words one of the biggest reasons for all of our efforts to preserve and restore the largest estuary on the West Coast.—Judy Kelly, SFEP Director

**CANARY IN THE CAULKING?**

Estuary scientists have long known that the Bay and Delta are contaminated with PCBs, or polychlorinated biphenyls, prompting the S.F. Regional Board to issue a TMDL (total maximum daily load) and warnings that humans limit consumption of Bay fish. PCBs—a probable human carcinogen—may be causing reproductive failure in birds and affecting immune response in harbor seals. Once used in electronic equipment and as plasticizers in sealants, grout, paint, floor and ceiling tiles, and caulking materials, PCBs were banned 30 years ago. But recent studies of PCBs in building caulking in Germany, Switzerland, Finland, Boston, and New York have raised questions about whether there might not be an ongoing source of this “legacy” pollutant hiding right beneath our noses, particularly as buildings are renovated or demolished. Could PCB dust or particles run off from the ground into stormwater and the Bay? “The problem is, this stuff is now 30, 40, 50 years old if it hasn't been replaced,” says the S.F. Estuary Institute's Susan Klosterhaus.

“It can degrade over time and become dust. When caulking is on the outside of the building, PCBs can enter the surrounding soil, and potentially enter urban runoff that way.”

While studies of Bay Area buildings and their surrounding soil have not yet been conducted, the issue has been under scrutiny elsewhere. A 2004 study by the Harvard School of Public Health and the International Union of Bricklayers and Allied Craft Workers of 24 public buildings (schools, universities, and other buildings) in Boston found that eight exceeded the 50 ppm U.S. EPA criteria for hazardous waste, some by a factor of nearly 1,000. After reading that study, a retired podiatrist in New York, Dr. Daniel Lefkowitz, became curious about possible PCBs at his son's elementary school in Yorktown Heights, where the windows had been removed the year before.

“I called the EPA and asked them how I could know the caulking didn't have PCBs,” recalls Lefkowitz. “They told me to see if I could find



Photo Denise Grieg

continued page 4

**INSIDE**

WESTLANDS CONSERVATION LEADERS .....	2
A GREENER SHADE OF BLUE? .....	3
SILVER WASHOUT .....	5
ECLECTIC MODEL .....	6

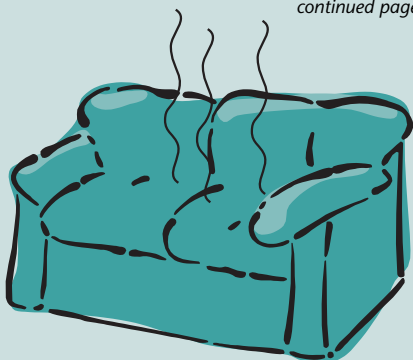
# WATERWORRY

## COUCH CSI

The S.F. Estuary Institute's Susan Klosterhaus was curious about her new couch—and the chemicals she might be sitting or lying on. Klosterhaus, who had spent five-and-a-half years studying PBDE flame retardants and their bioaccumulation in Chesapeake Bay food webs in graduate school, moved to California last year and purchased a couch. Knowing that PBDEs, which have shown up in Bay harbor seal blubber in high concentrations, have been banned in California, with the exception of Deca-BDE, she was curious about what alternatives might have been used. A scientist friend, Arlene Blum, who has been studying flame retardants since the 1970s, zapped Klosterhaus's couch with a portable X-ray fluorescence analyzer, and the couch "talked": its cushions contained 4% bromine. Klosterhaus then tried to find out which brominated flame retardants had been used by calling the chemical manufacturer. Although the chemicals are considered proprietary business information, the company did send her a sample, which she then had analyzed by Duke University and Wellington Laboratories in Ontario, Canada. The two chemicals turned out to be a tetrabrominated benzoate (TBB) and a tetrabrominated phthalate (TBPH).

The next step was to try to find out what, if any, known health or toxic impacts there might be from these chemicals—on human health or to fish and wildlife. U.S. EPA risk assessments only identify PBDE replacements as "Proprietary F" and "Proprietary H," but Klosterhaus suspects those chemicals are TBB and TBPH respectively. In EPA's September 2005 Furniture Flame Retardancy Partnership report, hu-

*continued page 8*



# HOW I SEE IT

## WESTLANDS WATER DISTRICT: CONSERVATION LEADERS

As the largest agricultural water district in the United States, a major employer, and a key component in California's economy, Westlands not only has a vital interest but also a significant role to play in the evolving debate over the future of California's water system. It is a responsibility that the more than 700 families who farm the Westlands district take very seriously.

We are the stewards of some of the most productive agricultural lands in the world. The food and fiber grown here serve markets all over the globe. And to continue as leaders in a global economy, Westlands is constantly changing to meet the needs of a dynamic marketplace, enhance the environment, expand the diversity of its crops, and apply the most advanced irrigation techniques and technology for water conservation and long-term sustainable production.

Westlands encompasses more than 600,000 acres in an area 15 miles wide and 70 miles long on the west side of California's Central Valley. The value of our crops exceeds \$1 billion in most years and the regional economic activity generated by our operations exceeds \$3.5 billion annually. Diversity has been the key to the district's continuing prosperity. Twenty-five years ago, 79% of the district's lands were planted in cotton, wheat, and other field crops. Today more than 61% of the district's lands are producing fruits and vegetables as well as permanent crops such as almonds, pistachios, and grapes.

Productivity, however, is only one measure of the value we bring to the California economy. Westlands is also a world leader in water conservation. Scientific research and innovation have kept Westlands at the cutting edge of new technology. As a result, agricultural leaders from around the world come to Westlands to learn about the water-saving techniques we have developed.

From its inception, Westlands' water distribution system has been fully enclosed, to eliminate losses from evaporation and leakage. Laser-leveling, computer-aided drip irrigation, and the extensive use of GPS help Westlands farmers achieve efficiencies of water use of 85% and higher. And in recent years, we have retired nearly 100,000 acres in order to reduce water demand, improve drainage, and provide wildlife habitat.

Water conservation is essential because we've learned that Westlands cannot rely on receiving our full allocation of water from the Central Valley Project. In recent years we have been lucky to receive even half of those supplies. This year, we were told we would only receive 40% of our allocation. But mid-year it was announced that

we could only use half of our allocation during the three most important irrigation months of June, July, and August. As a result, hundreds of millions of dollars worth of fresh fruits and vegetables have been abandoned in the fields because there isn't enough water to sustain them. The drought that has held California in its grip for the last two years is only part of the problem. The impact of those natural shortages has been compounded by a court decree that has sent more than 600,000 acre feet of California's fresh water floating out into the ocean, in hopes of improving the habitat for a small number of Delta smelt.

As a result, tens of thousands of acres of valuable croplands have been taken out of production. Hundreds of people have lost their jobs and many more working families are being displaced. Businesses are beginning to close, deepening the crisis for some of the poorest cities and towns of the Central Valley. Schools are facing shortages in attendance, and some may not be able to open. Communities that have had to endure unemployment levels of 20% and higher face a mounting demand for social services of all kinds. And crime rates are going up as desperation erodes the quality of life.

Like the smelt, we are all facing the consequences of the environmental collapse of the Delta. The Delta is the essential link in the state's broken water system. And as the governor's recent Delta Vision report has confirmed, repairing the Delta environment and restoring reliability to the delivery of water supplies are co-equal objectives, inseparably intertwined. In other words, we cannot accomplish one without also doing the other.

This is the task that we are now beginning to address in California. To succeed, our progress will not be measured in how much of our precious water supply we continue to waste into the ocean or by how much more water we deny to the 25 million Californians who depend upon supplies pumped through the Delta. It will be defined instead by our ingenuity in balancing environmental integrity with the needs of future generations. If we fail to find that balance, the prosperity that agriculture produces, the jobs and the communities that rise and fall with the Central Valley's agricultural economy will not be able to survive. That would leave the nation poorer and consumers more reliant than ever on other countries and their agricultural standards and attitudes toward environmental health.

Westlands brings value to the debate over California water policy that goes beyond economics. Year after year, the farmers of Westlands have demonstrated flexibility to respond to a deteriorating water system, ongoing respect for the environment, and a commitment to sustaining the quality of our lives on the land. Those

*continued page 8*

## A GREENER SHADE OF BLUE?

OPENING REMARKS (EXCERPTED FROM THE 2008 STATE OF THE ESTUARY REPORT)

*How green—or ecologically sustainable—is the Estuary and its watershed? How much progress has been made since the CCMP, the Comprehensive Conservation and Management Plan for the Bay-Delta Estuary, was first signed in 1993?*

### MARC HOLMES, THE BAY INSTITUTE

I think the question mark in “A Greener Shade?” is merited. Right now, almost every assumption that we made ten years ago about the future is in serious doubt, from the value of tidal wetland restoration with rising sea levels, to our ability to sustain Estuary fish in the face of drought and ongoing excessive water diversions. Add to those the unpredictable impact of thousands of pollutants on the ecosystem and, with these variables alone, it is becoming increasingly clear that we don’t have much of a clue about how to proceed. As an environmental community, we certainly should be having frank conversations about this unpredictable future. Whereas in the past, we thought we were struggling only with the question of how to sustain the ecological vitality of the Estuary in the face of wildlife declines, since Katrina, the POD, and sea level rise, we now are faced with the reality that we also are unable to sustain California’s traditional economic activities related to the Estuary. We now must consider not simply tweaking the plumbing to increase fish numbers, but retooling the entire Central Valley land use map, as well as the activities of all of urban California that relies on Estuary water. That is to say, the California way of life requires complete overhaul.

### LEO WINTERNITZ, CALFED BAY DELTA PROGRAM

Clearly we’re worse off than 15 years ago. We have the pelagic organism decline (POD); we have toxic algae in the environment, more invasive species, greater urbanization in the Delta. We’re not better off, and those are the symptoms. The big symptoms are the numbers of lawsuits being filed once again in this arena: they are indicative of problems we’re facing and haven’t been able to resolve. In terms of our thinking, we’re better off. We understand more; we know better what we don’t know. Perhaps we’re a bit more sophisticated in recognizing that we don’t have the answers and that therefore our plans have to be able to accommodate mistakes or things we don’t know. For instance, we’ve recognized over the last 15-20 years the immense values of floodplain attenuation and the values of floodplains for the ecosystem. We’ve come to recognize that water is a very limited resource, and that the system is probably over-appropriated in terms of water diversions as we look at their effects on the environment. We’ve become smarter not just at doing things but in recognizing uncertainties in what we do and acknowledging those, so in that sense we’re a lot greener. Can we put this knowledge to use, to action in the near future and for the long term? I don’t know; we’ll have to find out.

### DAVID LEWIS, SAVE THE BAY

In some areas we’ve made significant improvements, and in other areas I think we’ve lost ground. We’ve made the most progress meeting wetlands and habitat goals; 15 years ago we still had to convince people that wetlands were important; 5 and 10 years ago we still had to convince them that wetlands needed to be acquired and protected. Now we have almost 40,000 acres waiting to be restored. Save the Bay’s polling shows strong support for helping pay for that work. Proposing to destroy wetlands on the Bay shoreline is pretty close to impossible these days—that’s a big change in 15 years. Is there more work to do? More places to acquire? Obviously a lot. And there is increased pressure to expedite the pace because of sea level rise. We will be able to restore more and restore more easily and with more benefits the sooner we do it; the longer we wait the harder it will be to get it started, and the harder it will be to have a maximum benefit. I’m optimistic, though, because of public attitudes and institutions. We’ve also made big progress in 15 years on water quality, and we’re on the verge of making more. Most of that progress has been in point source regulation. Where there hasn’t been as much progress is on non-point source—trash and other pollutants. But there is growing public understanding, and potential for significant effective regulation. If something dramatic doesn’t happen with the Bay Area stormwater permit and soon, I think the Bay Area will go the route Los Angeles did—with litigation.

## PEOPLE

### DAHM HEADS CALFED SCIENCE



Ecologists are big-picture, see-all-the-pieces folks, and Clifford Dahm, CALFED’s newly-appointed lead scientist, plans to apply just that sort of all-inclusive vision to the state’s seemingly intractable water issues and the thorny questions facing the Delta. Dahm is a biology professor at the University of New Mexico,

where he leads the interdisciplinary Hydrogeocology Research Group, studying aquatic ecology, interactions between stream and groundwater, nutrient cycling in ecosystems, dissolved organic carbon in streams, and riparian ecology. On a two-year interagency loan to CALFED, Dahm says, “I consider myself an ecosystems ecologist and because of that, see the need to interface and understand both biological and abiological worlds. I’ll try to bring that focus to the CALFED program—I like to bring in the physical, chemical, and biological perspectives, rather than looking at things piecemeal. Whether you’re studying an estuary or a delta or river, that kind of perspective is profitable.”

Dahm has worked on other politically-charged ecosystem issues, namely on the Kissimmee River in Florida, and, for the past five years, as a member of an external advisory panel setting minimum flows and levels for major rivers in the Tampa area—work that seems especially timely, given California’s interest in restoring flows for fish all while ensuring water supply for the state’s myriad other users. “The Delta Vision process puts those forth as co-equal goals. The question is how we are going to do that—balance those competing needs,” says Dahm.

Dahm recently co-authored a paper in *Science* based on his work with the National Center for Ecological Analysis and Synthesis at UC Santa Barbara, examining data on about 40,000 stream and river restoration projects nationwide. “We looked at what kind of restoration was done, what kind of expenditures, monitoring and evaluation were done to discover whether or not restoration was successful. A billion dollars is being spent each year on stream and river restoration, yet we found that less than 10% of the projects are being evaluated.” Another recent co-authored paper published in *Nature* examined the fate of nitrate within streams in North America—in watersheds dominated by native species as well as agricultural and urban streams. “We found that as nitrate loading increases, the ability of the system to process that nitrate goes down,” says Dahm.

CALFED’s Leo Winternitz looks forward to working with Dahm. “His experience on the Kissimmee River and in Tampa Bay is directly relevant to the kind of problems we’re facing here. He has experience guiding ecosystem restoration programs and in setting flows and levels for healthy rivers and with water management and drought issues in the southwest, all extremely relevant to problems we face here.” **LOV**

## WATERWORRY

### TOXIC TIES AND POLES

With re-registration pending, the U.S. EPA has issued revised risk assessments for two controversial wood preservatives, creosote and pentachlorophenol. Pesticide activists call the use of treated wood for railroad ties and utility poles an archaic technology, and argue that EPA's prior claim that suitable alternatives are lacking no longer holds water. "We've long believed these chemicals, because of the importance of human and environmental health and in light of the availability of alternative materials to treated wood, should be banned by the agency," says Jay Feldman, executive director of Beyond Pesticides. Locally, the San Francisco Department of the Environment and the San Francisco Bay Regional Water Control Board have been sharply critical of the federal risk assessments.

Creosote is a source of polyaromatic hydrocarbons (PAHs), which impair 20 California water bodies, including central San Francisco Bay. Fish embryos and larvae are extremely sensitive to PAH mixtures. Despite that, 15% of all creosote use in 2004 was for piers, pilings, and other aquatic installations. Beyond Pesticides identified 19 aquatic data gaps in the EPA's creosote risk assessment. The Water Board also called for better aquatic toxicity data and identification of hazards and costs to the herring and salmonid fisheries.

Pentachlorophenol (PCP) is important as a precursor of dioxins, which can form from it in clay soils. According to a 2004 San Francisco Estuary Institute report, utility poles treated with PCP may be the largest source of dioxin releases into San Francisco Bay, already impaired because of dioxin levels in fish. Although PCP is an important stormwater pollutant, the EPA doesn't address urban runoff of PCP or its dioxin products, a key issue for San Francisco's combined sewer system. Despite the presence of dioxins in fish, the EPA did not perform a dietary risk assessment, and SF Environment says it also downplays residential exposure. The city agency even raised wildlife exposure issues: Woodpeckers foraging and drumming on treated wooden poles are directly exposed to PCP, but the EPA's avian risk model uses ground-feeding bobwhite quail.

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### CANARY CONTINUED

any leftover caulking on the ground. I picked up a piece and had it sampled—it came back at around 180,000 ppm." Lefkowitz then asked the local health department to sample the ground surrounding the school, but it refused. He had the soil tested on his own dollar—the result came back at 240 ppm (far above EPA soil cleanup standards of 1 ppm). Eventually, says Lefkowitz, the school removed the caulking. Lefkowitz next teamed up with a bricklayer in Massachusetts who shared some of the same concerns. Last year, they tested some schools in the Bronx, which also revealed high PCB levels, and took the results to the media. Today, says Lefkowitz, legislation is being drafted that would mandate testing for PCBs in schools.

"If you're a building owner, you don't want to know about [PCBs]; once you find out, you have to deal with it," says Lefkowitz. "You have to remove it, and it's expensive, especially if it's a 10- to 15-story building, and there's soil contamination outside, too. It's bigger than asbestos. If you find asbestos you can deal with it, encapsulate or isolate it; you don't have to remove it."

Lefkowitz worries that renovation and construction are not the only ways PCBs are getting into air, soil, and water. "They can volatilize out of the caulking and even contaminate masonry." He worries about PCBs less for their potential cancer-causing effects than for their health impacts, especially on children. "They can cause endocrine disruption and thyroid issues, which people aren't focusing on as much," he points out. Klosterhaus says that construction workers renovating or demolishing buildings may also be exposed to PCBs in dust particles from caulking.

The PCB problem is thought to be restricted to buildings built or renovated before 1977, before PCBs were banned, says Klosterhaus, although Lefkowitz points out that stockpiled supplies could have been used for years afterward. Lefkowitz says Finland has been very active in removing PCBs. "We're not doing it here because the problem is so immense; we're probably talking trillions of dollars, and there's no political backbone to do it."

At last October's State of the Estuary conference, Kevin Kelley, of California State University at Long Beach, presented studies showing that thyroid function, growth, metabolism, and stress responses (among others) were being affected in shiner surfperch and staghorn sculpin in the Bay. Kelley pointed out that these fish are accumulating PAHs, chlorinated pesticides—and PCBs—in their livers. Could PCBs from caulking and other building materials continue to be a

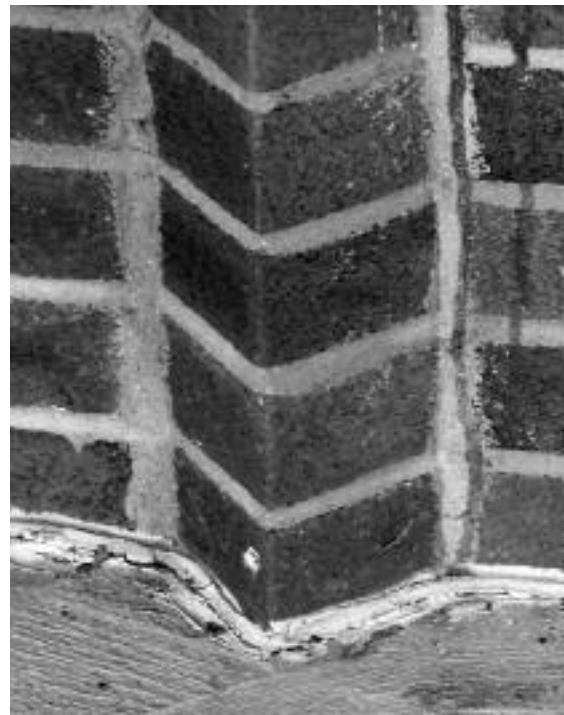


Photo of PCB-laden caulking by Daniel Lefkowitz

source of Bay contamination, years after they were banned? "They are very much a potential source since concentrations can be so high—at percent levels—in the caulk," says Klosterhaus, who adds that both the Swiss and Swedish governments have developed programs to manage PCB-containing building materials during renovation or demolition. Klosterhaus points to a study of 1,348 buildings by the Swiss government, which showed that almost half the surveyed buildings had PCB-containing joint sealants, with 10% of those buildings containing sealants with PCB concentrations exceeding 10% by weight. The "total PCB reservoir" in building joint sealants in Switzerland was an estimated 50–150 metric tons. (The population of Switzerland, 7.3 million, is similar to that of the Bay Area, 6.8 million, but building construction dates and methods may differ.)

While the United States does not have a management program for PCBs in building materials, in the Bay Area, the now-defunct Clean Estuary Partnership had come up with a very coarse estimate of the potential contribution from various sources of on-land PCBs, according to the Alameda Countywide Clean Water Program's Arleen Feng. That estimate showed that caulks and sealants could be contributing up to 5 kg/year of the (roughly estimated) 25–40 kg of PCBs in urban runoff to the Bay.

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## ENVIRONMENT

### SILVER WASHOUT

It is unlikely that every cloud has a silver lining. However, that may not be true of your socks. Technically, it would be not so much a lining as a myriad of silver nanoparticles, as small as 10 nanometers in diameter. (A nanometer is a billionth of a meter.) Nanosilver releases silver ions that kill bacteria; added to sock fabric, it supposedly helps reduce foot odor. But recent research at Arizona State University shows that the nanosilver doesn't always stay in the socks, and where it goes from there—including possibly into the Estuary—is a matter of environmental concern.

Nanotechnology, once the stuff of science fiction, is quickly becoming an industrial commonplace. The total worldwide value of products incorporating nanotech was \$50 billion in 2006 and projected to hit \$2.6 trillion by 2014. As of last year, at least a hundred products containing nanosilver alone were on the market: clothing, cosmetics, computer peripherals. "You can get antibacterial dishtowels from Martha Stewart," says Samuel Luoma of the US Geological Survey (emeritus) and the John Muir Institute of the Environment at UC Davis.

ASU professor Paul Westerhoff and graduate student Troy Benn chose six sock brands—athletic socks, hikers, lounge socks—and quantified their nanosilver content. The socks then went through a distilled-water wash. "We found that some held on to their silver better than others," Benn says. Some shed most of their nanosilver after 2 to 4 washings.

"We also wanted to know how well water treatment plants could remove the silver," Benn explains. "We exposed the wash water to wastewater treatment plant bacteria, which removed it fairly well. But we could never get 100% removal." This could leave treated biosolids with a high silver concentration, limiting their agricultural use.

Benn is also concerned about nanosilver's toxicity to beneficial microbes. He says the ionic form of silver is toxic to fish and earthworms. According to Luoma, silver pollution is known to have shut down the reproduction of mollusks in San Francisco Bay. Discharges from a photo-processing lab in Palo Alto caused complete reproductive failure in the clam *Macoma balthica*. "The ones that grew large enough to have gonads didn't produce sperm or eggs," he says. An episode of silver contamination near the Concord Naval Weapons

Station had a similar effect on the overbite clam (*Corbula amurensis*).

Little is known about nanosilver's biological impacts, although two recent studies with zebra fish show embryonic deformities similar to those induced by selenium. Otherwise, there are mostly question marks. "We don't know how long nanoparticles will last or how organisms will be exposed to them—through food or in solution," Luoma cautions. In estuarine environments, nanosilver can form a bioavailable complex with chlorides. But scientists don't know whether it bioaccumulates the way selenium and other contaminants do. "We don't have any way to analyze nanosilver in the environment itself," he adds. "We can't detect it if it's there."

And how it behaves at the cellular level is a matter of conjecture.

One researcher drawn by the challenge of nanosilver is Joyce Chai, a student at Palos Verdes Peninsula High School in southern California. Chai, who has been modeling the toxic effects of silver nanoparticles, was recently named the US winner of the 2008 Stockholm Junior Water Prize.

The regulatory picture is cloudy. Luoma says the Environmental Protection Agency has regulated only one consumer product containing nanosilver, a washing machine that shoots silver ions into wash water. EPA treats the appliance as a pesticide, covered by the Federal Insecticide, Fungicide, and Rodent Control Act, because of its antibacterial properties. Benn suggests that manufacturers inform consumers of nanomaterial content: "I've spoken with a lot of people who don't necessarily know what nanotechnology is but they are out there buying products with nanoparticles in them." More information would help them make informed decisions, says Benn.

Luoma has a sense of déjà vu: "The analogy is photography. Every time you develop a photograph, you wash a little silver down the sink." The release of nanoparticles, potentially significant in the Bay Area and elsewhere, is happening in a scientific and regulatory void. "We're doing another experiment on ourselves," he says.

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## WATER WORRY

### CLEAN HANDS, DIRTY BAY?

Antibacterial soaps and other such germ-fighting products are popular with the public, but it turns out they may not be so great for the health of fish and frogs, or even at fighting bacteria. Triclosan and triclocarban are two of the chemical culprits. They're found in everything from hand soaps to toothpaste, dish and laundry soap, toothpaste, and mouthwash—and now even in countertops, cutting boards, paint (as a fungicide), doorknobs, and sandals. "There's an amazing array of antibacterial products," says EBMUD's Jen Jackson, who explains that triclosan is a registered pesticide regulated by the U.S. EPA in non-cosmetic uses, while the U.S. FDA regulates its cosmetic uses.

New studies show that triclosan is a thyroidal endocrine disrupter in aquatic life, particularly in frogs. A study by University of Victoria, British Columbia researchers and others published in 2006 in *Aquatic Toxicology* found that in combination with natural thyroid hormones, triclosan triggered increased rates of metamorphosis and tail fin gene expression in North American bullfrogs. Triclosan has also been found to bioaccumulate in fish, has been found in human breast milk, and, in the presence of UV light, can degrade into a compound with dioxin-like characteristics.

After a 2002 USGS survey discovered triclosan in waterways throughout the country, EBMUD tested wastewater from residential, commercial, and industrial sources, as well as its effluent, and found the compound in nine out of 21 samples. Last year, the agency switched to using good old-fashioned soap among its own employees, and sent information about triclosan's possible impacts on the Bay in customers' bills, says Jackson. (The agency offers alcohol-based hand sanitizers to workers who come into contact with risky substances.) In 2000, the American Medical Association recommended avoiding the use of antimicrobials in consumer products, citing worries about adding to the problem of antibiotic resistance, and stating that "no data exist to support their efficacy when used in such products or any need for them."

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## OUTREACH

### LICENSE TO HELP THE BAY

Joining the ranks of whale tails and scenes of Yosemite and Lake Tahoe, a new Bay Area license plate made its debut in mid-July at a Crissy Field press conference. Sponsored by the Coastal Conservancy and the Bay Area Open Space Council, the plate features the Golden Gate Bridge against a backdrop of the Marin headlands and pelicans soaring over the Bay.

Says the Open Space Council's Elizabeth Adams, "We're hoping that people will respond to it on all sorts of levels; on an intellectual level to help us fund projects; also on an emotional level, and an understanding that nature here is so important to the identity of the Bay Area. And that it is beautiful right here—you don't have to spend a huge amount of money on gas to go anywhere else."

The Conservancy and Council first polled the public on the tagline, and "Nature Within Reach" was the winner, says the Conservancy's Amy Hutzel. "It's really about celebrating this place. 'Nature within reach' ties in well with the Golden Gate Bridge image on the plate and the work that the Bay Area Open Space Council does, making sure people have access to nature."

The final design for the plate has been approved by the DMV, says Hutzel; the next step is to get 7,500 people to submit paid pledges in one year. The majority of proceeds from the plate will go to the Coastal Conservancy, says Hutzel. "We can then grant those funds to non-profits and local agencies to do all the types of projects we already support. The great part is that we will have a sustainable source of funds annually that is very flexible (more so than bond dollars) to do open space protection, wetlands restoration, and public access."

To sign up for the plate, see [www.bayarealicenseplate.org](http://www.bayarealicenseplate.org).

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## SCIENCE

### ECLECTIC MODEL

Fifty-one years ago, the US Army Corps of Engineers built a working model of San Francisco Bay on the Sausalito waterfront. Its purpose was to test the feasibility of damming and filling most of the Bay; the Corps continued to use it for research until 2000.

An interdisciplinary team of US Geological Survey scientists is now constructing a virtual version of the Bay model. The Computational Assessment of Scenarios of Change for the Delta Ecosystem (CASCaDE) project, funded by CALFED and the USGS, will replicate Bay, Delta, and watershed processes in a series of linked computer models. Like water in the real world, CASCaDE data is intended to flow from one level to the next, linking the Sierran snowpack with downstream phenomena like phytoplankton productivity and the accumulation of selenium by clams. When it all comes together, it will be possible to run alternative global climate change scenarios and forecast their very local ecological consequences. "People have done conceptual models of these linked processes before," says Neil Ganju, who is studying sedimentation. "But to do it numerically, with global climate models coming down to the region—that's new."

Ganju says another researcher, Noah Knowles, is helping link the global and regional scales. "I'm waiting for Knowles' scenarios of Sacramento and San Joaquin flows for the next hundred years," Ganju explains. "Once he has those, the sedimentation models are ready to go." He'll pass his sedimentation data on to Jim Cloern and Lisa Lucas, whose focus is phytoplankton primary production. Lucas' model will overlay a model of Delta hydrodynamics developed by Nancy Monsen, and both, along with Jan Thompson's clam research, will provide data for Robin Stewart's and Sam Luoma's work on mercury and selenium contamination.

Linking the models will help clarify the effects of changes in flows and water sources on Bay-Delta ecosystems. Monsen points out that San Joaquin River water has much higher contaminant concentrations than Sacramento water. "If we change flows," Stewart says, "Nancy's hydrodynamic model of the Delta suggests the proportion of Sacramento versus San Joaquin water will likely change, and so will habitats and conditions that determine phytoplankton uptake of contaminants." She points out that changing flows into the Delta will change the salinity range for the invasive overbite clam *Corbula amurensis*, an important accumulator of sele-



Beavers in Alhambra Creek, downtown Martinez. Photo courtesy of Cheryl Reynolds ([www.martinezbeavers.org](http://www.martinezbeavers.org))

nium: "A clam can impact the entire food web. If you increase the range of *Corbula*, you increase the range of exposure for clam-eating predators like sturgeon and splittail."

Thompson, meanwhile, is pinning down growth and mortality rate parameters for *Corbula* and the Asian clam *Corbicula fluminea*. "Ideally, you'd have bivalves in the phytoplankton model, as they're food dependent," she says. "It's a really interconnected loop, difficult to sort out." Thompson and Lucas are collaborating on a lookup table showing mollusk grazing rate as a function of salinity, temperature, and chlorophyll concentration.

Although CASCaDE has another year to run before funding ends, some trends already seem clear. "With an ongoing decline of sediment supply and sea level rise, it's pretty much guaranteed that the Bay will overall get deeper," says Ganju. "Intertidal mudflats may not keep up with the rise in sea level. And there may be an overall increase in the water clarity of the Bay, which will affect phytoplankton."

"The interdisciplinary aspect has been pretty interesting," says Larry Brown, who is investigating flow effects on salmonids and other riverine fishes. "It gives me a much better appreciation for the problems in other areas." Robin Stewart agrees: "The experts are focusing on their expert fields. That will make our estimates probably as reliable as the state of the science allows. We are learning from each other; we really enjoy working together." For Jan Thompson, who has degrees in ecology and engineering, that approach is nothing new: "It's the way I've made my living."

CASCaDE is expected to be more than a forecasting tool: It should increase scientific understanding of current processes. "We don't even completely understand phytoplankton dynamics for contemporary conditions—where is stuff coming from and where is it going," says Lisa Lucas. "In the case of my special piece, just understanding the contemporary Delta better will be really interesting."

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# PLACES TO GO & THINGS TO DO



## CONFERENCES, WORKSHOPS EXHIBITS, & TOURS

AUG  
18-22  
MON - FRI

### WETLANDS WORKSHOP

**TOPIC:** Application of Ecological Engineering Principles for the Management of Water  
**LOCATION:** Humboldt State University, Arcata, CA  
**SPONSOR:** Humboldt State University Office of Extended Education  
rag2@humboldt.edu; (707)826-3135

AUG  
30  
SATURDAY

### BROOKS ISLAND KAYAK TRIP

**TOPIC:** Brooks Island adventure  
**LOCATION:** Departure from Richmond Marina  
**SPONSOR:** East Bay Regional Parks (888)327-2757, option 2 for registration

SEPT  
25  
THURSDAY

### 2008 SOUTH BAY SCIENCE SYMPOSIUM

**TOPIC:** Research supporting restoration of the South Bay  
**LOCATION:** San Jose State University  
**SPONSOR:** U.S. Fish & Wildlife, U.S. Geological Survey, San Jose State University Dept. of Environmental Studies and College of Social Sciences  
<http://www.southbayrestoration.org/science/2008symposium>

OCT  
11-15  
SAT - WEDS

### 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  
26-29  
SUN - WEDS

### 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



## HANDS ON

SEPT  
20  
SATURDAY  
9AM-NOON

### CALIFORNIA COASTAL CLEANUP DAY

**TOPIC:** Clean trash from marshes and creeks.  
**LOCATION:** Coastal locations statewide  
**SPONSOR:** California Coastal Commission  
coast4u@coastal.ca.gov; (800) COAST-4U



# HOT OFF THE PRESS!

### A GREENER SHADE OF BLUE?

*State of the San Francisco Bay-Delta Estuary 2008. (July) October 2007 State of the Estuary Conference Proceedings.* San Francisco Estuary Project and CALFED. A must-read of the latest science, data, opinions, and "to do" lists for the Estuary. Hard copies are free to all presenters, available to others for \$7.00 by contacting Debbi Egter van Wisskerke (510)622-2304 or [DEgtervanwissekerke@waterboards.ca.gov](mailto:DEgtervanwissekerke@waterboards.ca.gov)  
Download a pdf at [www.sfestuary.org](http://www.sfestuary.org).

## SAVE THE DATE OCTOBER 22-24, 2008

5th Biennial CALFED  
Science Conference

**GLOBAL PERSPECTIVES AND REGIONAL RESULTS:  
*Science and Management in the Bay-Delta System***

Sacramento Convention Center  
[Denton.debra@epa.gov](mailto:Denton.debra@epa.gov);  
[tsommer@water.ca.gov](mailto:tsommer@water.ca.gov)

## NOW IN PRINT & ON LINE

*Basins of Relations. A Citizen's Guide to Protecting and Restoring Our Watersheds.* Brock Dolman. Occidental Arts & Ecology Center Water Institute.

*EBMUD. June 2008. 2007 Annual Water Quality Report.* [www.ebmud.com](http://www.ebmud.com)

*Large-Scale Ecosystem Restoration: Five Case Studies from the United States*, edited by Mary Doyle and Cynthia Drew. Island Press, July 2008. [www.islandpress.org/bookstore/details.php?prod\\_id=1106](http://www.islandpress.org/bookstore/details.php?prod_id=1106)

*Malformed Frogs: The Collapse of Aquatic Ecosystems* by Lindsay Wong. University of California Press, July 2008. [go.ucpress.edu/Frogs](http://go.ucpress.edu/Frogs)

*The Martinez Beavers* by Penelope Dyan and John D. Weigand, Bellissima Publishing, June 2008. [www.bellissimapublishing.com](http://www.bellissimapublishing.com)

*Riparian Habitat Conservation and Flood Management in California.* Dec. 2007 Conference Proceedings. Riparian Habitat Joint Venture. July 2008. <http://www.prbo.org/calpif/rhjcconference/proceedings/>

## FEEDBACK

"Wither Wetlands" (June 2008/Regulation) struck a nerve with the S.F. Bay Regional Board. The Board is concerned that ESTUARY readers may have come away with the impression that their agency no longer requires mitigation for impacts to wetlands associated with development and other activities.

"We're not bound by federal wetland mitigation rules," says the Board's Brian Wines. "We are bound by our basin plans, the Porter-Cologne Act and the state Water Code (the laws that implement the Porter-Cologne Act). It is inappropriate to suggest that water boards are ignoring small projects because they are hard to mitigate; the new mitigation rules have no bearing on our authority; they are binding only on federal agencies. Our policy always has and always will be to avoid, minimize, and mitigate, in that order. Mitigation banks are not always our most preferred option because they are likely to be off-site."

In response to the creek culverting example used in the article, says Wines: "We consistently require mitigation for such culverting projects. We also strive to ensure that mitigation is as close to the site of impact and as close to 'in-kind' mitigation as possible. In addition, there are no mitigation banks currently approved in the San Francisco Bay region that provide appropriate mitigation credits for impacts associated with the culverting of creeks. And there are only two approved mitigation banks in the region for impacts to wetlands. Therefore, the new wetland mitigation rule has very little relevance to current S.F. Bay Regional Water Quality Control Board practices related to compensatory mitigation."



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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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**WESTLANDS WATER DISTRICT CONTINUED**

same qualities of creativity, perseverance, and optimism are also some of the essential resources California needs to resolve its water crisis.

*Jean P. Sagoupe is a farmer on the west side of the San Joaquin Valley. He has been farming in the Valley his entire adult life. He is President of Westlands Water District and serves as a Director and Vice-Chairman of the San Luis & Delta-Mendota Water Authority.*

**A GREENER SHADE OF BLUE? CONTINUED****TOM MUMLEY, CHAIR, CCMP IMPLEMENTATION COMMITTEE, S.F. BAY REGIONAL WATER QUALITY CONTROL BOARD**

There is heightened communication and awareness of Estuary issues, and we have much improved monitoring and planning. There is greater appreciation of the Estuary's values and the challenges in sustaining and improving them. We have stopped the loss of wetlands and we are now restoring them. We see benefits of pollution prevention and control actions resulting in continued decline of legacy pollutants such as mercury and PCBs and much improved management of copper and pesticides. We now manage dredging and disposal of dredge material in an environmentally beneficial way, and we are seeing more and better watershed-protection based land use. That said, we face major challenges with the continued emergence of new chemical pollutants and influx of invasive species, and as we make progress managing water use and floods, we must account for the future consequences of climate change. Fortunately, we have created partnerships and collaboration forums to give us cause to be optimistic that we will successfully conquer these challenges.

**COUCH CSI CONTINUED**

man health risks from those chemicals are listed as low or moderate; however, Proprietary F and H rate "high" as acute and chronic ecotoxins. Additional information is not widely available, says Klosterhaus, but she aims to find out whether, like PBDEs, these alternatives can bioaccumulate in fish and wildlife tissues. Klosterhaus sent samples of sludge collected from two municipal wastewater treatment plants to Duke University for analysis. Both TBB and TBPH were found, the first time the chemicals have been detected in samples from the environment. At one treatment plant, says Klosterhaus, concentrations were comparable to PBDE concentrations, suggesting that TBB and TBPH also have the potential to accumulate in sediment.

Klosterhaus recently sent samples of fish, harbor seal blubber, birds' eggs, and sediments collected from S.F. Bay to Duke University for testing, and is waiting for the results. The bottom line is that not enough is known, says Klosterhaus. "But now that we know what's in [these commercial mixtures], we can get chemical standards made. We hope our findings will prompt more studies."

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LOV

