YOUR INDEPENDENT SOURCE FOR BAY-DELTA NEWS & VIEWS

ESTUARY

MELT DOWN

The world won't end, and tsunamis triggered by global warming won't engulf the Statue of Liberty, as in the blockbuster movie, The Day After Tomorrow. But a landmark study on greenhouse gas emissions and climate change published in the Proceedings of the National Academy of Sciences in August projects temperature increases by the century's end that range from substantial to downright scary. What happens next will depend on the energy-use choices the world makes in the upcoming decades, according to climate experts.

Under a more extreme scenario, in which the world stays on a "high carbon diet," says Dan Cayan, Scripps Institution of Oceanography, the more sensitive climate model predicts temperature rises of 15° F in some California cities, which will then feel something like Death Valley. And under both severe and moderate scenarios, warming would increase the amount of rain in the state and cause the snowpack to melt earlier, both of which could lead to more flooding and reduced water supplies in summer.

CALFED CONFERENCE CLIP

"California's water supply problems could go from very challenging to extraordinarily difficult," says Cayan. Currently, we keep reservoir space open during winter—to the tune of about 5 million acre-feet—as a safeguard against flooding from heavy rains. With warming, the Sierra's snowpack, which now stores about 15 million acre feet of water in winter, will melt earlier in the year and run off into the reservoirs when capacity is needed most. How much snow might melt off early? The moderate scenario predicts about 5 million acre feet.

We're between a rock and a hard place, says Scripps' Mike Dettinger. "If we catch the early runoff, we lose our flood protection; if we let the water pass through, we lose it."

One solution may be to change when, where, and how we store water, says Dettinger, who is skeptical about how many more reservoirs can be built. Instead, he says, the state may need to rely on temporary storage in aquifers. Overall, given how challenging the problems will be, he thinks it's a good thing we're starting to worry about them now, rather than in 20 years. "We'll have to adapt," says Maurice Roos with the Department of Water Resources, "and decide where to put our money." SPW

Chasing Mercury

CALFED CONFERENCE CLIP

Bubbles are breathing oxygen into the deepest layers of the South Bay's Guadalupe Reservoir in an experiment aimed at inhibiting the transfer of mercury from bottom sediments to water and fish. Mercury, a silvery metal, is all over the Bay-Delta watershed, thanks to the Gold Rush. Miners used it to gather the finest grains of gold, like a magnet in a sandbox full of iron filings. When basic garden variety mercury (inorganic) converts to methyl mercury (organic), it easily crosses from water and sediments to algae, plants, fish, and humans — magnifying in concentration every step of the way. Levels have gotten so high in some reservoir and Bay-caught fish that anglers are warned off regular fish fries. Wildlife managers championing wetland restoration are also being warned to have a care, as the bacteria and organic processes at work in wetlands convert mercury into its more dangerous methylated form. But ten top scientists at the October CALFED conference said it's not that simple.

"Just because we happen to have all this mercury in our backyard doesn't mean it's available; less than 5% of the pool is reactive," says the U.S. Geological Survey's Mark Marvin-DiPasquale, who spoke at a conference panel devoted to informing restoration managers about all the latest mercury research. As mercury moves from sediments to water, he said, it undergoes "multiple transformations," affected by sediment particle size, temperature, salinity, sulfur content, iron chemistry, bacteria, seasons, oxygen levels, and other factors. "Lots of things control reactivity across the ecosystem. The trick is to find those places along the way, those critical points in the process, that control the larger story," he said.

CALFED is funding a slew of research to fill in the details of this story. "Mercury could adversely affect a good number of CALFED's strategic goals, so we developed a Mercury Strategy in 2003 to deal with it," said panel kick-off speaker James Wiener of the University of Wisconsin-LaCrosse. The strategy combines science, public input, performance measures, and adaptive management to help manage landscapes to decrease mercury exposure. According to Wiener, there are 239 former mercury mines in California, some of which still contaminate waterways with cinnabar (mercury sulfide), as well as a legacy of about 3,600 metric tons of elemental mercury laying about which were flushed from the Sierra Nevada into the Bay-Delta as a result of gold mining. But legacies aren't the only source of mercury. Indeed high mercury levels in Midwestern fish come from atmospheric sources such as coal combustion, not mining, he said.

Next at the podium, the S.F. Estuary Institute's Josh Collins explored questions resource managers might have to answer before making restoration decisions—everything from whether harm to organisms is measurable at a population or community level to how much the degree of methylation might be reduced by simply changing a channel meander or a plant type in a restoration design.

The effect of plants can be substantial, concluded Marvin-DiPasquale after his talk. Comparing methylation levels in pickleweed, bulrush and plain old mudflats at the South Bay's Steven's Creek Marsh, Marvin-DiPasquale found some surprising things. "The weird thing is that methylation can be four to six times higher in the root zone of the pickleweed versus the mudflat just two meters away, because the plants themselves affect the sediment chemistry," he said.

Plants can either inhibit or stimulate the activities of certain microbes that promote mercury methylation. These bacteria "convert sulfate to sulfide to make their living, just as humans convert oxygen to $C0_2$," said Marvin-DiPasquale. How plants mediate the activities of these bacteria depends on the season, the level of organic carbon in the soil, and how much oxygen their roots are pumping into the sediments. His research results suggest

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THE MONITOR

SLIME FEST

Over the years, San Francisco Bay has become a cioppino of exotic marine species. Riding in ships' ballast water or hitchhiking on hulls, creatures like the Amur clam, the Chinese mitten crab, and the New Zealand sea slug have made themselves at home here.

Invasive marine organisms keep on coming. "We always find new things when we go out and look," says S.F. Estuary Institute's Andrew Cohen. In a one-week Rapid Assessment survey last May, he and other biologists found 116 exotic species. They documented the presence of several newcomers and rediscovered other creatures found in the past but not seen in recent years.

A bryozoan called *Victorella pavida*—a small colonial invertebrate—previously detected only in Lake Merritt in the 1970s is now abundant in the North Bay, especially in the Petaluma River, although its lack of tolerance for high salinity should limit its range. The sponge Prosuberites, which grows on hard surfaces like docks, has more nuisance potential but is not yet common in the Bay.

The one to watch, according to Cohen, is a European ascidian or "sea squirt," *Didemnum cf. lahillei*, already considered a problem species on the Atlantic coast: "There's reason to be concerned about the sea squirt—it's a major global invader on the move." Ascidians are remote relatives of vertebrates; they go through a tadpole-like larval stage, then settle down to become sessile filter feeders. *Didemnum* is a colonial form that grows in slimy amorphous masses. Biologists first found it in the Bay in 1993, but subsequent wet years seem to have impeded its spread. Now it's back with a vengeance, encrusting the docks at Pier 39 and the Sausalito Marina.

Cohen says *Didemnum* poses a threat to aquaculture in other areas where it's taken hold, including Puget Sound. The organism overgrows rafts and other structures on which oysters and mussels are grown, choking out the shellfish.

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MERCURY CONT'D

great variability in methyl mercury production over time and space: indeed, spikes in methylation levels flip-flopped between mudflats and pickleweed and winter and summer.

"The take home message is that simple measures of methyl and total mercury levels can't drive all decision-making and are a bad surrogate for assessing contamination in the food chain," he said. "It's why the levels are high—the processes that made them high—that we need to understand."

Pickleweed also outpaces cordgrass as a mercury methylator, according to studies done at the Hamilton Air Force Base wetland restoration site in Marin County. Speaker Herbert Fredrickson of the U.S. Army Corps has been researching what impact tidal marsh restoration on 203 hectares of this former Air Force base might have on methyl mercury production and whether the addition of 10.6 million cubic yards of material dredged from the Oakland harbor in order to elevate the site will make a difference one way or another.

To find out, Fredrickson's team poked nearly 100 cores (a hollow pipe through sediments) into Hamilton's mudflats, pickleweed marshes, cordgrass stands, bare zones, and microbial mats—all injected with a cocktail of mercury isotopes. Five hours later, after the tides had sloshed back and forth, the team pulled them out again to analyze how much had methylated and how much had demethylated (aerobic bacteria can actually reverse the methylation process).

"All Hamilton sites were net producers of methyl mercury," he said at the conference, but contrasted this with other data redlining the natural salt marsh at China Camp as the highest net methyl mercury producer in San Pablo Bay. As to whether dredged material is a good or bad addition, he argued that it's actually the creation of tidal marsh elevations where plants can grow, and the templates for bacterial processes, rather than the dredged material itself, that affects methylation (the Oakland material is actually cleaner than the Hamilton base sediments).

"There is room to manage this restoration in a good or bad way," said Fredrickson.

Beyond the Gold Rush legacy of mercury deep in the sediments, we also have to scrutinize methyl mercury flowing into the Delta, recirculating within it, and going out to the Bay and Southern California (via exports), said Chris Foe of the Central Valley Regional Board in his talk. Working on this "mass balance," Foe found that the Delta gets about 16 grams a day from rivers, treatment plants, and other sources, and loses about 6 grams in outputs, leaving 10 grams unaccounted for. "The Estuary turns out to be a net methyl mercury sink," said Foe.

Another eight grams could be thrown into the sink by CALFED's plans to restore about 50,000 acres of wetlands, estimated Foe. "You're looking at a potential 50% increase in methyl mercury loads from restoration, and an equivalent possible jump in fish tissue levels. So if you're going to make a lot of marshes, you'd better have a care."

Of course the thing we've always cared about most is the big fish and birds we hunt, eat, and worry about protecting from extinction. Though large game fish are the "driving motivation for a lot of the research we're doing," says U.C. Davis' Darell Slotton, studying them is not the best way to locate mercury hot spots. Slotton points out that long-lived big fish integrate mercury exposure across many years and migration routes. Smaller, younger fish, like inland silversides and young trout, make better "biosentinels" of trends in mercury contamination because they are part of the local food web, short lived, and non-migratory. "You couldn't build a more perfect little machine to stick under a rock and measure bioavailable mercury," he said. This fall CALFED funded a five-agency integrated fish-monitoring program for mercury to study both biosentinels and game fish throughout the watershed.

With mercury climbing up the food chain from so many sources and processes, it's no wonder health advisories against eating local fish have increased markedly. In the past few years, seven new advisories for Coast Range, Trinity, and Sierra reservoirs have been added to the books, and they're "looming" for the Central Valley, said the S.F. Estuary Institute's Jay Davis in his talk.

One mercury mystery Davis is sleuthing lies in the Central Delta. Though inputs of methyl mercury are high from the big Delta rivers, concentrations in the food web drop below threshold levels of concern in the Central Delta. "It's a black hole in our understanding right now," said Davis, though it is consistent with lower mercury concentrations as the Estuary flows seaward.

Clearly, finding the critical points in the methylation process and linking them to seasons when methylation may be higher or lower, or when birds or fish may be migrating through Bay wetlands, is one path to progress. Another path will be teasing out how much of the methylation and bioaccumulation problem is due to hotspots and how much to more manageable factors such as types of wetlands, plants, substrates, or hydrological regimes. "It's messy, but possible," says Marvin-DiPasquale. **ARO**

ENVIRONMENT

CALFED CONFERENCE CLIP

DELTA DOOM

Ever since we began reclaiming and reconfiguring that mysterious maze of waterways that makes up the hub of the state's water supply system, we've treated the Delta as if it were a stable, static landscape. But, say two UC Davis scientists, it is time to face the fact that a 1-in-100 year earthquake or a 1-in-100 year flood could cause levee failures that would make this summer's $44 million Jones Tract levee break and repair look like a Tinker Toy game. As sea levels rise, the climate warms, and humans continue to manipulate the Delta's soils, levees, and waterways, the Delta is changing, warned Jeff Mount and Peter Moyle at the CALFED science conference.

"Our planning is predicated on a fixed landscape," said Mount. "We need some reform; we need to realize that the Delta is a dynamic landscape, and we need to change our way of thinking. Gradual change is a certainty. Abrupt change is highly likely." Mount cautioned that his predictions, based on CALFED and DWR literature, his own research, and sea level rise data from the Intergovernmental Panel on Climate Change do not include cascade or threshold effects and assume a business-as-usual (the same as we have now) approach to Delta management. For example, if an island levee fails, the likelihood that adjacent island levees will fail increases significantly (a "cascade effect"). Plus, even though we assume a steady increase in risk of failure as sea level rises and subsidence continues to occur, says Mount, there can be points or "thresholds" at which the risk of failure or rapid change increases substantially—even abruptly.

As if the potential collapse of Delta levees were not anxiety provoking enough, Moyle pointed out that climate models show California becoming warmer and drier over the next 50 years. As a result, snow could melt earlier, the snow pack be reduced, rain increase, winter floods worsen, and sea level rise. These phenomena will not be a constant, said Moyle, but will vary with storms and El Niño events, putting additional stress on the Delta and its levee system.

Meanwhile, California's population is projected to top 80 million people by 2050, said Moyle, so there will be greater demand for water for human consumption, greater demand for storage of that water, and greater demand for the construction of more and bigger levees. Moyle predicted that as the demand for water grows and supply becomes more variable, flows in our streams will increasingly be regulated, meaning less water for fish—and more extinctions of native fish, a decrease in wildlife habitat, a decline in our salmon fishery, and an increase in non-native fish.

Existing good habitat could become marginal, and anadromous fish could see their ranges reduced as less spawning and rearing habitat is available in rivers and as ocean conditions change. If trends continue, said Moyle, there will be a severe decrease in populations of California's native inland fish.

Moyle thinks Delta smelt and longfin smelt could decline further if levee collapses cause the Delta to flood and become brackish, while the Sacramento splittail might benefit. Moyle also predicted that native minnow and sucker populations will decline as streams dry up or become warmer in summer. Alien invaders like carp and largemouth bass will increase, said Moyle.

"Why should we care?" he asked. "Because fish drive conflicts over water, and they are good indicators of healthy aquatic ecosystems." Only 40% of our native fish populations are in stable condition today, said Moyle, although he pointed out that in the 10 years since the 1994 Bay-Delta Accord, things seem to have gotten better for fish. The Sacramento splittail has been delisted, and good progress has been made in restoring salmon streams, such as Clear and Butte creeks. CALFED actions taken during this relatively wet period have helped spur progress, said Moyle. But the next 50 years won't always be as benign, he warned.

What should be done? "We need to face reality and plan for large-scale changes in the way we manage our water," said Moyle. "We need to face up to [the problem] to avoid emergency solutions. We need to explore conjunctive use—and even 'the P word'—the peripheral canal. If the Delta becomes brackish, we have to think of all of the alternatives, including the effects of expanded storage."

Contact: Jeff Mount mount@geology.ucdavis.edu; Peter Moyle pbmoyle@ucdavis.edu LOV

ABRUPT CHANGE IN THE DELTA

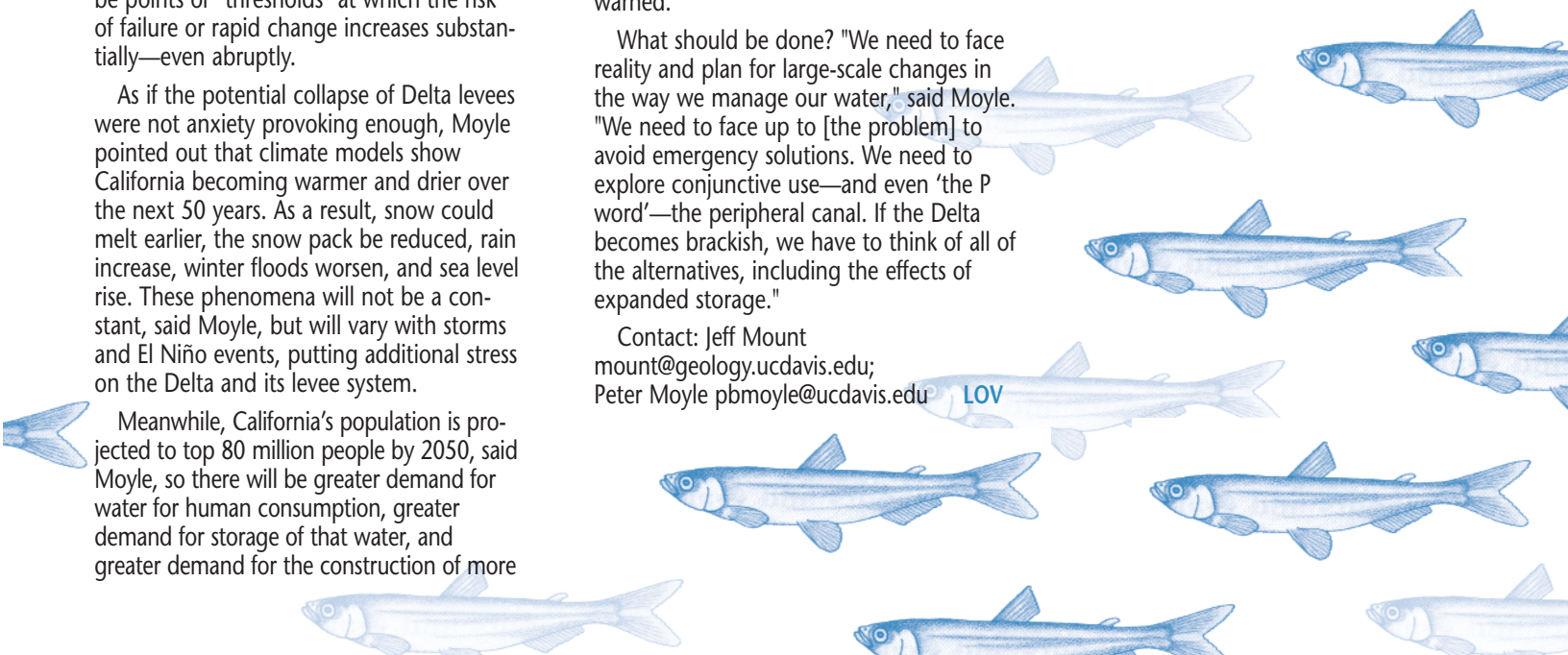
The odds, according to Mount, that over the next 50 years

- a 100-year flood will occur, causing widespread island flooding? 4-in-10
- a 100-year seismic event will occur, with multiple levee failures? 4-in-10
- both a 100-year seismic and 100-year flood will occur? 1-in-6
- either the 100-year seismic or the 100-year flood will occur? 2-in-3

OTHER FIXES

In addition to planning ahead, and exploring conjunctive use, expanded storage, and "the P-word," Moyle says we should:

- restore more floodplains (like the Yolo Bypass) and manage for native biodiversity
- take irrigated farmland out of production now that is likely to be lost in the future as the result of salinization or flooding
- expand use of the Public Trust Doctrine to protect habitats of native fishes
- restore the San Joaquin River for spring-run salmon
- decrease the impact and spread of alien invasive species
- increase environmental water and permanent funding for restoration



SPECIESSPOT

MICE MIX IT UP

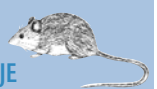
The salt marsh harvest mouse is fine-tuned for life in San Francisco Bay's coastal wetlands, capable of drinking brackish water and eating vegetation with a high salt content. The minuscule rodent has long been thought to depend on pickleweed as its primary habitat. Consequently, management strategies for this endangered species have focused on growing more pickleweed. But Diego Sustaita of the California Department of Fish and Game says the picture is more complex.

Sustaita and other scientists with DFG and the Department of Water Resources studied the mouse in Suisun Marsh, home to its northern subspecies; most prior research has involved the southern race in South San Francisco Bay. In a two-year project, mice were trapped, marked, released, and recaptured in a mix of microhabitat types: pickleweed-dominated stands, mixed halophyte growth (rushes, sedges, saltgrass, fat hen), and upland annual grassland. The researchers also sampled both tidal and diked marshes; the diked areas were not managed for waterfowl.

Their findings: "Mixed halophyte microhabitat was much more heavily used than we anticipated." Overall, population density, reproductive potential, and survival in the pickleweed and mixed-halophtye zones were similar. When only tidal habitats were compared, the percentage of females in reproductive condition was higher in the mixed halophyte zone than in pickleweed. The diversity of this plant community may provide harvest mice with better cover for nesting and foraging. Diked marshes seemed to support viable mouse populations as well as tidal wetlands did. Sustaita says the upland grass habitat was seldom used.

"There's much more habitat available that provides more options for management," Sustaita concludes. Since the combination of pickleweed and mixed halophyte habitats appears vital for the mouse, he recommends that restoration efforts try for a gradient between the two vegetation types. He expects future studies using radiotelemetry to track individual mice to fill in more details on how the rodents use the different habitats.

Contact: Diego Sustaita
dsustatia@delta.dfg.ca.gov JE



CALFED CONFERENCE CLIP

BUREAUCRACY

PAYING THE PIPER

Total projected 10-year cost of the CALFED program: $8.2 billion. Total federal money potentially available for CALFED through 2010: $345 million. Total estimated state money for CALFED over 10 years: $885 million. Total projected unmet CALFED needs: $6.3 billion. Total 10-year cost to California water users: a hefty price tag.

The Bay Delta Authority delivered the sobering news this month about what it will take to fund CALFED, the state-federal program aimed at improving water quality for all Delta water users. The Authority's ten-year finance plan includes the much anticipated water user fees—paid by those deemed as beneficiaries—to finance certain facets of CALFED, such as the environmental restoration program, the environmental water account, Delta levee improvements, and science.

CALFED's rollout of its ten-year finance plan comes amid a mixed bag of news concerning the program and its finances. On the bright side, President Bush signed the Water Supply, Reliability, and Improvement Act into law last month, reauthorizing the CALFED program with a total of $389 million. To appropriate the funding, however, a follow-up bill will be needed.

On the grim reality side, there's the California budget crisis that's crimping every corner of the state government, particularly the General Fund, which has provided an average of $76 million per year for CALFED from 2000-2003. That amount declined to $11 million for fiscal year 2004, and the current fiscal year may see the contribution from the General Fund dip to $8 million. In addition, bonds that dedicate funds for implementation of parts of the CALFED program—Propositions 13 and 50—are scheduled to run out in 2006 and 2007.

Looking over options for financing the $6.8 billion in unmet needs, the Authority does not presume that the reauthorization of CALFED will lead to average federal contributions of $150 million per year. This assessment is based on experience: through the first three years of CALFED, the federal government contributed $166 million, less than half of what was originally authorized. Other possibilities the Authority also sees as unlikely include another public bond—which would need to go before voters in 2006—or an increase in the state's General Fund.

This leaves "beneficiary pays," a principle laid out in the 2000 Record of Decision. In theory, most parties of CALFED support the idea of having users who benefit from any of the 11 programs pay to support it. But once officials start defining just who benefits—and pays—the hackles go up.

"It's not that people disagree that a program has benefits for water exporters or for the ecosystem, but they do disagree when you talk about how much they'll pay for that benefit," explains CALFED's Kate Hansel.

CALFED has programs that have no clearly defined group of beneficiaries, such as the environmental water account and ecosystem restoration program. During the first four years of CALFED, the state picked up 60% of these costs. Under the 10-year finance plan, the state's share will go down to 30%. This reduction depends on an increased share from the federal government, but it is also pushing the burden for payment to users, including water exporters.

Funding for projects like water storage will be contentious. The CALFED reauthorization bill created a trigger system by which studies on various surface storage projects will be completed and then brought up for authorization by Congress. Environmental groups are leery of any proposal to enlarge existing dams or construct new ones. "What we're seeing is a financial shell game where folks are advocating projects and claiming public benefits that aren't real," says Barry Nelson of the Natural Resources Defense Council.

An enlarged Los Vaqueros would have public benefit, says Contra Costa's Greg Gartrell. It would provide a steady supply of water for the environmental water account where there is none. Gartrell says Contra Costa users already paid $450 million for Los Vaqueros when it was first built, with the promise of better water quality. The proposed enlargement could also provide water for parts of Alameda and Santa Clara County.

Just how the Authority's proposal gets implemented is not something it has any control over. It must wait to see what Congress, the California Legislature, or Governor Schwarzenegger will do with their plan.

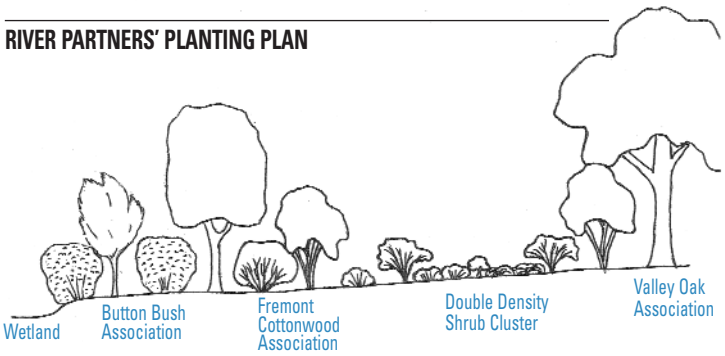
"We are pushing the envelope away from the public share and putting the burden on beneficiaries more than we ever have," says CALFED's Hansel. "But we've put a reasonable allocation on the table considering what we know and don't know."

Contacts: Kate Hansel (916)445-0143;
Greg Gartrell (925)688-8208 KC

REHAB

BUNNIES AND BIRDS GET A (LEVEE) BREAK

RIVER PARTNERS' PLANTING PLAN



An endangered rabbit the size of a running shoe, a bright chip of a songbird, and a wood rat are just a few of the species that will benefit from a multi-agency restoration effort on the San Joaquin River National Wildlife Refuge. With a $7 million CALFED grant, thousands of acres of marginal, flood-prone ag land and conservation and flood easements were acquired from willing sellers, and 800 contiguous acres of riparian woodland habitat restored, according to Fish & Wildlife Service's Kim Forrest, the refuge manager. After a levee is breached in a half dozen places, with the approval of and help from the U.S. Army Corps of Engineers, the river will be reconnected with its floodplain, making this the first non-structural flood control project on the San Joaquin River, according to River Partners' John Carlon, whose non-profit designed and planted the riparian forest.

Once the river and its floodplain are reacquainted, salmon and steelhead will be able to rear there, Sacramento splittail will have access to spring spawning habitat, and the river itself will be able to scour and drop out sediment, processes that help create and sustain riparian forests, says River Partners' restoration ecologist Tamara Sperber. Allowing the floodplain to flood again will reduce weeds and non-native rodent populations as well as promote species richness and habitat diversity. Breaching the levee will also help reduce flooding pressure on levees both up- and downstream of the refuge, says Sperber.

The Corps, long known for constricting rivers rather than freeing them, is happy to be on the other side of the levee for a change. "It gives us a chance to use some of the other tools in our box that we don't get to use very often," says the Corps' Eric Nagy. "It's part of a set of alternatives we try to look at all the time, but this time all the planets were aligned to make it happen." Adds Nagy, "So many times we're at loggerheads with Fish and Wildlife. But in this situation, a non-structural solution was the best alternative for both of us." That's not to say all has been smooth sailing. The Corps is still trying to help three local reclamation districts dissolve in order to release the state Reclamation Board from liability. "It's easier to fix a hole in a levee than to try to figure out how to address all of these complex issues," says Nagy. But if ever there was an ideal spot for testing the idea of allowing the river to reclaim its floodplain, he says, this is it. The Corps hopes to give Fish & Wildlife the go-ahead for the levee breaches by the end of the next calendar year, according to Nagy.

One goal of the planting plan was to create habitat for the riparian brush rabbit, probably the state's most endangered mammal. Planted in March 2002 and 2003, the former ag fields are full of thickets of rose, willow, and blackberry, which the unusual rabbit tunnels into. Cottonwoods, willows, and other riparian trees were planted to attract songbirds like the yellow warbler, an indicator species of concern that has returned to the area after 30 years, and elderberry for the valley longhorn elderberry longhorn beetle, an endangered insect. Another endangered mammal, the riparian wood rat, is also expected to benefit from the restored habitat.

A thick herbaceous understory of mugwort, gumplant, and creeping wild rye was planted for the rabbits, as were "bunny mounds" where the rabbits can find refuge during floods. The stronghold of the rabbit's population, Caswell Memorial State Park on the Stanislaus River, was hit hard in the 1997 floods, but a few rabbits managed to hang on. The Endangered Species Recovery Program, which operates out of CSU Stanislaus, is releasing captive-bred rabbits both at Caswell and now at the refuge near the restoration site. The rabbits are already crossing the levees from their release site on the older part of the refuge to explore their new, tailor-made habitat.

According to Forrest, the refuge was established in the 1980s to help the Aleutian Canada goose, whose population was down to 700 or 800 geese: it now numbers between 50,000 and 70,000. Forrest hopes the rabbit will follow in the goose's webbed steps. "We're very rapidly approaching success stories for two species on this one little refuge."

Contacts: Kim Forrest Kim_forrest@fws.gov: Eric Nagy, eric.e.nagy@usace.army.mil LOV

NEXTGENERATION

SLOUGH SLEUTHS

Debris-strewn mudflats, fennel-choked uplands, and contaminant-laden soil surround the Yosemite Slough canal near the decommissioned Hunter's Point Naval Shipyard. But high school students from nearby Bay View Hunter's Point discovered 118 bird species, 5 reptile species, 1 amphibian species, 10 mammal species, and 14 kinds of butterflies in this degraded environment, says Golden Gate Audubon's Arthur Feinstein, who led the young surveyors. "We were surprised to find three kinds of snakes, and lots of salamanders. One day we spotted 100 meadowlarks, and we didn't expect that either."

The teenagers were hired by a non-profit called Literacy for Environmental Justice (LEJ) and trained in wildlife census-taking by local naturalists. Every other Saturday for over a year, the teenagers hiked for hours in the Yosemite Slough watershed—right near their homes. Their inventory will guide restoration of a 34-acre portion of the watershed located in the Candlestick Point Recreation Area, according to LEJ's Dana Lanza.

"I lived in this neighborhood for years and never noticed birds other than pigeons," says Erica Andrews, a student who helped take the census. "But we learned to be super aware, and I realized that this community has something grand about it that I hadn't known about before."

Impressed by the teenagers' enthusiasm, folks at the California State Parks Foundation, which is raising $10 million for the restoration, funded LEJ to hire more youth to propagate 10,000 native plants for the project. Now seven high school students are collecting seeds, "one of their favorite activities," says LEJ's Patrick Rump, who adds that he has taught them to take no more than five % of a plant's seeds, brush off bugs, and chafe and organize their finds in a file. Next, they will build a shade house where this spring they will grow toyon and coyote bush for upland areas and marsh rosemary and gum plant for the restored marsh.

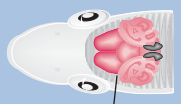
Contacts: Arthur Feinstein (510)843-6551; Dana Lanza (415) 508-0573 SPW

SCIENCESPOT

CALFED CONFERENCE CLIP

EARS TO THE BAY

As any paleontologist or pathologist knows, bones have their own stories to tell. The tiny objects called otoliths, found in the heads of all bony fishes, are no exception. Fish use the three pairs of ear bones—the sagitta, asteriscus, and lapillus—for balance, orientation, and sound detection. Biologists have learned to use them to determine a fish's age, life history, growth rate, migratory patterns, and pollutant exposure. The bones have growth rings, formed daily as calcium and protein are deposited. They also contain chemical isotopes and trace elements that can be clues to a fish's environment.



Otolith

UC Davis' SweeTeh and Guohua Zhang are studying the Sacramento splittail. They've found that the ratio of selenium to calcium in splittail otoliths is a useful marker for toxic selenium levels. Another team, led by Bodega Marine Laboratory's Wendy Rose, has used otolith analysis to measure the effect of cadmium exposure on the growth of larval topsmelt, a tidal marsh fish.

Otolith research can also reveal where a fish spends key portions of its life cycle. James Hobbs, a Bodega Lab post-doc, has used strontium isotope ratios to identify geographic patterns of growth and mortality in the endangered Delta smelt. Jonathan Rosenfield, another Bodega post-doc, has focused on the longfin smelt, a species that has suffered a major decline in the Estuary, confirming that it migrates from freshwater to marine habitats. Fred Feyrer of the Department of Water Resources has used trace elements in otoliths in conjunction with nuclear DNA studies to identify the streams where splittail were hatched.

In a study that ties together migration and pollutants, U.C. Davis' David Ostrach examined strontium-to-calcium ratios in the ear bones of striped bass. His data showed wide variation in migratory behavior; some stripers stayed in fresh water year-round, others commuted between marine and freshwater habitats, and habitat use changed over an individual fish's lifetime. Ostrach hopes to combine this with analysis of contaminants to reveal where and how the bass are picking up their pollutant loads. **JE**

OUTREACH

CALFED CONFERENCE CLIP

GETTING THE CREEL PICTURE

Despite more than a decade of warnings about mercury in Bay fish, a 2001 survey found that 1 in 10 Bay anglers were eating more of their catch than is considered safe. Resource managers and health officials are now worried that Delta anglers—whose catch is also laced with mercury and other toxins—could be consuming beyond what is considered safe. Efforts are underway by several agencies, including the California Department of Health Services, to try to fill in knowledge gaps about who is eating what and how much, and to get consumption guidelines for Delta fish out to the patchwork quilt of ethnic groups that fishes the Delta.

As part of a session on environmental justice at the October CALFED conference, Health Services' Alyce Ujihara discussed the numerous ongoing projects that aim to get an idea of who is fishing the Delta and what kinds of fish anglers and their families are consuming. One of the biggest environmental justice issues regarding angler and fish consumption surveys is outreach itself. "We have this debate over posting signs—that people don't always see signs—or that signs are not in the right languages," explains Ujihara. "It's best to get information out in a number of ways."

A big target of Health Services' efforts is women of childbearing age, and children, who are most at risk from exposure to mercury. Ujihara described interviews conducted at a women and children's clinic in Stockton to better understand consumption habits. Ujihara says that one of the most surprising things they learned is that one-third of the women were eating locally caught fish. "That's unusually high," she explains. "But there are so many other holes—how much locally caught fish are they eating and are children eating the fish?"

U.C. Davis' Fraser Shilling discussed Cal Fish & Game's angler surveys and their revelation that Hispanic anglers fish very heavily along the San Joaquin River while Asians fish along vast parts of both the Sacramento and San Joaquin. Shilling says there is no measure of mercury concentrations in fish tissue in these areas where angling activity is high. Yet these surveys, originally designed to look only at steelhead and salmon angling, revealed that quite a number of species are caught along Delta waterways, including striped bass and catfish—fish that are known to have high concentrations of mercury.

Fish & Game also teamed with Health Services in July 2003 for a pilot project to learn about fish consumption habits. What the Department learned from this pilot was valuable, including the fact that a large number of Hmong fish in the Delta. Unfortunately, budget cuts to Fish & Game have ended its angler surveys—and its pilot with Health Services—for now.

"That's a huge loss because it was one way to know something about the fishing populations," says Ujihara.

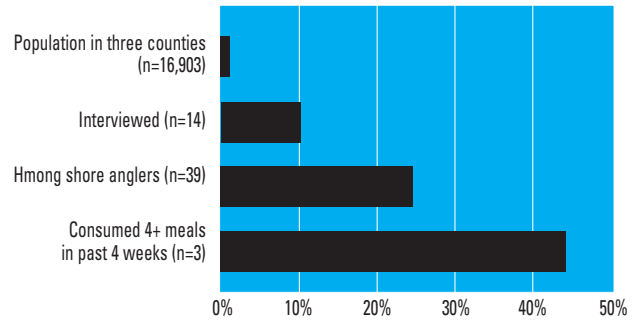
Yet even with the Fish & Game survey, only the main rivers of the Delta—Sacramento and San Joaquin—were covered, leaving out many sloughs, channels, and cuts. Studying fish consumption patterns will take a lot of creativity, and whenever possible Health Services piggybacks onto other surveys as a means of outreach and education. Health Services added questions about fish consumption to the California Women's Health Survey telephone interviews about health practices. A boating survey in Contra Costa County included questions from Health Services about fishing—whether boaters fish, what they catch, and how much they and their families eat. A series of mini grants from Health Services to community groups has been helping develop education and outreach programs and advisories in several languages.

January will see the beginning of a $4.5 million CALFED mercury-monitoring project for the entire watershed. A joint effort by the San Francisco Estuary Institute, California State University San Jose, the Department of Health Services, and U.C. Davis, the project will also involve outreach and education about mercury levels in fish.

Ujihara is hopeful the CALFED project and the ongoing efforts with various agencies will help generate a clearer picture of fish consumption in the Bay and Delta and "a good sense of the severity of the overall exposure."

Contacts: Fraser Shilling fmshilling@ucdavis.edu; Alyce Ujihara (510) 622-4481 **KC**

HMONG IN DFG CREEL SURVEY



PLACES TO GO & THINGS TO DO

WORKSHOPS & CONFERENCES

JAN WEDS 19 - THRU FRI 21

2005 WILDLIFE SOCIETY, WESTERN SECTION CONFERENCE

TOPICS: Ecology and management, amphibians and reptiles, conservation genetics, fire's role in wildlife management, and updating classic tools for wildlife biologists.

LOCATION: Sacramento, Calif.

SPONSOR: The Wildlife Society.

Cynthia Perrine csperrine@yahoo.com

www.tws-west.org

TROPHY-LIFE

JAN SAT 15

NATIONAL WETLANDS AWARDS PROGRAM

DEADLINE: SATURDAY, JAN. 15

Each year the environmental community comes together to honor individuals who have dedicated their time and energy to protecting our nation's precious wetlands. The 2005 Awards will be given in six categories: Education and outreach; science research; conservation and restoration; landowner stewardship; state, tribal, and local program development; and wetland community leader.

Katie Wells at (202)939-3810; wetlandsawards@eli.org, or contact

www.eli.org/nwa/nwaprogram.htm

MONEY

JAN THURS 6

CALIFORNIA BAY-DELTA AUTHORITY SCIENCE PROGRAM

DEADLINE: THURSDAY, JAN. 6, 2005

The California Bay-Delta Authority Science Program is seeking to invest in projects that develop new knowledge about how water use and management activities interact with and affect key aquatic species and environmental processes across spatial and temporal scales. The geographic areas of interest are the S.F. Bay Estuary and the Bay-Delta system. The Science Program is particularly interested in research on general topics, including water operations and biological resources, ecological processes and the relationship to water management and key species, and performance assessment to improve tools and implications of future changes.

Helpline (877)408-9310

www.science.calwater.ca.gov/psp/psp_package.shtml

ANNOUNCING THE 2004 CALFED SCIENCE CONERENCE STUDENT PRESENTATION AWARDS:

Out of 26 speakers and 32 posters, the winning students were:

Oral presentation:

David Ostrach, U.C. Davis: *Immunohistochemical Evaluation of P450 Expression and Tissue Distribution in Striped Bass Experimentally Exposed to Beta-Naphthoflavone*

Poster:

Craig Swolgaard, C.S.U. Sacramento: *Habitat Use of Swainson's Hawk in a Vineyard Landscape in the Lower Mokelumne River Watershed*

SLIMEFEST CONTINUED

Since it's been found covering the Atlantic seafloor with a slimy monoculture far offshore at Georges Bank, Cohen is also concerned about its impact on Pacific sites like the Cordell Banks. Like many successful invaders, *Didemnum* has no known predators in its new home.

The sea squirt's larval phase is so brief that it's unlikely to survive long in ballast water. Cohen thinks it's probable that *Didemnum*, like other fouling organisms, arrived on a ship's hull. He suspects the culprit was a vessel that spent months sitting in port—a fishing boat, pleasure craft, or barge—rather than a big cargo carrier. "Hull-fouling organisms are harder to deal with than ballast water," he acknowledges. Better hull hygiene can help, but there's concern about the toxicity of the available anti-fouling compounds.

Invasives seem to go through cycles of boom and bust. Other exotic sea squirts found in previous years were missing in this year's survey. Sometimes, Cohen says, an organism will prosper, then lose ground when a closely related invader arrives. And it's often hard to sort out the effects of wet and dry years on these fluctuations. Still, the Bay's 200-plus exotic species are bad news—and keeping new arrivals out requires constant vigilance.

Contact: Andrew Cohen acohen@sfei.org JE

ANNOUNCING

THE SAN FRANCISCO ESTUARY PROJECT'S 2004 SMALL GRANT AWARDS!

Mission Creek Conservancy ($8,500) – remove debris and revegetate portion of shoreline at Mission Creek in San Francisco.

Sonoma Ecology Center ($9,984) – environmental science education program for fifth grade classes in Sonoma Valley, including classroom presentations and hands-on restoration of existing wetlands.

San Francisco Bay Bird Observatory ($8,000) – volunteer training for monitoring nesting colonies of waterbirds in the South Bay.

Mill Valley StreamKeepers ($8,000) – strengthen baseline data for Coho salmon restoration in Arroyo Corte Madera watershed, Marin County.

Golden Gate Audubon Society ($9,000) – environmental education and restoration program for East Oakland students and their families.

Friends of the Estuary ($8,000) – education and training for construction industry, public agencies and restoration community on streamside soil bioengineering techniques.

The Watershed Guides ($8,000) – train student interns to lead field trips and restoration projects at Sausal and Peralta Creeks for sixth grade students in East Oakland.

San Pablo Watershed Neighbors Education and Restoration Society ($9,000) – establish a creek-oriented dumping and pollution abatement program in lower San Pablo Creek watershed.

Contra Costa Resource Conservation District ($8,000) – demonstration project to improve cattle grazing practices in Alhambra Creek watershed.

Marin Audubon Society ($1,271) – hold public hearing as part of CALFED-funded Bahia restoration project.

Friends of Pinole Creek Watershed ($5,200) – public outreach and restoration project for Pinole Creek.

Natural Heritage Institute ($8,000) – environmental education, including monitoring training, for community members in North Richmond.

Tiburon Audubon Center ($8,000) – produce a Guidebook to Native Oyster Restoration for Richardson Bay Wildlife Sanctuary and entire SF Bay.

For more information, contact Carol Thornton (510) 622-2419.

Editor's note: Our October Bulletin Board should have included the Department of Water Resources Urban Streams Program as one of the funders of the Codornices Creek restoration project.

"I'm always pleased to discover Estuary in my in-box; every time it arrives it feels like Christmas. Keep up the good work."

Patricia Chambers
Environmental Communications and Outreach

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Editorial Office: PO Box 791
Oakland, CA 94604
(510)622-2412
Lowensvi@earthlink.net

Estuary Web site at *www.estuarynewsletter.com*

Subscription Q&A: (510)622-2321

STAFF

Managing Editor: Lisa Owens Viani
Senior Editor: Kristi Coale
Copy Editor: Kathryn Ankrum
Graphic Design: www.dcampeau.com
Contributing Writers: Joe Eaton
Ariel Rubissow-Okamoto
Susan P. Williams

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