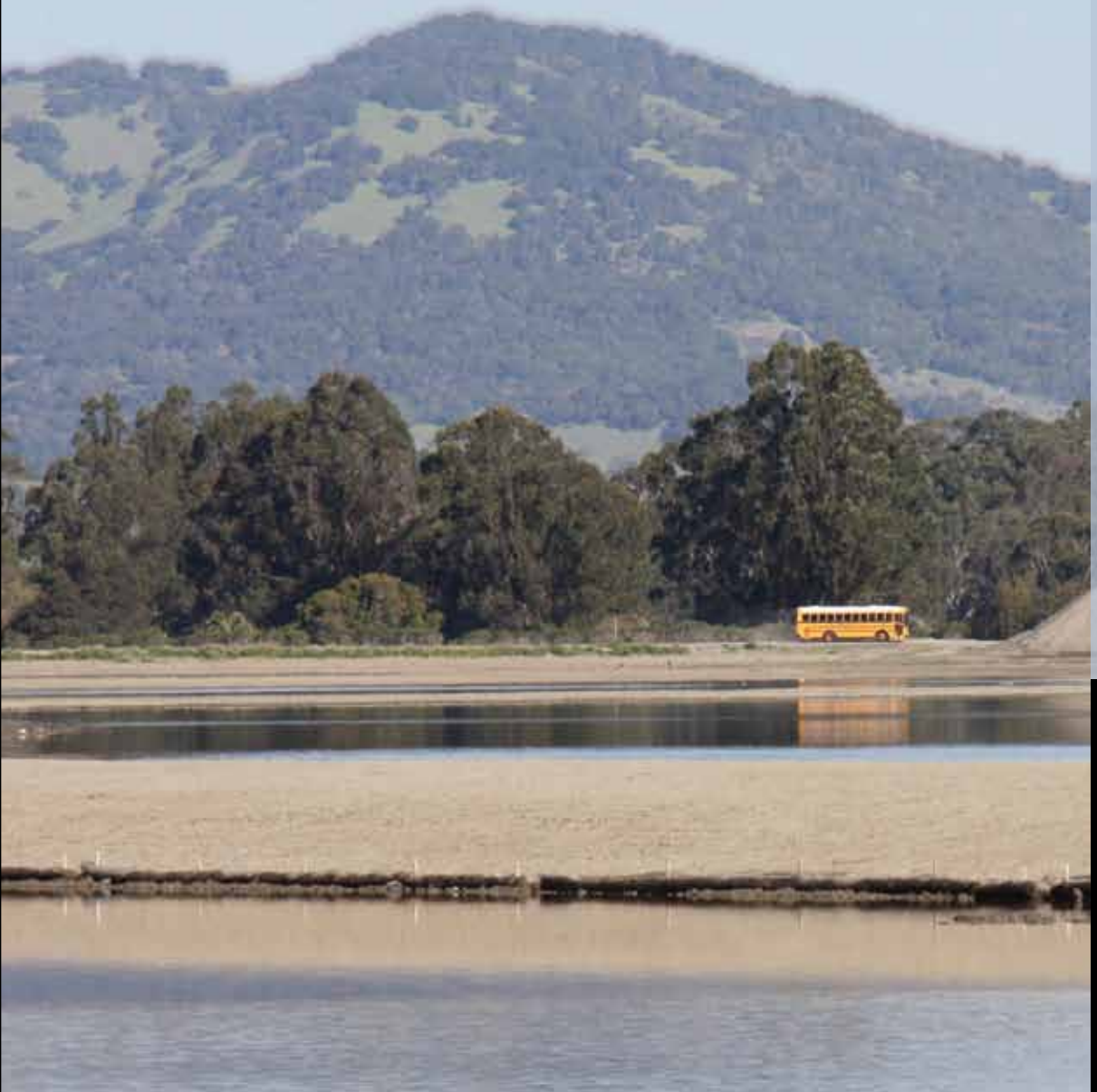
San Francisco Estuary Partnership

ESTUARY NEWS

SCIENCE • RESTORATION • WATERSHED • POLITICS • SPECIES • BAY

There was no sign of shirking when 50 school kids began digging holes and planting buckeye saplings at the former Hamilton airbase. These kids weren't just playing at restoration, they were actually doing it.... see p.3



JUNE 2012
VOL. 21, NO. 3

INSIDE

Kids Plant Trees 3
Bird and Vet Refuge.....4
Goofy Sturgeon 5
Delta Flow Stations.....6
Legendary Lady.....9
Grey Water 10

B R I E F S

Watershed at a Glance

SMELT HOTEL AT DAVIS: Delta smelt are picky when it comes to things like temperature, salinity and turbidity. Getting these variables to resemble "natural" estuarine conditions is tough to accomplish in university research tanks. "Delta smelt don't like to be in clear water, don't like a lot of light, and don't like to be by themselves, which makes them perhaps the most challenging fish we have to work with," says UC Davis fish biologist Nann Fangue. But the main Davis campus has a new experimental facility, including three recirculating systems, where many of the variables that affect smelt survival can be manipulated. While UC Davis cultures Delta smelt in a state-of-the-art lab in Byron, this is the first on-campus facility where scientists can really work on how all life stages of this endangered fish respond to changes in environmental conditions, and study the pickiest life stage of all, larva.

GOT ANTS? The San Francisco Estuary Partnership is gearing up for a fall outreach program to inform the public about handling ants in the home without causing environmental damage. According to the Partnership's Athena Honore, data show that urban areas use more pesticides than farms, with ants the most common target. Those used for indoor and outdoor ant control are extremely toxic to stream life, even at very low concentrations. The education program will employ a "mix of media," says Honore, including advertising, a web site and Facebook. SFEP will partner with 50 organizations statewide, including leaders in IPM, structural pest control, and stormwater and wastewater management.

BIRD BUILDING COLLISIONS: Golden Gate Audubon, Citizens for East Shore Parks, and other groups are fighting a proposal to allow new six story (100-foot-high) buildings at the north end of Berkeley's Aquatic Park. The current height limit is 45 feet. At a hearing this May, the groups expressed concerns about collision risks to the birds that inhabit the park's lagoons.

BALLAST WATER BELT-TIGHTENING: Federal agencies are tightening controls on ballast water, a major vector for invasive aquatic species on the West Coast. The US Coast Guard's new standard for the allowable concentration of living organisms in discharged water took effect June 21, 2012. Lieutenant Rebecca Deakin, speaking at the Bay Planning Coalition's Ballast Water Briefing in Oakland on June 7, said ships built after December 1, 2013 must meet the new requirements; existing ships will be phased in over a five-year period. The agency considers the standard as the tightest than can be implemented and enforced at this time. Meanwhile, the US Environmental Protection Agency is revising its Vessel General Permit in light of both the Coast Guard regulations and California's more stringent standards.

The largest containership ever to visit North America docked at Oakland this March. Photo courtesy Port of Oakland.

SCENIC RIVER REPEAL? Rallying to the defense of the Merced River, Friends of the River has urged Senator Dianne Feinstein to oppose HR 2578. The bill, introduced by Representative Jeff Denham (R-Merced), would repeal federal wild and scenic river protection for the Merced to allow expansion of the McClure Reservoir. HR 2578 has cleared the House Committee on Natural Resources but has not been voted on by the full House. Earlier this spring, Feinstein stated that she was "not advancing legislation on behalf of this project at this time." The House recently approved another Denham amendment to block federal funding for reintroducing salmon in the San Joaquin River.

NATIVE WATERSHED VEGETATION RESEARCH: A new US Forest Service classification of watershed conditions in the National Forests is paving the way for more research on vegetation condition and invasive species spread. As a result, the California Native Plant Society recently received funding to add to the knowledge base of plants and habitats at the watershed level. The Society launched pilot fieldwork projects this summer in the San Bernardino and Plumas National Forests, with additional sites to be determined.

WATER BOARD APPOINTMENTS: Felicia Marcus and Steven Moore, longtime friends of the San Francisco Estuary Partnership, have been tapped for the State Water Resources Control Board by Governor Brown. Marcus, western director at the Natural Resources Defense Council, also serves on the Delta Stewardship Council. Moore, a civil and sanitary engineer with Nute Engineering, is a current member of the San Francisco Bay Regional Water Quality Control Board and was formerly a board engineer. Moore also serves on the editorial board of *Estuary News*. The appointments require Senate confirmation.

VALLEY GROUNDWATER GETS A PHYSICAL: San Joaquin Valley farmers used enough groundwater between 2006 and 2009 to fill Lake Mead, according to a new study by Bridget Scanlon of the University of Texas at Austin and US Geological Survey scientists. But depletion is worse in the High Plains, including the Texas Panhandle. While Scanlon and her colleagues say water banking has the potential to support Valley agriculture, they warn that irrigated farming is no longer sustainable in the southern High Plains.

SHARE YOUR NEWS? Tell us what's going on in your corner of the watershed, or send us a story idea. Ariel Okamoto: bayariel@sbcglobal.net or *Estuary News*, 1515 Clay Street, Suite 1400, Oakland, CA 94612

COVER PHOTO: Jacoba Charles

E D U C A T I O N

Kids Dig Futures

Fifty kids from fourth and second grades scattered across a barren field on a recent spring morning to ply the dirt with adult-sized shovels and hoes. They were putting in a morning's work planting buckeye and live oak saplings at the former Hamilton Air Force Base as part of a program called STRAW (Students and Teachers Restoring A Watershed). Every year, the program helps more than 3,000 students get their hands dirty through a curriculum focused on science and environment — and responsibility.

Photo by Jacoba Charles

"This isn't just kids playing at doing something," said Laurette Rogers, who founded the program, now hosted by the Point Reyes Bird Observatory, 20 years ago. "They know they're actually doing it, and that makes a difference."

And the students of Rancho Elementary School in Novato seemed to enjoy the challenge. After piling off the bus, they gathered in a semi-circle on the dirt and sparse grass where an airport runway once stood. STRAW instructors showed them the proper way to use their tools and handle the plants. Then, in groups of four, they began to scrape away weeds and dig their holes.

"There's a lot of clay in the soil," observed fourth-grader Michael Griffin. "It takes teamwork to get it done."

The second-grade girls in one group were so small that several of them needed to jump together on their shovel to drive it into the earth. Yet there was no sign of shirking or flagging. Once they got their sapling in the ground, they took turns lugging buckets of wood chips across the field to use for mulch. Then they scrunched their faces up and in unison yelled "plant inspection" at the top of their lungs. A STRAW instructor then came to check their work before they started digging another hole.

"I like knowing that I'm helping the environment," said fourth-grader Sriha Srinivasan. Other students also echoed the ecological principles that they had been taught in the classroom before the field trip. "It'll help the animals because it should give them more habitat," said nine-year-old Wesley Souder. "There's going to be forests," one second-grade boy said. "Animals," added another, as a third gleefully chimed in with, "Bugs!"

Though the entire restoration site at the Hamilton Air Base covers 2,500 acres, the trees the kids planted can easily be seen from a nearby public trail. And that's a big advantage according to STRAW's Rogers. A lot of kids like to go back and check on how the restoration is coming along — months or even years later. Fourth-grader Ashley Urrea is already looking forward to that. "The neatest thing is that we'll get to see the plants grow over time and say, 'I made the world a better place,'" she said.

It is not just the world that is being helped, observed second-grade teacher Sue Spry. Kids of all different learning abilities seem to enjoy the program. She pointed out one little girl who is autistic and has trouble in the classroom—but out here she is doing just fine.

"I can't say enough about what a positive experience this is," said Spry. "The kids remember it, they take pride in it, they pick up trash at school because of it. It offers a connection to nature, and lets them know that they have the power to do something." **JC**

CONTACT: STRAW
www.prbo.org/cms/192

YOUTH SPEAKS

Saving the World

I grew up loving the outdoors, playing in the dirt, and being one with the bugs. I pressed flowers and made mud pies. As I grew older my connection to nature changed. I ran cross country in high school and loved traversing the local hiking trails. While my classmates debated becoming doctors, lawyers, or engineers I knew that my place was outside; I decided to study the environmental sciences.

I graduated with my Bachelors degree from UC San Diego in the spring of 2009, not a good year for the economy. Since very few of my fellow graduates, myself included, had jobs lined up it was difficult to throw our caps up in the air and take the world by storm. Still, I had made the smart choice; I was graduating with a degree in Environmental Science and I was needed! From what I'd learned environmental catastrophe was imminent and I'd better get out there and solve some pressing problems. A good place to start had to be... permitting?

Permitting? That isn't what I would have said my career goal was as an undergrad. But three years, a Masters degree, and several internships later I have a different view of the environmental science field. I have found that my interest lies in the arena of environmental permitting and management. This means that I have never lobbied to save the endangered polar bear, but I do know how to avoid the accidental taking of a gray fish called the Santa Ana sucker. While I respect the lone activist chained to the redwood I understand that a Habitat Mitigation Plan can save an ecosystem.

With this in mind, I feel that my childhood self wouldn't mind the cubicle too much. Yes, I will save the planet through permitting. **RW**

Rebecca Whiteside worked most recently for the Orange County Water District monitoring groundwater and doing GIS work. She is 25, married, and moving to the Bay Area in search of work.

HABITAT

PEACE FOR VETS & TERNS

The cracked tarmac of the former Alameda Naval Air Station is one of the world's most incongruous bird sanctuaries, but it looks like home to California least terns. The endangered terns that nest and fledge here are helping propagate the species by establishing other colonies around the Bay. But the habitat of these seabirds has been in bureaucratic limbo since the base closed in 1994. While the air station is still owned by the Navy, it's provisionally overseen by the US Fish and Wildlife Service. Now a new configuration may be taking shape.

Eight years ago, the Navy proposed handing over a portion of the base near the terns' nest site to the Department of Veterans Affairs for a medical center and columbarium, a repository for the ashes of cremated veterans. The proposal generated opposition from the Golden Gate Audubon chapter, and several other environmental groups concerned about potential impacts on the terns.

Photo: Eleanor Briccetti

Recently, the VA agreed to move the medical center farther from tern territory. And the East Bay Regional Parks District has plans to create wetlands that the birds could use on an adjacent parcel in the so-called Northwest Territories.

There is one hitch: the proposed wetlands tract belongs to the City of Alameda. Although the city obtained the land from the Navy for free, officials are demanding compensation from the Park District. The conflict has forestalled plans for the new park. In the meantime, however, the VA has promised to minimize disturbance to the birds, and Fish and Wildlife will continue its management role.

"It's still a compromise, because the columbarium will be on the refuge footprint," says Golden Gate Audubon's Mike Lynes. "But it's about as good a deal as we think we can get."

According to VA chief of public affairs Robin Jackson, the columbarium will occupy no more than 80 acres, 1766 feet from the tern colony at its nearest point. But Fish and Wildlife was unable get the VA to agree not to expand their facility in the future.

"The first step is to accept the proposal; the second hurdle will be the details," says refuge advocate Leora Feeney. She hopes the new interagency partnership will result in protection for the tern and the establishment of the new park: "With sea levels rising, the Northwest Territories will be wetlands whether we want it or not." **JE & ARO**

CONTACT: Robin Jackson, robin.jackson2@va.gov or Mike Lynes, mlynes@goldengateaudubon.org

CAPITAL BEAT

Levee Policy Mismatch

The debate over whether to allow vegetation on California's thousands of miles of levees moved into a new arena this May, with the introduction of HR 5831 by Representative Doris Matsui (D-Sacramento). The vegetation issue has been at the center of a dispute between the US Army Corps of Engineers and state and local resource agencies, prompted by dissatisfaction with the latest version of the Corps' vegetation management guidelines which include a complex variance approval process and no exemptions for projects already authorized and constructed.

"The Corps' current one-size-fits-all national vegetation policy will have a negative impact on public safety, on the environment, and on the cost of our levee projects," Matsui said in a May 18 press release.

Matsui's Levee Vegetation Review Act addresses concerns that the Corps is imposing a uniform policy that disregards local conditions. The Act would require the Secretary of the Army to undertake a comprehensive review of the Corps' policy guidelines on vegetation management for levees, considering factors that promote potential variances from national guidelines. The scope of an approved variance could include an exemption from national guidelines. The bill also sets a two-year deadline for revising the current guidelines to include procedures for developing regional or basin-wide variances.

Ever since the new one-size-fits all guidelines were released, California agencies have been scratching their heads over how to continue to keep the Corps happy on the levee safety front while continuing ongoing levee restoration and maintenance projects. The State Water Resources Control Board has repeatedly warned that the policy would result in removal of riparian vegetation and would conflict with the Porter-Cologne Act. The California Central Valley Flood Control Association pointed to implementation costs and cited the Corps' longstanding practice of encouraging levee vegetation for wildlife habitat and erosion protection. In a rare bipartisan move, 35 members of the California Congressional delegation had previously criticized the guidelines. Thirty of them have signed on to Matsui's bill, which is being referred to the House Transportation and Infrastructure Committee. **JE**

CONTACT: Kyle Victor, kyle.victor@mail.house.gov

ENDANGERED

Goofy Sturgeon Behavior

If a delta smelt bangs against a fish screen at an irrigation intake more than three times, it's usually history. But the larger endangered fish they share Sacramento River habitat with – green sturgeon and Chinook salmon — may come away unscathed, given the right human precautions. A UC Davis research team led by fish ecologist Nann Fangue is now investigating if deterrents such as strobe lights, fast moving water, metal screens and louver racks could help these fish steer clear of water intakes.

Sturgeon aren't very used to steering clear of anything. As adults, they're so big and so difficult to chew, armored as they are with rigid "scutes," that few predators favor them as food. Even juveniles seem to have the fearless mentality of adults. "A six-foot-long-sturgeon is not going to be eaten by much, except maybe a killer whale," says conservation biologist Dennis Cocherell, coordinator of the UC Davis studies on sturgeon, and how they behave around fish screens.

Green sturgeon may not be very vulnerable as adults in the ocean, but they are as juveniles spawned in the Sacramento River system like salmon. In the four months after they've hatched near the Red Bluff Dam and before they can tolerate salt water, a striped bass or catfish might eat them, or they could get sucked into one of the river's estimated 320 unscreened agricultural water diversions. And nobody wants to see that happen. Experts estimate that there are only 10-28 annual spawning adult green sturgeon left in the Sacramento River watershed. "That is a tiny number," says Fangue. "So from the perspective of conservation, and maintenance of diversity, they're one of most important species for us to look at."

UC Davis is looking hard. Throughout this last six months, Fangue's group has been "swimming" sturgeon through the university's mini metal river channel, a flume that is a meter-and-a-half-long and a meter wide. While swimming, the fish encounter two sets of screens and louvers, and experience a variety of water velocities and light conditions — tests have even been conducted in pitch dark with infrared cameras and night vision goggles. Each fish is in the flume for about 15 minutes, and the team does about 20 tests per day. It takes 20-30 days of testing to get a good sample size, says Cocherell.

The research is still in the pilot, data collection stage, but Cocherell says they're poised to start pulling together results. Anything that looks promising, in terms of what keeps sturgeon away from agricultural diversions, will get tested on a larger scale in the coming years, scientists hope. In the meantime, they've noticed a few things about green sturgeon.

First, unlike salmon who respond quickly to changing conditions, sturgeon are more "goofy" and slow. Send a pulse of fast water down the flume and a salmon starts swimming against it immediately. But sturgeon sometimes don't move at all during an experiment. "They're not always that motivated or interested in water velocity, and fast flows don't send them into a panic," says Fangue.

Likewise, sturgeon seem to remain pretty mellow when the team sends vibrations through the flume screens similar to those made by predators. Many fish species pick up these vibrations via sensory "lateral lines" along their sides, but sturgeon don't seem to respond in the same way. Cocherell sees more promise in the strobe lights, which do seem to get the attention of the sturgeon. "We haven't quite figured out whether it's a deer in the headlights effect, or if they're actually trying to stay away from the lights," he says. But strobe lights can be tricky to use as a deterrent.

continued to back page

ADAPTIVE MANAGEMENT

Mercury Stays Put

Late this May, regional water quality regulators gave the goahead to open three out of eight gates in a levee along Alviso Slough, as new data reveal little erosion of mercury-tainted sediments in the slough bottom.

Mindful of the mercury deposited here over decades, due to the area's location downstream of what was once the world's largest quicksilver mine, managers of the 15,000-acre South Bay Salt Pond Restoration project have been proceeding slowly with efforts to reintroduce water into its southernmost ponds. No one wants to trigger a sudden release of mercury into fledgling wetlands and shorebird habitat. But the prospects for further restoration look good.

Scientists recently completed a preliminary assessment aimed at pinning down exactly how much erosion occurred, and how much mercury was mobilized, as a result of the breaching of Pond A6 in December 2010 and the opening of the one gate into Pond A8 between June and December 2011 (the rest of the year the gates were closed to protect migrating salmon). They compared the results of 2005, 2010 and 2011 bathymetric surveys conducted by the state-of the-art USGS catamaran *R/V Snavely*. They also took into account mercury concentrations measured in deep cores sunk by USGS' Mark Marvin DiPasquale. Results suggest that very little erosion or deposition, or mobilization of mercury, occurred in Alviso Slough after the A8 notch opening.

"The majority of the erosion occurred around the Pond A6 breach locations," says USGS' Laura Valoppi, lead scientist for the restoration project. "Pond A8 itself actually seems to be getting cleaner, if we look at methyl mercury in the water column." Preliminary analysis suggests only 25 – 50 centimeters of bed sediments eroded in the areas in Alviso Slough downstream of the A6 breaches, with up to one meter of erosion directly adjacent to the breaches. And the amount of total mercury mobilized in Alviso Slough from the Pond A6 breach was 10-20 times less than projected. **ARO**

CONTACT: Laura Valoppi, laura_valoppi@usgs.gov or for a map: www.southbayrestoration.org/maps/

TECHNOLOGY

Measuring Flow: The Master Variable

Stand on a tule island at the junction of two delta channels and you'd think you could tell which way the water was flowing. Surely anything that looks so much like a river naturally flows downstream, from the hills to the sea? But the Delta is not a one-way system, nor is nature entirely at the controls. Throw in ocean tides coming in and out, pumps directing water from here to there, and seasonal ups and downs, and the only people who can really tell which way the water is flowing at any given time or place aren't standing on a tule island. They're sitting in a dark room staring at computer screens showing the minute-by-minute measurements of the USGS flow station network.

The network is pretty comprehensive. Over three decades, and with the help of various state and local agencies, USGS has installed 33 stations at what scientist Jon Burau calls "every hydro-dynamically significant flow split or confluence" in the landscape of the delta's 700 miles of channels (see map). Most of these stations employ a gizmo called a sideward-looking acoustic Doppler current profiler, mounted on a piling or channel marker. These devices bounce sound waves off particles in the water across entire river channels, measuring flow, also called "discharge," as a volume per time (such as cubic feet of water per second). Small solar panels power the sensors, and help them relay the information they collect to computers in operations rooms and science labs throughout California.

"We happen to have a flowing system, and it's flowing not just in one direction but it's flowing every which way, because of tides, and rivers coming together, and pumping," says Anke Mueller-Solger, Lead Scientist of the Interagency Ecological Program for the Delta Stewardship Council. "Understanding anything in this system must start with a good understanding of flow, and how that interacts with more stationary variables like channel geometry, physical habitat, sediment beds, and point sources of pollution. Flow is a dynamic master variable."

Fresh water flow is also something 25 million Californians rely on — for drinking and irrigation water — in what has been called the "most managed watershed in the country." State and federal water managers use flow station network data to make critical daily decisions about how much fresh water they can pump to cities and farms, and when and where. Wildlife scientists also use this information to protect fish species endangered by pumping and loss of habitat. In California's long history of wrangles over water, many resulting court decisions, biological opinions, and water quality standards have become, to some extent, reliant on the numbers spit out by the flow stations.

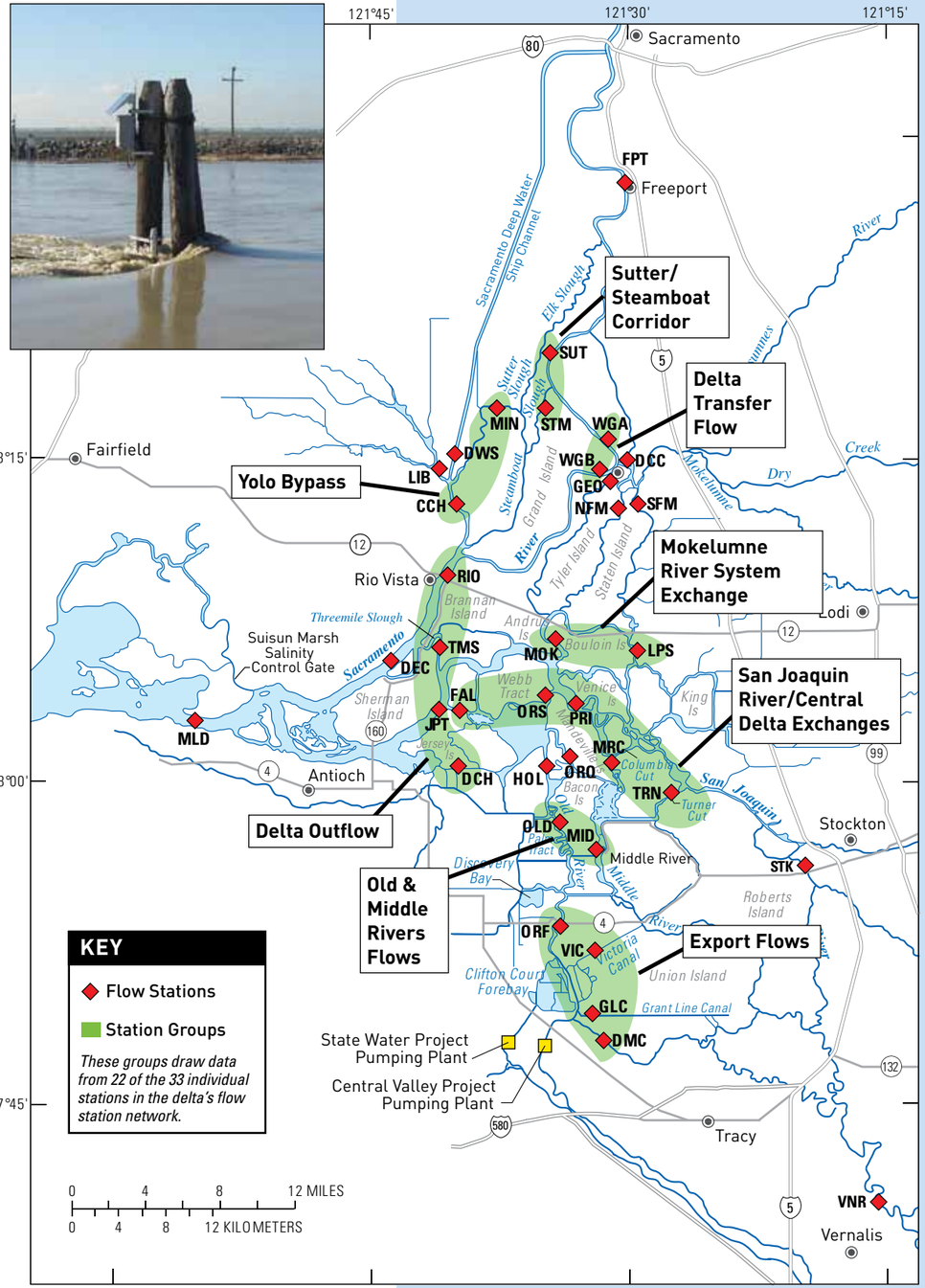
The one number everyone has wanted from these submerged outposts scattered throughout the delta is the '"net flow, or the amount of water flowing in a channel with the tidal flows averaged out. In the early days, getting this number involved a lot more than a few clicks on a key pad. The technology to measure the pulse of fresh water moving through a system overwhelmed with twice-daily ocean tides simply did not exist before the mid 1970s. Particularly challenging was to try to extract this number in the 500 meter wide channels in the delta.

But that's exactly what the state's Department of Water Resources (DWR) set out to do in the late 1920s. Researchers first stretched a cable across the channel, called a tag line, then attached their boat to the cable. As the boat moved through 12-24 stations along the cable, they used a device called a Price AA meter to take individual water velocity measurements. By summing the flow curves at each station between tidal peaks, DWR produced a snapshot of net discharge at that time and place.

"These were incredibly labor-intensive, even Herculean, field efforts, working with multiple boats over 24-hour periods, but they did an amazingly accurate job given the technology they had," says USGS scientist Jon Burau.

Eight decades later in the 2010s, measuring net flow involves equally, if not more, complex efforts, but technology and computers do most of the heavy lifting. The biggest challenge overcome by the hydrodynamics team of the USGS California Water Science Center, which runs the network, has been to find a way — through data collection, math and modeling — to isolate the small signal (net flow) from what they call the big "noise" of the tides. At the Jersey Point Station, for example, daily peak tidal flows can be on the order of 150,000 cubic feet per second (cfs), while the net flow may be 2,000 cfs or less. According to Burau, this means

continued to page 8



Location of USGS-operated flow station sites in the Delta. Source: USGS, CWSC

NETWORK SNAPSHOT

The flow station network developed over time in response to a series of questions. The first question, how much fresh water was flowing into the delta from the Sacramento River, was answered with the installation of the first hydro-acoustic meter at Freeport in 1978. A decade later, water managers and scientists wanted to monitor the influence of the export facilities on the north-to-south movement of water from central to south delta. So they installed two more acoustic velocity meters at Old River at Bacon Island and at Middle River (1987). In the early 1990s, water project operators installed two stations in the Walnut Grove area, so they could find out how much water was flowing from the Sacramento River into the central Delta through the Delta Cross Channel and Georgiana Slough, the so-called Delta Transfer Flow. Finally, a combination of four stations in the south delta were installed to estimate delta flow to the export pumps. Below is a description of the groups of stations used to address specific regional scale questions.

Delta Outflow - The sum of the measured flows from stations at Rio Vista (RIO), Three Mile Slough (TMS), San Joaquin River at Jersey Point (JPT) and Dutch Slough (DCH) are used to estimate delta outflow. Delta outflow is a key ecosystem metric because it is a measure of water received by San Francisco Bay (i.e. inputs less exports and consumptive use).

Delta Transfer Flow - The delta transfer flow is computed as the difference between the flows measured at stations WGA and WGB, two flow stations located near Walnut Grove. The calculation helps water managers estimate the amount of Sacramento River water that flows into the central delta through the Mokelumne system (the Delta Cross Channel and Georgiana Slough). The delta transfer flow is critical for maintaining salinity standards in the central delta.

Old and Middle Rivers – The sum of the flows at stations OLD and MID represent the flow to the export facilities from the north. Typically, Old River is saltier than Middle River at this location, suggesting the former carries the lion's share of the water from the western delta. The 14-day average of the sum of the Old and Middle River flows is known as OMR and appears in numerous regulatory documents and court cases.

Sutter-Steamboat Corridor - Sutter and Steamboat Sloughs are significant conveyance channels that carry, at times, half of the water that passes the city of Sacramento. Sutter Slough carries the bulk of the net flow; Steamboat Slough is much more strongly tidally-affected. The flows in both of these channels are strongly influenced by Sacramento River flows and Delta Cross Channel gate operations. Hydrodynamics data gathered from SUT and STM is important in the study of salmon outmigration.

Yolo Bypass – The flows entering the delta from the Yolo Bypass are computed as the flow in Cache Slough (CCH), minus the flow in Miner Slough (MIN). The computation also measures the tidal and net exchanges into the Liberty Island/Cache Slough region, an area slated for significant restoration efforts. Moreover this region is one of the few places where delta smelt are consistently captured.

Mokelumne River System Exchange - Most of the Sacramento River water that is exported south of the delta flows through the Mokelumne River system. When the Delta Cross Channel gates are open this region is essentially riverine, but when the gates are closed, this system is virtually tidal. The data from the MOK and LPS stations may also be relevant to salmon outmigration, and critical in monitoring the system's response to the proposed restoration of McCormack-Williamson Tract and Staten Island.

San Joaquin River/Central Delta Exchanges- Exchanges of water from the San Joaquin River into the central delta are important for understanding how the salt and sediment fields evolve. The four stations used to calculate this exchange are Turner Cut (TRN), Middle River north of Mildred Island (MRC), Old River north of Frank's Tract near the confluence of the San Joaquin and Mokelumne Rivers (OSJ) and False River (FAL). These exchanges strongly influence the rate of entrainment of salmon outmigrants into the central delta.

Exports – The partitioning of water entering the federal and state export facilities from the various "feeder" channels is obtained from the following stations: Old River near the Forebay (ORF), Victoria Canal (VIC), Grant Line Canal (GLC), and Delta Mendota Canal (DMC).

Flow, continued from page 6

that to correctly measure the net flow his team has to be accurate in its tidal estimates for Jersey Point to within one percent. "Even a small bias in our tidal estimates can indicate completely erroneous net flows, possibly in the wrong direction," he says.

One way the team detects errors is by cross-checking data with flow stations nearby. The team uses groups of stations, for example, to verify localized inputs and outputs of water, and localized "storage." To get more information about what's going on at each location, the team has also added another gizmo called a "CTD" to many stations. These devices measure electrical conductivity (salt) and turbidity (sediment in the water).

Despite all the automation, things do go wrong with the flow stations. "Electronics and water don't get along too good," says Burau. Passersby can't help but be curious about the bright shiny devices sitting out in the water on posts. "If the fishing's bad, folks start fooling around with our equipment," says Burau. Most of the time, USGS can tell if equipment's malfunctioning remotely, using telemetry and a "data crawler" that looks at key status variables such as electrical power. "If any of our stations fail any of our tests, the crawler sends us a text," he says. Even with all the remote fail-safes, something's always up when you have 35 stations running 24-7. Burau estimates his techs are out in a boat doing repairs and site maintenance, and collecting calibration data, at least three times a week.

USGS also uses robot boats to monitor flows. The ten-foot-long-length of these boats, which are equipped with acoustic Doppler current profilers, enables them to span the 4-5 foot wave lengths common in wide delta channels without bobbing. The robot boats also maintain a much steadier course than any heavier, human-controlled vessel.

In places with a lot of boat or shoreline traffic, USGS will sometimes hide its flow station entirely underwater by tethering it to an anchor and buoy system. The buoy has an acoustic release catch on it. One time, the USGS maintenance team approached one of these cloaked stations to find two fishermen, rods up, beers open, parked right on top of it looking out at the Bay. The team couldn't resist sending the "wake-up" signal to the underwater station. As they watched, a beach ball sized orange buoy leapt out of the water into the air right in front of the fishermen, then splashed down hard. "It scared the hell out of them, it was a terrible trick," says Burau.

Collecting the data is one thing, using it another. According to IEP's Mueller-Solger, the data from the flow station network is useful in two obvious ways. First, everyone uses it to calibrate and validate their hydrodynamic models, not only simpler "mass balance" equations like the much-used "Dayflow" calculation of delta outflow, but also in more sophisticated 3-D computer models of where water might flow in the future given sea level rise, levee failure, or the construction of a new canal to reroute water around the delta's biological weak spots. "If you don't have any flow stations to groundtruth delta models, you lose all faith in predicting what will happen with new water projects," says Deanna Sereno, an engineer with the Contra Costa Water District.

Though Sereno doesn't use flow station data much for day-to-day district operations, she does use it for other purposes. A couple years ago, when the district was building a new drinking water intake at Victoria Canal, Sereno was alarmed one day to see a spike in turbidity. Sereno checked to see if the spike was coming from up or downstream of the nearest flow station. "Since the flow and turbidity data are paired, it was easy to determine that it was coming from the opposite direction from our intake, and that our construction wasn't the cause," she says.

Sereno remembers working on a big research study as a graduate student aimed at tracking phytoplankton on two islands. As part of the study, Burau's group put flow sensors and CTDs on all seven boundary channels for Frank's Tract to measure what was coming and going out of the system. "It helped us understand that Frank's Tract was a net sink, or trap, for fish food, and that Mildred Island was a net source. You can't do that without the flow stations to determine the flux at those boundaries," says Sereno.

Station measurements also become useful for entities like the State Water Resources Control Board, or other regulators, when they are trying to determine compliance with flow objectives, water export standards, and biological opinions created to protect the beneficial uses of the system's water and fish. "Real time measurements of flow help us do a number of things," says the Board's Leslie Grober. "They help us to determine compliance with flow objectives, to adjust flows in real time to make them more functional for fish, and to decide on future changes based on how species responded to actual recorded flows."

Regardless of water management's reliance on the data, only a few of the flow stations are currently mandated by the State Board, the agency with the regulatory authority over withdrawals of water from the delta. Mueller-Solger thinks such mandates are a two edged sword. On the good side, you have long term security and consistency in monitoring; on the bad side, as management questions and technology change, mandates can get in the way of needed updates.

One thing scientists from many agencies agree on now is the need to "co-locate" data collection. As researchers measure variables, such as turbidity, salinity, plankton, or fish numbers, the value of this information is enhanced if they also have information on the hydrodynamic context from the same time and place.

Experts say the flow station network will become even more foundational to delta planning in the future. "When we start putting in new conveyance facilities and doing marsh restoration, we're going to change the hydrodynamics and transport processes in the delta dramatically. So what you want to do in that situation is monitor it now, so you know how it works, and then again, when you make the change, so you'll know what's happened," says Burau. **ARO**

Raw data in real-time:
http://cdec.water.ca.gov/

Quality assured data:
http://waterdata.usgs.gov/ca/nwis/

Honoring a Legendary Lady

San Francisco Bay has been fortunate in its champions. Florence LaRiviere, cofounder with her husband Philip of Committee to Complete the Refuge, has focused on saving wetlands in the South Bay, lobbying for the creation and later expansion of the Don Edwards San Francisco Bay National Wildlife Refuge and blocking development at Bair Island and Mayhews Landing. A restored tidal marsh in Fremont bears the LaRivieres' name. Most recently, the 88-year-old great-grandmother was honored by the Environmental Law Institute as Wetland Community Leader of the Year in Washington, DC.

Photo: Carin High

How did you get involved with wetland conservation? When my husband and I moved from Berkeley to Palo Alto, we found Palo Alto very hot. In the evening we'd put supper in a basket and take the kids to the edge of the Bay. The road stopped at the old harbormaster's house, where someone had put a picnic table. It's lovely—the marsh in the evening. The tide moves the cordgrass, and the birds cry. Then we learned what was happening to Bay wetlands: sewage outfalls, garbage dumps, salt ponds. In Palo Alto a convention center was planned, covering that lovely marsh with concrete.

Arthur Oglevie, a Santa Clara County planner, wrote in the *Mercury News*: "If you're worried about what's happening to the marshes, come to my office tomorrow at 10 am." There were 20–30 people there; that started the campaign for the refuge. We went to Representative Don Edwards. "If you people want it, it sounds right to me," he said.

Republicans and Democrats alike signed on. We went to city councils, Kiwanis clubs, everywhere. One mayor called us carpetbaggers, but by the meeting's end he said, "This is democracy in action."

What are you proudest of? That we not only have the refuge but went back in 1988 to expand it, to get adequate habitat types. We were inspired by the people in Redwood City who had battled Mobil, and so proud of how the 1982 Redwood City referendum went. Audubon's help was particularly valuable; they paid for a full-page ad in the *New York Times.*

What's your favorite marsh? Any one I can get to. I particularly like standing on the hill at the Fremont refuge headquarters. To the east you can see where the buildings end and the refuge begins; to west, a lot of ponds we own but Cargill still makes salt on. Leslie Salt was going to have a city there. When I went to Washington I asked my kids what to tell people there. They said: "Tell them the condominiums would be marching to the edge of the water."

What's your most memorable negotiation? That would be the Carruf property near Cushing Boulevard in Fremont. We were trying to get that just because it was on the edge of the Bay and seasonal wetland. I walked out there with some friends. All of a sudden over a little hummock we came upon a vernal pool. I'd never seen one before. We got that land. They were going to build on it but went into bankruptcy and a bank in Los Angeles had it. The bank backed off on developing it because of local opposition. It turned out to have endangered species of fairy shrimp. It's about the last vernal pool habitat near the Bay.

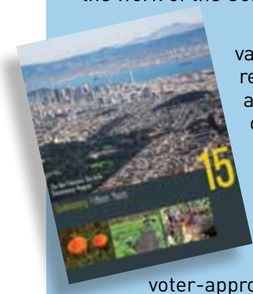
Who else has inspired you? All of the biology department at San Jose State; they would stand around at city council meetings until 1 AM in the morning. And our members are wonderful—all volunteers; we have no paid staff.

What's ahead for the Committee? The refuge is not complete. There are missing pieces in Redwood City and Newark. Sea level rise has given us new impetus to try to get everything that hasn't been built on. One word I hear from developers is "balance." If we're going to have balance, we're going to have to dig out an awful lot of fill. **JE**

REPORT OUT

Ebb Tide in Restoration Funding

Support for conservation is cyclical, says John Woodbury, who worked with State Senator Byron Sher to draft legislation that enacted the San Francisco Bay Area Conservancy Program in 1997. The 1970s exploded with federal laws to protect air, water, and land. Attempts to back the momentum with funding fizzled during the Reagan years in the '80s, and continued into the late '90s. But in the Bay Area, the first decade of the 21st century will go down in history as a conservation boom period thanks to willing taxpayers and the work of the Conservancy.



In May, the Conservancy issued a 32-page report that highlights an impressive array of accomplishments over the last 15 years, including the permanent protection of nearly 85,000 acres of land. Funds from voter-approved state bond measures 12, 40, 50, and 84 flowed through the Conservancy to support 425 projects that improved the health of 50 creeks and rivers, planned or restored 34,793 acres of wetlands, and added 200 miles to four regional trails.

The report also acknowledges that we are on the downside of the funding cycle. "It's not likely that we'll see these investment levels in the near future," said Amy Hutzel, the Conservancy's Bay Area manager. The fallout from a downsized Conservancy will be felt region wide.

"The Conservancy Program jumpstarted the San Francisco Bay Trail," says Laura Thompson, the trail's project manager. The Program helped fund all phases of many new trail sections from conception to construction. Now they will plan to fund each phase separately. Funds from Prop 84 covered a conceptual study for a nine-mile gap between Newark and Fremont, for example, but the buck stopped there. "There are other pools of money, but

continued to back page

MARITIME

Unwanted Yacht Menace

Behind the tidy rows of white yachts moored at the Bay's picturesque marinas is an untidy collection of vessels abandoned by their owners. Economic downturns always force people to give up luxuries, and boats, with their maintenance and docking and registration fees, are often to first to go. But the hundreds of abandoned vessels now moored outside supervised marinas or tended berths around the Bay are not only creating navigational and pollution hazards, but also attracting criminal activity. Local agencies, marina operators and shoreline landowners are trying to tackle the unpleasant side effects of this fleet of castoffs as best they can.

The Bay's abandoned vessel problem is not new. "This has been going on at least since the 1990's," says Jim Haussener, who directs the California Marine Affairs and Navigation Conference. Years ago, Redwood City and Contra Costa County had a big problem with abandoned vessels and illegal liveaboards, and Marin County has struggled with similar issues for decades.

Right now, the problem seems more acute in the Oakland Estuary, where second hand brokers and salvage dealers have been selling the vessels, and locals are starting to use them as illegal homes and bases for shoreline raids and burglaries. Without the proper infrastructure provided by marinas these floating camps can become point sources of untreated sewage, which affects nearby marinas and property owners.

The number of abandoned vessels rises and falls with larger economic trends. Sometimes, especially with older vessels, the couple hundred-dollar monthly berthing costs far exceed the boat's value. Compounding the problem, Haussener explains, is that the state changed their vessel registration requirements about ten years ago. The state used to require boat owners to update their registration every year, but now they can do it every other year. "The boat can be sold two or three times during that period and nobody's really paying attention," Haussener says.

Dealing with abandoned boats and illegal liveaboards takes a lot of coordination among various regulatory and enforcement agencies. The San Francisco Bay Conservation and Development Commission, for instance, has the ability to classify a boat as Bay "fill" if it is lived on or moored for an "extended" amount of time outside of a marina basin. As such, the Commission can issue an order requiring the owner to remove an illegally moored boat but it does not have the power to remove the vessel if the owner fails to do so. The Coast Guard, which is mandated to protect all navigable federal waters, assists in environmental cleanup if abandoned vessels become a source of contamination, or a security liability. But neither agency has the primary responsibility of identifying derelict vessels and tracking down who is responsible for their cleanup and disposal.

That often leaves local law enforcement with the job. In some places, like in Contra Costa County, the Sheriff's department took the lead on the abandoned vessel issue. "We would clean them up each year, but they would just come back again," says Lieutenant Doug Powell from county's Sheriff Marine Patrol. "We had whole communities out here and they wouldn't leave until the boats sank."

Powell was instrumental in getting the county's mooring and sanitation ordinance passed in 2005 and for its subsequent enforcement. Put simply, the ordinance says that boats cannot be moored in the county if they lack the means to move or a marine sanitation device. The code is enforceable through inspections. The Marine Patrol writes grants and gets funding from programs, such as the state's Abandoned Watercraft Abatement Fund. One program started in 2010, Powell says, has been particularly helpful. This Vessel Turn In Program (VTIP) allows boaters to turn in aging boats at no cost which is a better alternative than being held liable for abandoning them.

Setting up local ordinances to address holes in existing marine regulation and enforcement efforts may be the most viable option for dealing with a problem that presents environmental and public safety threats. That's why Brock de Lappe, the Harbor Master at Alameda Marina, recently helped to start the Oakland Estuary Coalition. It's a group of harbor masters, local law enforcers, and representatives from various agencies interested in getting the abandoned boat and liveaboard issue under control. The goal is to develop an Alameda County ordinance that will work for all stakeholders. "A county ordinance would facilitate law enforcement," says de Lappe, "and the consensus is that that would be beneficial." **DM**

CONTACT: Brock de Lappe
brock@alamedamarina.net or
Doug Powell dpowe@so.cccounty.us

These abandoned vessels wrecked this June in the Oakland Estuary (and it didn't take long for a scavenger to explore below decks). Photo: Brock de Lappe.

OUTSIDE THE BOX

New Grey Areas in Plumbing

Advocates of water collection and reuse alternatives are encouraged to see California's plumbing codes becoming a little more grey- and rain-water friendly. Grey water is the slightly soapy stuff that comes out the other end of your washing machine or shower; rain water, in this case, refers to the kind collected in rooftop tanks. Both, with little or no treatment, can make perfectly safe water supplies for watering gardens and landscaping — saving reservoir and snowpack supplies for the drinking water tap. But for years it's been challenging to get permits and plumbers to install household or commercial grey and rain water collection systems. Restrictive plumbing and building codes simply got in the way.

When the state Department of Housing and Community Development released its first draft of revised chapters of the plumbing code in March, the organization Greywater Action called the proposed new code "more restrictive and cumbersome," with "overly stringent requirements" for residential rainwater systems. But in its second draft, the agency seemed to take public comments to heart. "The second revision is a big improvement over the first," says the organization's Laura Allen. "During the triennial code change, they threw the 2009 code out, took the Uniform Plumbing Code and tried to adapt it. In the process, some of the good things that had happened were lost." She explains that the residential and commercial codes are being revised separately, the latter by the Building Standards Agency, but the intent is for both to contain parallel language.

Allen pointed out a few things that still need work. First, the code estimates grey water production based on 1990s fixtures and appliances, and doesn't take into account recent improvements for water use efficiency. For example, the code assumes each person makes 15 gallons per day of laundry water. "My washing machine only uses 12 gallons a load, so that would mean I do more than one load of laundry every day. In reality I do one a week," says Allen. The outcome is to require water-efficient homes to install unnecessarily large and expensive grey water systems. Second, the code classifies kitchen sink water as"black water" which is the same as toilet water. Obviously, what goes down the kitchen sink drain is different that what goes down the toilet. "The code should rename kitchen sink water as 'grey water' or 'dark grey water' to account for its gunkier nature," says Allen. Lastly, she thinks the irrigation parts of alternative systems "don't line up very well with the plumbing code."

On the good side, Allen notes that the code section on clothes washing systems is less prescriptive than other parts: "You don't need a permit for a one- or two-family dwelling if you follow the guidelines." That's more in line with the policies of other states friendlier to grey water, including Arizona, New Mexico, Texas, and Wyoming: "The codes in those states give guidelines on areas of public and environmental health concern like pooling and runoff, but how you distribute the water is your business. We'd like to see California being even more proactive — making water reuse more available and actually promoting it," she says.

Like Allen, Paula Kehoe of the San Francisco Public Utilities Commission is positive about the latest version: "We're very pleased with the direction they're taking in terms of the second draft. It's been a very collaborative process. We're looking forward to the adoption of guidelines that will help us expand our water supply portfolio." **JE**

CONTACT: Laura Allen,
laura@greywateraction.org &
Paula Kehoe, pkehoe@sfwater.org

San Francisco Estuary Partnership
1515 Clay Street, Suite 1400
Oakland, CA 94612

www.sfestuary.org

San Francisco Bay and the Sacramento-San Joaquin River Delta comprise one of 28 "estuaries of national significance" recognized in the federal Clean Water Act. The San Francisco Estuary Partnership, a National Estuary Program, is partially funded by annual appropriations from Congress. The Partnership's mandate is to protect, restore, and enhance water quality and habitat in the Estuary. To accomplish this, the Partnership brings together resource agencies, non-profits, citizens, and scientists committed to the long-term health and preservation of this invaluable public resource. Our staff manages or oversees more than 50 projects ranging from supporting research into key water quality concerns to managing initiatives that prevent pollution, restore wetlands, or protect against the changes anticipated from climate change in our region. We have published *Estuary News* since 1993.

ESTUARY NEWS

ESTUARY News
June 2012, Vol. 21, No. 3
www.sfestuary.org/pages/newsletter.php

MANAGING EDITOR Ariel Rubissow Okamoto

CONTRIBUTING WRITERS
Jacoba Charles
Joe Eaton
Aleta George
Daniel McGlynn
Rebecca Whiteside

DESIGN Darren Campeau

RETURN SERVICE REQUESTED

PRESORTED
FIRST-CLASS MAIL
U.S. POSTAGE
PAID
OAKLAND, CA
PERMIT NO. 832

Want to switch to a PDF from this print version sent through the mail?
Email: bayariel@sbcglobal.net

RESTORATION, *continued from page 9*

they are more competitive," says Thompson. "The pot is much smaller without Bay Area Conservancy funds."

San Francisco Bay Joint Venture coordinator Beth Huning is also looking at distinct funding phases with her project partners. The 2,327-acre Sears Point Restoration Project is a case in point. The environmental reports are done, but they don't yet have construction permits. Meanwhile, funds are available to begin construction, but not complete it. "Everyone is going to have to prioritize," says Huning. "We are now looking to non-traditional sources of funding for our projects, and trying to find ways to include restoration in infrastructure improvements."

The Conservancy is also making hard choices. Trying to protect large projects, they're looking for external funding for several ongoing projects such as the South Bay Salt Pond Restoration Project and the San Francisco Estuary Invasive Spartina Project. "Any delay in funding would be a major setback," says Hutzel regarding the region-wide effort to combat invasive cordgrass. "We could lose the work we've done so far."

Like the tides, the up-cycle will likely come again. "The important thing is to plan, set a vision, and be ready when the timing is right," says Woodbury, now general manager of the Napa County Regional Park and Open Space District. "It's possible to have great things happen despite the economics," he says, noting that the East Bay Regional Park District was formed during the Great Depression. In other words, look for treasures while the tide is out. **AG**

CONTACT: John Woodbury, jwoodbury@ncrposd and Amy Hutzel, ahutzel@scc.ca.gov

STURGEON, *continued from page 5*

Cocherell has one substantial conclusion he's comfortable sharing before he gets done with his data analysis. "At a very young age sturgeon are good swimmers, but their capacity doesn't increase linearly like salmon, which are the Olympic athletes of fishes. As Chinook get bigger and bigger they get better and better at swimming faster and faster. The sturgeon increase very rapidly and then stay at a steady swimming speed all the way up to sub-adulthood. So a little eight centimeter sturgeon swims just as well as a 28 centimeter sturgeon — about 2-3 body lengths per second," he says.

All these swimming performance tests will help UC Davis evaluate the validity of current state and federal screen criteria for agricultural intakes, which dictate what size and shape a screen has to be to cover intakes, and how fast water can be pumped out of rivers onto farm fields (not so fast as to suck a fish against the screen). The current criteria are protective of delta smelt, Chinook salmon and steelhead. "It would be great if we could show that what works for the other species works for sturgeon too," says Cocherell. If not, the last few green sturgeon in the river may need their own unique set of protections. **ARO**

CONTACT: Nann Fangue nafangue@ucdavis.edu and Dennis Cocherell decocherell@ucdavis.edu