San Francisco Estuary Partnership

ESTUARY NEWS

SCIENCE • RESTORATION • WATERSHED • POLITICS • SPECIES • BAY

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IT'S NATIONAL ESTUARIES WEEK
Celebrate Your Work Sept 17-24

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Computers Catch the Nutrient Drift

Dry Tales of Drought

Birds Adopt Managed Ponds

College Class Tracks Invasive Clam

Follow Up on Seven Old Estuary Stories: Three Times More Groundwater?

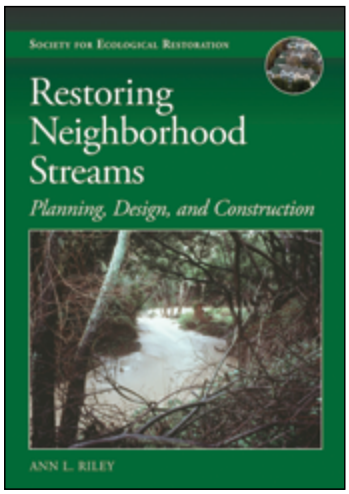
Regional Partnership Announces New Estuary Blueprint

PUBLICATIONS

Ten City Creeks Restored in One Book

"All politics is local" was former House Speaker Tip O'Neil's famous dictum. For Ann L. Riley, that's also true of urban stream restoration. In her new book *Restoring Neighborhood Streams: Planning, Design, and Construction* (Island Press), Riley draws on her extensive experience with the San Francisco Regional Water Quality Control Board and the Waterways Restoration Institute to explore the particulars of rehabilitating waterways in city settings.

After covering the philosophical foundations of stream restoration, Riley details 10 neighborhood-scale projects in Oakland, Berkeley, El Cerrito, Richmond, and Martinez. Two are outliers. Berkeley's Strawberry Creek project involved daylighting a creek but not recreating its original form and function. In Martinez, the restoration effort began when a family of beavers adopted a downtown stretch of Alhambra Creek. While Riley is technically correct in calling this "passive restoration", the beavers might disagree. There's nothing passive about a beaver.



Stream restoration is a learning process, she argues, and practitioners must be ready to deal with the unexpected. They need to mesh funding and design with winning official approval and keeping nongovernmental stakeholders on board. That can mean allaying fears of criminals lurking in the underbrush, satisfying neighbors who believe all streams should babble, even weighing aesthetic appeal and viability in choosing a plant palette.

When Riley entered the field, some called restoration a pipe dream: the waterways were too degraded, the political and economic constraints too great. She and the rest of the local restoration community have proven otherwise. The streams in this book have become neighborhood treasures, with improved water quality and flood safety. As anadromous fish, riparian songbirds, and other wildlife return, they've also become more vibrant ecosystems. Restoration can't put all the pieces back together, but it can clearly improve the health of city watersheds. **JE**

LINK : www.islandpress.org/book/restoring-neighborhood-streams

Veggie Levees Reviewed

Although California's levees were built for flood protection, they can also provide badly needed habitat for fish, birds, and other wildlife. *Improving Habitats Along Delta Levees,* a new report from the Delta Stewardship Council, summarizes recent field studies and outlines some challenges and constraints of enhancing levee habitat.

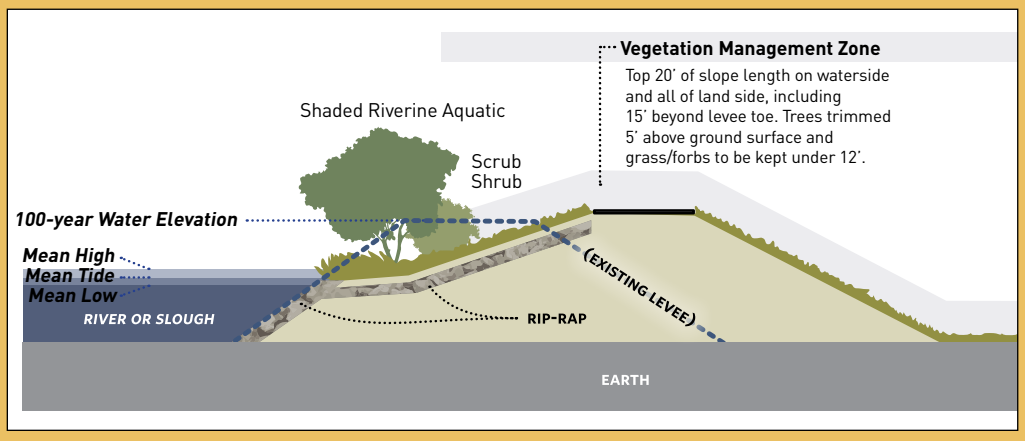
Among those, the US Army Corps of Engineers, which has historically considered trees and other vegetation a threat to levee integrity, requires removal of problematic plants from a "vegetation-free zone" on levees within its jurisdiction unless local districts go through a cumbersome variance process.

The Water Resources Reform and Development Act of 2014 required the Corps to reevaluate its levee vegetation policy by December 2015. But WRRDA did not provide funding for the reevaluation, and the target date passed without action. Tammy Conforti, Corps Special Assistant for Levee Safety, says the authorization remains in effect and the Corps has allocated funding to the vegetation policy review for the current fiscal year.

Meanwhile, the Delta Council's report says the lack of standardized monitoring makes it hard to measure wildlife responses to levee planting projects. But some studies suggest that such efforts can benefit native fish even if the levee has been armored with riprap. Surveys on the Lower American River found migrating juvenile salmonids using riprapped and planted reaches almost as much as unmodified portions of the river.

The authors also stress the importance of specific habitat types for different target species. Constructing set-back levees can create seasonal floodplains where young Chinook salmon thrive, as demonstrated in the Yolo Bypass. Neotropical migrant birds need structured riparian growth and a mix of plant successional stages. Connections between riparian habitat patches are also vital. **JE**

LINK: deltacouncil.ca.gov/docs/improving-habitats-along-delta-levees-issue-paper



REGULATION

Wetland Protections in Transition

Environmentalists are heading warily into the fall following two regulatory developments that they fear may cramp efforts to protect California's wetlands. In June the State Water Resources Control Board released a draft document overhauling wetlands protection procedures but leaving open the question of exactly which wetlands are eligible for protection. In the same month the U.S. Supreme Court ruled that landowners may mount court challenges to U.S. EPA or Corps of Engineers jurisdictional determinations before a permit is issued, potentially generating a torrent of wetlands-related litigation.

The State Board's proposed *Procedures for Discharges of Fill or Dredged Materials to Waters of the State* are the upshot of nearly a decade of effort to strengthen wetlands protections and to create consistent discharge requirements across all of the Regional Boards and the State Board. Despite a 1993 Executive Order mandating no net loss of wetlands, the Corps of Engineers estimated that 300-400 acres of waters of the United States, some of which were wetlands, were lost annually between January 2007 and April 2009. Additionally, two Supreme Court decisions in the early 2000s limited the ability of the Corps to protect wetlands through the federal Clean Water Act and left several ecologically significant types of hydrological areas without federal protection. "This policy was supposed to be something that would stop the loss of wetlands in California," says Carin High of the Committee to Complete the Refuge.

As in the past, the procedures align closely with the CWA and are designed to work in tandem with it. However, the proposed definition of wetlands differs from the CWA's in that an area can be classified as a wetland if it has wetland hydrology and soils, even if there is no vegetation. It therefore includes some types of aquatic features that are not necessarily covered by the CWA such as mudflats and alkali flats.

Environmentalists are disappointed that the wetlands definition does not cover ephemeral wetlands, such as those that appear in desert areas after heavy rains. They favor a "one-parameter" definition whereby a site is classified as a wetland if it has just one of three characteristics: water on or near the surface; hydric soils; or hydrophitic vegetation (vegetation that likes being in water).

"There are many types of seasonal or transient 'waters' that naturally don't meet federal wetland criteria," says former Corps regulator Peter Baye. "Some of these orphan 'waters' provide important ecosystem services."

An even more significant issue for wetland advocates, though, is that the proposed procedures state that not all wetlands are "waters of the state" and therefore eligible for protection under California's Porter-Cologne Water Quality Control Act. Exactly which wetlands are also waters of the state is left to the Regional Boards and the State Board to decide on a case-by-case basis—and the procedures do not provide any guidance on how to make the determination.

"It's puzzling and frustrating," says long-time wetland activist Arthur Feinstein. "The definition does not tell you if it's a water of the state or not, or how you would decide if it's a water or not. It actually makes things worse because it leaves the question of whether a wetland is a water or not completely open to political influence and favoritism. Regulators have got to figure out how to defend whatever decision they make, so the likelihood is that every delineation will be subject to a lawsuit. And that's a crazy way to regulate."

Photo: Rick Lewis

What the environmentalists see as a bug, however, State Board staff saw as a feature of the proposed procedures. "We tried to be very clear about it," says the Board's Phil Crader. "We were not trying to define which wetlands features or other types of features are waters of the state—we were just going with current practice which is to determine that on a case-by-case basis. All of the aquatic features that would be subject to permitting under the proposed procedures were subject to permitting before, and the manner in which we determine whether they are waters of the state will be the same as always."

Crader notes that after the EPA released its 2015 Clean Water Rule, which defines "waters of the U.S." and categorically excludes certain features and activities, the Board spent several months talking with the Regional Boards about the types of features they have regulated in the past to determine if a similar definition and exclusions could be included in the procedures. "It was a very challenging exercise," he says, "One of our goals has been not to undermine our Regional Boards or the State Board in protecting features that they have protected in the past." When several federal courts stayed implementation of the CWR, the Board backed off its effort as well, falling back on the policy of case-by-case determination.

Environmentalists who participated in stakeholder meetings to develop the procedures see this as akin to a betrayal. "At best the Board is saying that they are codifying the status quo," says Kim Delfino of Defenders of Wildlife. "That is not acceptable because under the status quo we are losing hundreds of acres of wetlands every year."

Definitions and delineations are not the only sticking point for environmentalists. The new procedures

continued on next page

Diked baylands often have complex site histories — as humans drained, farmed, or fallowed fields and allowed them revert to vegetated wetlands — histories than often inspire jurisdicitional disputes. Pierce Island's diked baylands include gypsum alkali flat, on a former dredge disposal site fringed with pickleweed marsh, as well as an upland transition zone of mixed wetland and upland plants and ambiguous soils. Close up: Pickeweed with a gypsum garland. Photos: Peter Baye

were supposed to create a regulatory process based on the CWA guidelines, which require an applicant to perform an alternatives analysis to show that there is nowhere else they can do the project, to minimize the environmental damage, and to carry out compensatory mitigation for any damage. "But the proposed procedures make the alternatives analysis entirely discretionary, to be decided on a case-by-case basis," says Feinstein. "And again there's no criteria for when you would need it or not."

Crader says the proposal was intended to allow staff the option of using the analysis that the applicant provides to the Corps of Engineers where possible, but also to allow staff to require additional analysis when needed. Stakeholders have requested more clarity around this requirement, and staff is considering options.

When it comes to compensatory mitigation, the draft procedures call for a one-to-one ratio of wetlands restored to wetlands destroyed. This has never really been viewed as a fair trade. "We are not able to create wetlands that match the functioning values of wetlands destroyed," says Feinstein. "You need more like a two-to-one or three-to-one ratio." Furthermore, the draft says that if the discharger includes a buffer area, the mitigation can be less than one-to-one.

Compensatory mitigation requirements must be commensurate with the amount and type of impact that is associated with a particular permit, according to Crader, who adds that the proposed strategy generally uses a minimum of one-to-one as a starting point. "This strategy is currently employed to determine mitigation amounts and often results in ratios greater than one-to-one being required," he says.

Carin High sums up environmentalists disappointment with the proposal. "Where's the strong policy, where's the protection? It is not apparent to us in anything that is written in this document."

According to Crader, Board staff got the message loud and clear during a July 19 hearing and through public comment letters. "We are taking a step back and looking again at opportunities to identify features that meet the wetland definition and are either always waters of the state or never waters of the state, but doing so with the recognition that we put a fair bit of effort into this exercise before and found that the majority of features do not fit neatly into either category. But we want to respond to the concerns we have heard, so we are exploring some options." Given the extent of the comments, Crader expects staff may propose substantive changes. If so, then the Board will release another draft for public comment later this year.

The other wetland regulation horizon fraught with uncertainty derives from the Supreme Court's unanimous decision in U.S. Army Corps of Engineers v. Hawkes, Co. The Army Corps is pondering potential options for responding to the implications of the decision, which allows court challenges to determinations by the Corps or the US EPA that property targeted for fill includes jurisdictional wetlands or other waters of the U.S., without the need to wait for a permit to be issued.

The danger, says S.F. Baykeeper's Erica Maharg, is "the practical effect that this can have on inhibiting Army Corps and EPA action. Staff may be more reticent to issue jurisdictional determinations because of the fear of litigation. We just want to encourage staff to do their jobs and not worry about litigation."

According to the Corps' Doug Garman, the agency plans to do just that. "We have emphasized to our field staffs how important it is to continue providing timely, consistent, and accurate determinations regarding the scope of waters covered under the CWA and the Rivers and Harbor Act of 1899," he says.

Maharg worries that the State Board's draft procedures and the court's decision may reflect a troubling trend. "There has been a line of cases and policies questioning whether wetlands can and should be protected by the CWA and state law," she says. "It's important to remember that wetlands are vitally important to the health of nearby surface waters and it is extremely important that they be protected overall. So the whittling away at what we define as wetlands or curbing staffs' discretion to protect these wetlands is concerning." **CHT**

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MONITORING

Nutrient Nuances Modeled

San Francisco Bay is becoming less opaque as the sediments power-washed into the Estuary by miners so long ago gradually disperse. This lets sunlight penetrate deeper into the water, creating more favorable conditions for the kind of problematic algal blooms that can shut down crab fisheries and keep people and their pooches out of the water. Scientists have collaborated on some new computer models, however, that may help them predict where and when nutrients, like nitrogen and phosphate from discharges and runoff, may exacerbate the situation.

"It's still a turbid estuary," says the San Francisco Estuary Institute's Dave Senn. "But there's been a relaxation of some of the things keeping a lid on algae growth."

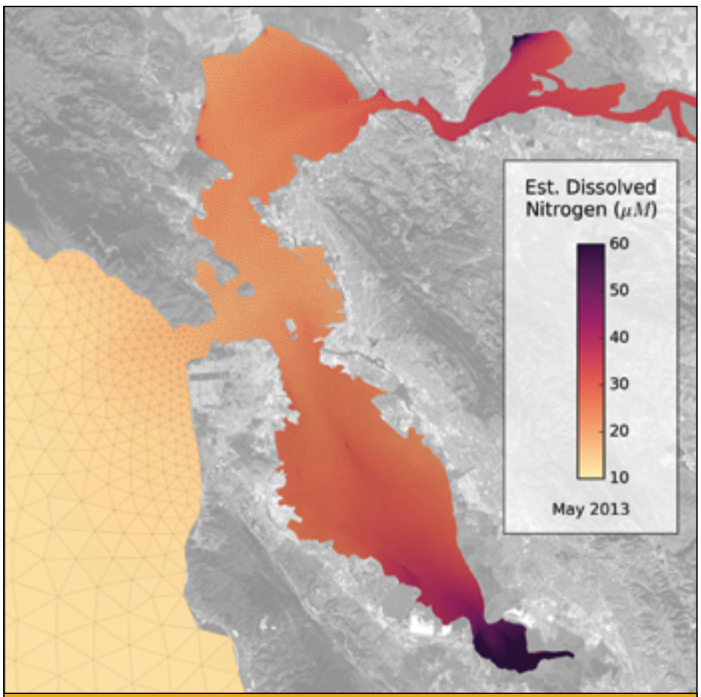
Scientists at SFEI are collaborating with the US Geological Survey and a Dutch research institute to build and share new, open-source, state of the art models of local nutrient dynamics based not only on hydrology but also on physics, chemistry, and biology. This ambitious modeling endeavor is being funded by the Regional Monitoring Program and the San Francisco Bay Nutrient Management Strategy.

Senn says the new models will be important tools for quantifying how excess nutrients influence water quality today, as well as for forecasting conditions under future scenarios, like what could happen to algae growth if sediment concentrations go down by another 50 percent. The models can help investigate the effects of seasonal and spatial variations in turbidity, the mixing by the strong tides in the Bay, and how the abundance of grazing organisms like clams keep algal growth in check.

The models will also help wastewater managers answer questions about actions they might take to mitigate or prevent impairment of the Bay in certain areas, and to identify nutrient concentrations that will be protective of ecosystem health, says Senn. Data on past algal blooms and other events are being used to calibrate and validate the models, which can then be re-run to test various management strategies, says SFEI's Rusty Holleman.

"If you see in the observational record that one day chlorophyll was alarmingly high in a spot, and then two months later not there at all, you could do a lot of reasoning based just on those observations," says Holleman. "But if we can replicate that in a model, we can pick apart the factors and then test hypotheticals."

Other specific issues the models could help elucidate are the spatial influence of nutrient loads from each nutrient source, including wastewater outfalls and nonpoint sources like storm drains and creeks, and how sloughs and ponds at the margins of the Bay affect water quality, among many others.



Model output showing one prediction (in micromoles per liter) for how nitrogen inputs to the Bay may be transported by tides and transformed by chemical and biological processes. The slow flushing of waters south of the Dumbarton Bridge is evident in the higher nutrient concentrations there. A number of nutrient sources are visible as small, local increases in concentration. Source: SFEI

East Bay Dischargers Authority General Manager Mike Connor says information gleaned from the new models could also help wastewater managers figure out if some parts of the Bay will need to be managed differently than others. "Right now the North and South Bays have very similar nutrient levels but very different chlorophyll responses. We suspect the newly restored salt ponds in the South Bay may be acting as little reactors that grow algae and then feed it back into the Bay, but these kinds of processes may work differently in the North Bay. The models will allow us to test different potential management strategies without having to do giant experiments in the Bay."

The Regional Water Board's Tom Mumley says his agency is developing nutrient water quality objectives and permit implementation requirements. "Given the significant costs of potential current and future nutrient management scenarios, our modeling investments will definitely yield decision dividends."

Ultimately, say Connor and Senn, the modeling results could be used to help structure a nutrient credit or trading system for wastewater dischargers in the Bay, similar to carbon trading. But a key difference is that the atmosphere is well mixed with carbon from emissions around the globe — while the Bay is not well mixed. "You're not going to influence summertime nutrient levels in South Bay by adjusting the inputs in Suisun Bay," says Senn. "But that's where the modeling can be really helpful; it takes into account nutrient inputs from each location and their transport and biogeochemical reactions when estimating how they contribute to nutrient concentrations in space and time." **LOV**

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B I R D S

Restoration Gets Results

In judging the success of a restoration project, wildlife response is a crucial metric. Biologists surveying waterbirds in former salt production ponds in the South Bay report good news for the massive tidal wetland restoration effort underway there. US Geological Survey biologist Susan De La Cruz presented their findings at last year's South Bay Science Symposium: for four avian guilds (groups of species with similar foraging and habitat requirements), numbers in the ponds doubled between 2003 and 2014. The annual Midwinter Waterfowl Survey shows 40 percent of the Bay's ducks use the South Bay ponds, which have comparable importance for shorebirds.

Birds were counted daily at high tide, when they move in off the mudflats to forage or roost on islands in the ponds. Positive trends for diving ducks, dabbling ducks, medium shorebirds (avocet-sized), and small shorebirds (sandpiper-sized) began during the project's Initial Stewardship Plan, when pond salinity was reduced, and continued into Phase I of restoration, when 10 percent of the project ponds opened to tidal influence. Dabbling duck use plateaued around 2006; numbers for the other guilds dipped temporarily but rebounded .

When the researchers analyzed how pond characteristics related to bird use, salinity and depth emerged as key factors. "The importance of each factor depends on the guild," says De La Cruz. For example, small shorebird numbers were highest in shallow breached ponds with islands.

Restoration planners would like to make the South Bay project's pond and marsh mosaic hospitable to divers, dabblers, and shorebirds alike. "There are ways to manage for multiple guilds, optimizing a pond for more than one species," says De La Cruz. The shape of the pond islands could be a factor, along with changes in pond depth, salinity, and topography. Maintaining species diversity may require a mix of methods for multiple ponds. **JE**

D R O U G H T

Short Memories, Long Views, Cool Dams, Hot Water

There hasn't been any shortage of drought-related stories and studies, what with California now in its fifth year, so *ESTUARY* offers this little round up.

First, nine of the 10 biggest urban water suppliers in the state, including East Bay MUD and San Francisco PUC, have set their water conservation targets to zero, according to a report in the *San Francisco Chronicle.* Last year, the state made the agencies reduce water use by up to 36 percent, but this year the agencies were given free rein to come up with their own conservation targets.

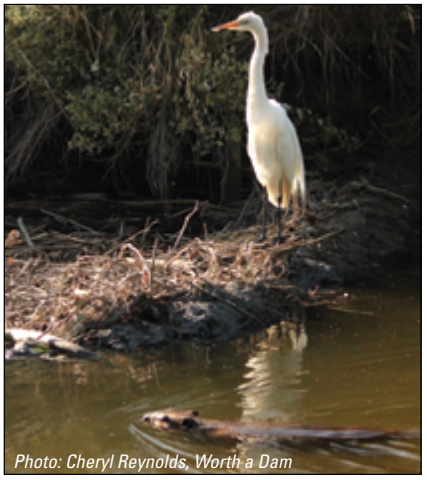

Photo: Cheryl Reynolds, Worth a Dam

According to SF PUC's Steve Ritchie, "Passing the state's "stress test" simply relieved us from their rationing requirement. However, our system storage did not fully recover this year, so we requested a 10 percent reduction in demand by all of our customers. This summer, they been achieving a roughly 20 percent reduction from 2013 levels."

Local water purveyors might want to check out some of the lessons learned in Australia after a decade-long drought led the country to change how it plans and sets priorities for water supply and the environment. According to a June 2016 report by the Public Policy Institute of California (PPIC), *Managing Water for the Environment During Drought/Lessons from Victoria, Australia,* policy reforms made by Victoria were controversial but helped the state avoid some serious biological losses during their extended drought.

The authors have some advice for California. They suggest making efforts to increase species' population resilience in advance of a drought, taking actions to recover species after a drought, and developing emergency response measures and water allocation priorities to reduce harm during a drought. They also recommend seeking better federal support: in Australia, the federal government reformed key laws to enable better water management and purchased irrigation entitlements to improve environmental flows. Other recommendations for California include granting the environment a high-priority water right with a better water market and maintaining a functional water registry; and better integrating the environment into water management. Australia explicitly recognizes that the environment is a "lawful" user of water entitled to a water right. Water that is stored under that entitlement then helps meet environmental needs during a drought — water managers can make transfers between local watersheds and release flows for biological needs.

A different way to store and slowly release water during a drought is by allowing beavers to build dams on rivers and streams. Beaver dams spread the water out, creating wetter habitat and promoting subterranean recharge and release of water later in the season, which enhances base flows. This enhanced flow offers valuable ecosystem benefits especially during prolonged droughts, according to a new report by the Occidental Arts and Ecology Center WATER Institute, *Beaver in California/Creating a Culture of Stewardship.*

Scientists predict that as the climate changes, stream temperatures will rise. A new database hosted by the Rocky Mountain Research Station offers stream temperature data and climate scenarios for streams across the western United States. Temperature data was compiled by biologists and hydrologists working for over 100 resources agencies; the database contains over 1.5 million hourly temperature recordings from over 20,000 unique stream sites.

CCMP 2016

ESTUARY BLUEPRINT

This fall more than 70 organizations reached collaborative agreement on four long-term goals and 32 actions to be taken over the next five years to protect, restore, and sustain the San Francisco Estuary. Their *Comprehensive Conservation and Management Plan* or CCMP is the third in a series, updating1992 and 2007 plans undertaken by the San Francisco Estuary Partnership.

This landmark update addresses current concerns and future uncertainties — ranging from rising sea levels to drought, habitat loss, and failing fish and wildlife – and provides our partners with the following priorities for 2016-2021:

- Close the gap in our understanding and monitoring of how watersheds support aquatic resources, and make the management connection between streams, rivers and Estuary habitats downstream.
- Optimize the region's significant past investment in wetland habitats by protecting and growing a healthy mosaic of different kinds of habitats along our shorelines, coasts, rivers, and stream banks.
- Weave together these tidal wetlands, mudflats, eelgrass meadows, fledgling oyster reefs, shorebird ponds, nesting islands, high water refuges, and vegetated levees, and connect them to our watersheds. Then protect as many of the immediately adjacent areas as possible for future migration into these critical buffer zones inland.
- Remain vigilant in controlling the stresses imposed on our native species and natural habitats by weeds, exotic species, invaders, and predators.

GOALS

- **Sustain and improve the Estuary's habitats and living resources.**
- **Bolster the resilience of Estuary ecosystems, shorelines, and communities to climate change.**
- **Improve water quality and increase the quantity of fresh water available to the Estuary.**
- **Champion the Estuary.**

- Help the ecosystem continue to function, rather than falter, by harmonizing human activities with natural processes. Bolster the "system" in "ecosystems," — the food webs, the connections between habitats, and the movement of fresh water and sediments through the Estuary — so that the system can sustain fish, birds, wildlife, and their habitats.
- Support natural solutions to protecting our shores and overcome the planning, legal, and policy roadblocks to adaptation and flexibility as we adapt to the challenge of rising sea levels. Build natural infrastructure (wetlands, horizontal levees, buffering habitats) and resilience into our shorelines.
- Acknowledge that the supply of fresh water for all kinds of uses, human and wild, is shrinking, and plan for long term droughts so we aren't caught short. Push for more water conservation, recycling, and regional planning so we can increase supply without diverting more from fish to cities.
- Don't ease up on tackling lingering pollution problems and try to stay ahead of new ones. Follow through

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32 ACTIONS FOR A HEALTHY RESILIENT ESTUARY

ACTION		DESCRIPTION
1	**Develop and implement a comprehensive, watershed-based approach to aquatic resource protection**	*Develop a watershed-based assessment, planning, management, and reporting process that improves protection for aquatic resources in the context of human population growth and climate change. Improve coordination of public policies and programs related to aquatic resource management.*
2	**Establish a regional wetland and stream monitoring program**	*Plan and implement a regional monitoring program for wetlands and streams in the Bay Area and the Delta to help local, regional, state, and federal agencies evaluate the effectiveness of efforts to sustain healthy aquatic habitats and resources.*
3	**Protect, restore, and enhance tidal marsh and tidal flat habitat**	*Restore tidal marsh and tidal flat habitats within the Estuary for multiple ecosystem benefits including recovery of threatened and endangered species. Consider connections between habitats. Strive to protect and restore complete tidal wetland systems.*
4	**Identify, protect, and create transition zones around the Estuary**	*Protect areas between estuarine and terrestrial ecosystems (transition zones), and their ecosystem services, to help the Estuary adapt to rising sea levels. Integrate transition zones into baylands restoration and enhancement projects to provide both migration space and high water refugia.*
5	**Protect, restore, and enhance intertidal and subtidal habitats**	*Protect, restore, and enhance intertidal and subtidal habitats to improve delivery of ecosystem services and water quality benefits to the Estuary. Consider connections between habitats within the full range of tidal elevations, from upland to subtidal, striving to protect and restore complete systems.*
6	**Maximize habitat benefits of managed wetlands and ponds**	*Maximize habitat benefits of managed wetlands and ponds for all species. In the near term, continue to support studies on bird use of managed ponds and sensitive species in managed wetlands to inform long-term management options for how these habitats can sustain these species.*
7	**Conserve and enhance riparian and in-stream habitats throughout the Estuary's watersheds**	*Conserve habitats by identifying priority streams and stream reaches, defining impairments and threats, filling data gaps, developing science based tools, and designing, advancing, and collaborating on projects.*
8	**Protect, restore, and enhance seasonal wetlands**	*Protect and enhance seasonal wetlands within the region using conservation easements, related protection tools, and improved grazing management practices.*
9	**Minimize the impact of invasive species**	*Reduce the impact of invasive species through prevention, early detection, rapid response, eradication, and control. Conduct work with national and regional coordinating bodies and the key agencies implementing specific programs.*
10	**Increase the efficacy of terrestrial predator management**	*Increase the efficacy of terrestrial predator management activities to promote healthy populations of wildlife around the Estuary. Assess and guide management of terrestrial nuisance species with access to shoreline habitats that prey on threatened and endangered species.*
11	**Develop processes for increasing carbon sequestration through wetland restoration, creation, and management**	*Sequester carbon in wetland restoration, enhancement, and creation projects to reverse subsidence of agricultural lands, reduce greenhouse gases in the atmosphere, and advance scientific understanding of carbon sequestration. Focus near-term projects in more subsided locations on conversion to managed wetlands and in less subsided locations on conversion to tidal wetlands.*
12	**Restore watershed connections to the Estuary to improve habitat, flood protection, and water quality**	*Plan and implement multi-benefit projects that connect watersheds to the Estuary and enhance habitats, natural processes, and ecosystem services. Integrated projects should be able to provide more than one benefit.*
13	**Manage sediment on a regional scale and advance beneficial reuse**	*Manage sediment on a watershed and regional scale to enhance Estuary habitats and shoreline flood protection efforts. Assess and harness natural processes and human activities that move sediment (such as dredging, erosion control, and construction) to optimize opportunities for restoration and adaptation to sea level rise.*
14	**Demonstrate how natural habitats and nature-based shoreline infrastructure can provide increased resiliency to changes in the Estuary environment**	*Promote projects that demonstrate how tidal habitats, oyster beds, habitat levees, restored beaches, and other natural and nature-based features of Estuary shorelines can make the region more resilient to rising sea level, drought, water pollution, and other future stresses. Identify locations where these kinds of features can provide the most benefits.*
15	**Advance natural resource protection while increasing resiliency of shoreline communities in the Bay Area**	*Protect natural resources such as estuarine habitats and wildlife as an integral part of any effort to increase the resilience of shoreline communities at risk from flooding and rising seas.*
16	**Integrate natural resource protection into state and local government hazard mitigation, response, and recovery planning**	*Provide technical support and resources to local governments so they can better protect and support the value of natural resources in resilience and hazard planning.*

ACTION		DESCRIPTION
17	**Improve regulatory review, permitting, and monitoring processes for multi-benefit climate adaptation projects**	*Improve and update regulatory processes to facilitate innovative multi-benefit climate adaptation projects such as new approaches to integrated flood management, shoreline alteration, sediment disposal, and habitat restoration. Support and assist existing efforts to address permitting challenges posed by changing conditions and coordinate permitting to encourage synergies and efficiencies among projects.*
18	**Improve the timing, amount, and duration of freshwater flows critical to Estuary health**	*Inform elected officials and the public about the critical importance of freshwater flows from the watershed through the Estuary. Work with partners and through other CCMP actions to adjust the timing and amount of freshwater flows through the Delta and San Francisco Bay to better support all public trust uses.*
19	**Develop long-term drought plans**	*Incorporate planning for long-term droughts of at least five years duration into all levels of water supply planning. Document efforts that will help sustain the Estuary through future extended droughts.*
20	**Increase regional agricultural water use efficiency**	*Assess opportunities to expand implementation of agricultural water use efficiency practices in the region. With partners, promote modification of small, private water storage methods with the intent of reducing direct instream diversions, promoting groundwater recharge, and providing greater water supply reliability for Bay and Delta farmers.*
21	**Reduce water use for landscaping around the Estuary**	*Facilitate more efficient use of water, whether recycled or potable, on landscaping. Collaborate with municipalities, water supply agencies, land use agencies, and others to reduce overall water use on landscaping. Create standards for measuring progress regionwide.*
22	**Expand the use of recycled water**	*Work with water agencies, municipalities, and stakeholders to reduce barriers to the broader use of recycled water. Encourage the use of the right water at the right time and in the right place.*
23	**Integrate water into the updated Plan Bay Area and other regional planning efforts**	*Expand the focus of the Plan Bay Area update to incorporate a full range of issues related to water and San Francisco Bay. Incorporate water related issues in other regional planning efforts related to transportation, housing, and greenhouse gas reduction.*
24	**Manage stormwater with low impact development and green infrastructure**	*Implement green infrastructure (GI) and low impact development (LID) to reduce pollution from stormwater runoff into the Estuary. Develop planning and tracking tools, technical materials, policy recommendations, and financing strategy guidance to aid local and regional public agencies with implementation.*
25	**Address emerging contaminants**	*Advance the existing regional management strategy for contaminants of emerging concern (CECs), action plans for specific CECs, and the associated Regional Monitoring Program (RMP) CECs monitoring strategy.*
26	**Decrease raw sewage discharges into the Estuary**	*Reduce the input of raw sewage into the Estuary by supporting and expanding sewer lateral repair programs and developing resources for marinas and recreational boaters to better manage sewage discharge. Create a mobile application for boaters to find pumpout stations and report repair needs.*
27	**Implement Total Maximum Daily Load projects in the Estuary, including projects to reduce mercury, methylmercury, pesticides, and areas of low dissolved oxygen**	*Develop and fund projects to reduce mercury loads from the Guadalupe watershed into San Francisco Bay. Reduce pesticide impacts to the region's urban streams. Explore opportunities to manage low dissolved oxygen and methyl-mercury in Suisun Marsh.*
28	**Advance nutrient management in the Estuary**	*Support water quality investigations, consistent monitoring and modeling, and analysis of management alternatives for nutrients.*
29	**Engage the scientific community in efforts to improve baseline monitoring of ocean acidification and hypoxia effects in the Estuary**	*Research and monitor the potential threats to the Estuary of ocean acidification and hypoxia.*
30	**Reduce trash input into the Estuary**	*Assist regional municipalities and agencies in attaining trash reduction objectives by assisting in source reduction activities, such as extended producer responsibility strategies that can reduce trash before it reaches the Estuary, and by highlighting trash reduction rates in the State of the Estuary Report.*
31	**Foster support for resource protection and restoration by providing Estuary-oriented public access and recreational opportunities compatible with wildlife**	*Provide Estuary-oriented public access and recreational opportunities that avoid or minimize adverse impacts to sensitive habitats and wildlife while accommodating environmental education, biking, hiking, paddling, wildlife viewing, and other activities.*
32	**Champion and implement the CCMP**	*Educate partners, stakeholders, national, local, and regional leaders, and other targeted audiences about the CCMP and engage them in advancing its goals, objectives, and actions. Provide local decision makers and the public with the kind of reliable information necessary to make policy and personal decisions in favor of Estuary health.*

on regional efforts to reduce mercury, PCBs, pesticides, trash, and the suffocating effects of hypoxia on aquatic organisms, and to curb direct sewage discharges. Spearhead new initiatives to better manage alarming new challenges, whether it's algae blooms, toxins in Dungeness crab, or pharmaceuticals in our wastewater.

- Keep pushing to solve the thornier challenges, like how to trap carbon in wetlands to reduce the green-house effect or reuse bay bottom sediments to raise the elevations of shorelines drowning under rising seas. Even thornier, keep pushing to make resilient land use planning practices more pervasive, retreating from floodplains and eroding cliffs, and greening grey pavements throughout our cities so they can better filter runoff and pollutants.
- And keep the public in the loop about why they should care about all these things, and what their tax-dollars are doing to keep our Bay and Delta healthy, and how they can help champion protection of the shore-line trails and parks that everyone has come to associate with the quality of life around the San Francisco Estuary.

ESTUARY BLUEPRINT ON THE WEB

The entire 76-page plan, as well as related informational materials and progress updates, can be found at www.sfestuary.org/ccmp

On the website or in the plan, you will find:

- Description of four goals, 10 objectives, and 32 actions. Each action includes tasks, milestones, background, and a list of owners and collaborating partners.
- Analysis of how the CCMP relates to State of the Estuary 2015 indicators.
- Analysis of how CCMP actions support sensitive species.
- Tools for tracking environmental outcomes and CCMP implementa-tion progress.
- Analysis of funding required to implement the CCMP.

QUESTIONS?

Heidi Nutters at:
heidi.nutters@sfestuary.org

The San Francisco Estuary Partnership was established more than 25 years ago by the State of California and the U.S. Environmental Protection Agency to prepare and implement a plan to better protect and restore the Estuary. Today, the Partnership manages over $100 million in regional restoration, water quality and climate resiliency projects. The Partnership is one of 28 National Estuary Programs across the country. The Estuary Partnership's host entity is the Association of Bay Area Governments.

San Francisco Estuary Partnership
1515 Clay Street, 14th Floor
Oakland, CA 94612

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CCMP Summary Version 1; 9/19/16

F O L L O W - U P

Three Times More Groundwater?

When Robert Jackson looked for groundwater in the Central Valley, he expected to find more than we knew about—but he didn't expect to find nearly three times more. "I was surprised by how much there was," says Jackson, a Stanford water expert who reported his findings in July in PNAS (*Proceedings of the National Academy of Sciences*).

The region's last comprehensive groundwater estimate was in 1991, when the USGS put it at 830 million acre-feet. But they only went to a depth of 1,000 feet. Jackson used data from oil and natural gas wells to go far deeper—10,000 feet—and found 2.2 billion acre-feet of freshwater, mostly in the shallowest few thousand feet.

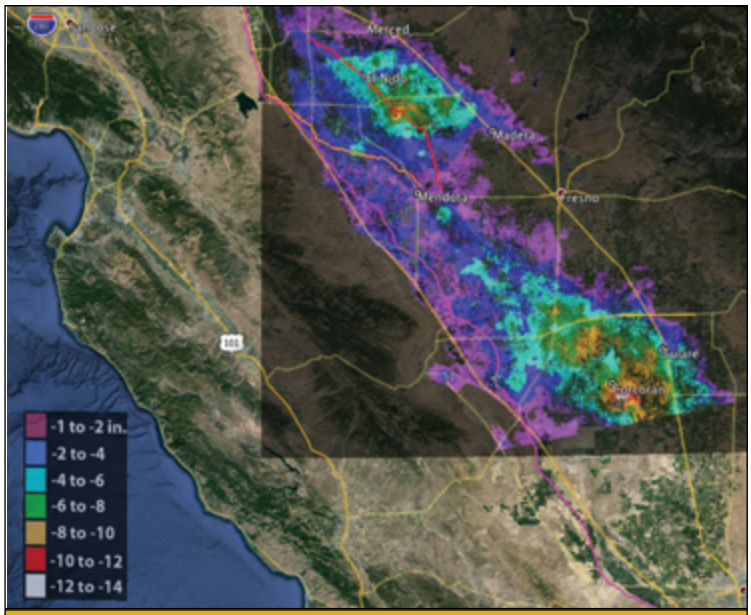
Jackson points out that freshwater does not necessarily mean drinking water. "Most of the freshwater we identified is not tap-ready," he says. "But it's close." In California, freshwater is defined as having less than 3,000 milligrams of salt per liter, while tap water has less than 1,000. "You can taste the difference," he adds.

Another consideration is that the deeper the groundwater, the more it costs to pump. "There's a saying in the water world: There's never a shortage of water—there are oceans of it—only a shortage of cheap water," says UC Davis Center for Watershed Sciences director Jay Lund. In the June 2014 *ESTUARY News* story *Running our Groundwater Dry*, Lund estimated that roughly 150 million acre-feet of groundwater were accessible by pumps statewide.

That said, some Central Valley cities already pump water from 1,500 feet deep and Jackson can envision a future when people pump from 3,000 feet. But he also urges caution: "You don't want to rush out and pump deep groundwater because it could cause subsidence; the most vulnerable places have thick clay layers and when you pull water out, they squish together." According to NASA, parts of the Central Valley sank more than a foot in 2014.

The water Jackson discovered is also at risk of contamination from fossil fuel extraction. "California is unusual — it has deep groundwater, and shallow oil and gas," he says. "We need to safeguard our deep groundwater." **RM**

MORE?
www.pnas.org/content/113/28/7768.abstract



Total subsidence in California's San Joaquin Valley for the period May 3, 2014 to Jan. 22, 2015 Source: NASA

R E C Y C L I N G

Purple Pipe to Wetlands Will Flow Soon

Recycled water isn't just for golf courses and business parks. As *ESTUARY News* reported in June 2014 (*Sonoma Water Trumps Cash*), the Sonoma County Water Agency demonstrated the potential of using treated wastewater for wetland restoration by building a $10 million pipeline linking the Sonoma Valley County Sanitation District plant to the Napa-Sonoma Salt Marsh, seven miles away. It was, and still is, the only of its kind in the Bay Area.

The idea is simple: use the tertiary-treated recycled water — safe for a range of applications from toilet flushing to farm irrigation — to reduce salinity and support gradual habitat restoration in two former salt ponds at the north end of San Pablo Bay. The ponds, which cover 640 acres and were used by Cargill through the early 1990s, will receive 1,700 acre-feet of water per year for roughly a decade.

Nearly three years after completion of the pipeline, however, restoration work has yet to launch in earnest, says the water agency's principal engineer Kevin Booker. The U.S. Army Corps of Engineers finished constructing a mixing chamber for diluting bittern, a residue of salt production, earlier this year. Next came final testing of pond plumbing and infrastructure, Booker says. Today workers continue to fine-tune the programming of a couple critical valves.

Full start-up of the system may not be far off, at which point the California Department of Fish and Wildlife will inherit the project and the eight-to-ten-year timeline will officially begin. In the meantime, recycled water continues to catch on: another wetland restoration project using partially treated wastewater is in planning stages at Bel Marin Keys in Novato, says the Sonoma County Water Agency's general manager Grant Davis. **NS**

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TEACHABLE MOMENTS

GUEST COLUMNIST:
MARILYN BROWNING VOGEL, PROFESSOR, DIABLO VALLEY COLLEGE

The Ocean 102 lab at Diablo Valley College in Pleasant Hill is a proper marine biological laboratory. It smells faintly of seaweed and formaldehyde, while fearsome, plastic versions of marine predators (sharks that happen to squeak) hang from the ceiling. A somewhat functional soldering iron sits on the counter in the supply room next to an open box of Girl Scout cookies. The Peterson benthic grab, a heavy jaw-like affair attached to a long rope sits in the supply room. Pity the TA who has forgotten to rinse it off since its last use at the various shoreline localities where Ocean 102 lab sections collect samples. As its name suggests, the Peterson benthic grab grabs the benthic, the benthic being the mud, rock and organisms that make up the bay floor. The benthic grab collects a known surface area of the sediment and allows oceanography students (or the marine scientists they hope to become) to tally the type and number of organisms found in that particular patch. After rinsing off the mud, Ocean 102 students will pluck out various species of worms, shrimp and clams that live on the bottom of the Bay, and mark them down on official laboratory tally sheets.

Nearly every semester, after sampling bay mud from Berkeley to Pittsburg, Ocean 102 students discover an astonishing surfeit of a tiny clam known as *Potamocorbula Amurensis*. One of the clam's shells tends to be larger than the other, making it easy to identify according to its informal name, the 'overbite clam'. Back in the lab, students will spend many hours assembling little piles of *Potamocorbula* shells, and learning the lessons it has to teach about how estuarine ecosystems work.

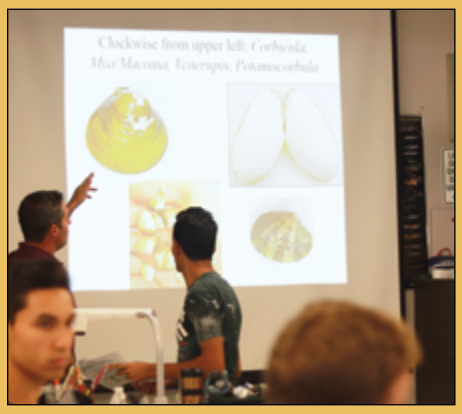
Dr. John Freytag is a professor of biology and director of the Diablo Valley College oceanography program. Dressed in flip-flops and a faded blue shirt, he is a proper marine biologist, on whom falls the task of turning *Potamocorbula* into a teachable moment. "With the sampling we do, it's an interesting opportunity to look at snapshots of what's happening in the Bay throughout the year, and we see fluctuations. There will be times particularly in the spring where we see a lot of dead or empty shells. If huge amounts of fresh water were allowed to flow through the Bay, it would effectively push *Potamocorbula* further west, because it can't tolerate the fresh waters."

Potamcorbula's remarkable abundance is also a teachable moment about invasive species and community science. The clam arrived in the Bay sometime around 1986 as floating larvae in the ballast water of cargo ships arriving from Asia. (*Potamocorbula* is also referred to as the 'Asian clam'.) The organism can tolerate a wide range of salinities and makes strident incursions deep into the Bay Delta, especially during times of drought, when freshwater outflows are absent.

"Some of the species that arrive in ballast water prove to be devastating," Freytag explains to his students. "The estuary here is considered to be the most highly invaded estuary in the world, which is not a title you want to hold."

Like many sessile, benthic organisms, *Potamocorbula* is a filter feeder, meaning that it sucks in water and harvests plankton caught in the intake. Due to its abundance, scientists estimate that *Potamocorbula* can currently filter feed on a volume of water equal the entire volume Suisun Bay, in one day. As it vacuums up the plankton that form the base of the food web, the clam has decimated native fish populations and changed some of the most basic characteristics of the bay ecosystem, ranging from the structure of the food web to the color and clarity of the water.

While its name is a mouthful, *Potamocorbula* is unfortunately inedible, even for many non-human consumers. Sturgeon feed on the clam but scientists have found that it can pass straight through the sturgeon digestive track, alive and well, landing wherever the tides or alimentary elimination will carry it. The clam does serve as a food source for ducks and even the native dungeness crab, which use the lip of the clam's overbite to pry it apart.



The clam itself can eat a wider range of planktonic organisms than scientists had previously believed possible. In addition filtering microscopic algae out of the water column, *Potoamocorbula* also feeds on bacteria and tiny crustaceans known as copepods. A study in 1991 found that *Potamocorbula* had reduced populations of the three most common types of copepods by as much as 53-91%, and could consume as much at 8% of the juvenile population per day. It's nothing personal, *Potamocorbula* also eats its own larvae, but not in quantities sufficient to overcome its ability to lay 45,000 – 220,000 eggs during a given breeding season, or as in the case of a drought, continuously throughout the year.

As Ocean 102 students tally their shells and learn about plankton, food webs and invasives, they seldom appreciate the historical role their laboratory course has played in the *Potamocorbula* saga. Dr. Bill Stevenson founded the Diablo Valley College Oceanography program and orchestrated its first training cruises in 1974. Later joined by his partner Dianna Matthias, Stevenson oversaw the lab sections and students that discovered some of the first *Potamocorbula* specimens ever observed in the

continued to back page

F O L L O W - U P

Evolving Standards, Experimental Treatments

Treating ships' ballast water before it's discharged into local waters is a front-line defense against invasive marine organisms hitchhiking to the Bay from other ports, as reported in *ESTUARY News* in August 2012 (*Taking the Measure of Ships' Ballast*). It's an evolving field, with multiple international, federal, and state discharge standards, competing treatment technologies, and controversy over shipboard versus shore-based treatment. A bill pending in Congress threatens to further roil the waters.

Four years ago, the US Coast Guard adopted treatment standards proposed by the International Maritime Organization; the US has not ratified the IMO's ballast water convention, however. According to Nicole Dobroski of the California State Lands Commission, the convention would enter into force if Panama, a major player in international shipping, signs on. More recently, the US Environmental Protection Agency implemented its Vessel General Permit with numeric standards aligned with the Coast Guard's. The two federal agencies have different approaches to implementation. California's standards are more stringent; some doubt they can be achieved or verified with the existing technology.

The California Maritime Academy's training ship *Golden Bear*, a familiar sight to drivers crossing the Carquinez Bridge, became a Coast Guard-approved floating test facility for ballast water management systems a few years ago. Dobroski says many of the systems being tested on the ship use ultraviolet radiation and electrochlorination (chlorine plus electric charges) to kill or disable ballast-water organisms, but other treatments are in the mix. None have received Coast Guard approval yet. "There will probably be a suite of final technologies, depending on the type of vessel, amount of ballast, and other factors," says the San Francisco Estuary Partnership's Karen McDowell.

To address the shipboard versus shore-based issue, the State Lands Commission is funding a feasibility study of shore-based ballast water treatment by Seattle-based Glosten Associates, managed by the Delta Stewardship Council. The study involves three public meetings, the most recent on August 30 in Long Beach. One option on the table is possible treatment of ballast water blended with municipal wastewater at an existing facility. Barges might also be used as treatment facilities.

In Congress, the Vessel Incidental Discharge Act, introduced by Senator Marco Rubio (R-FL), has been attached as a rider to the House version of the National Defense Authorization Act. VIDA would give the Coast Guard sole regulatory authority over ballast water discharge, removing the EPA's jurisdiction. The act is supported by the shipping industry, opposed by the governors of eight states (including California), several state Attorneys General, and environmental, fisheries, and tribal groups. Critics charge it would preempt state treatment standards and exempt some vessel categories from regulation. **JE**

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Golden Bear: www.csum.edu/web/gbf/home

Shore-based treatment study: deltacouncil.ca.gov/event-detail/13565

Mussel sniffing dog inspects boat hull (see sidebar article). Photo: CDFW

M U S S E L S

Too Close for Comfort

Since 2007, California has been on high alert for invasive zebra and quagga mussels, as reported in *ESTUARY News* in August 2012 (*Frontline Invaders*). Introduced from Eastern Europe via the Great Lakes, these small mollusks can be a big headache in freshwater streams and reservoirs where they outcompete native organisms, accumulate pollutants, and clog water infrastructure. Both species can survive out of water long enough to hitch rides on boats.

The mussels' low salinity tolerance has kept them out of the San Francisco Estuary so far; the US Fish and Wildlife Service has a Bay-Delta Rapid Response Plan, just in case. California authorities have responded with boater education campaigns ("Don't move a mussel") and deployed 12 mussel-sniffing dogs. New regulations empower the state Department of Fish and Wildlife to quarantine mussel-infested boats and impose penalties for quarantine violations, unauthorized possession of mussels, and failure to implement control and monitoring plans in affected water bodies.

Quaggas have been detected in multiple locations along the Colorado River and in reservoirs on the south coast, as far north as Ventura County's Lake Piru. They've cost Southern California's Metropolitan Water District millions of dollars in structural damage and added maintenance expenses to date.

The zebra mussel's only outpost west of the Rockies is San Justo Reservoir, a Central Valley Project storage facility in San Benito County where its presence was confirmed in 2008. That's a long ride for even the hardy zebra, but state Fish & Wildlife's Martha Volkoff says accidental transport could have been possible, especially in winter.

The reservoir has been closed to recreational use while an eradication plan is developed. The US Bureau of Reclamation, San Justo's owner, proposes killing the mussels with potash (potassium chloride), a treatment considered environmentally benign.

continued to back page

F O L L O W - U P

The Creek That Thinks it Can but Still Can't

Any attempt to restore natural functions or healthy steelhead habitat to a stream and watershed as large as Alameda Creek seems bound to fall short. As reported in *ESTUARY News* in September 2014 *(Alameda Work Trickles On)*, over the last couple of decades many have sought to tweak the creek's plumbing so it's better able to support fish, absorb floods, and supply water to local communities. But progress continues to be slow, not to mention frustrating for those with big plans who see little action.

March 2016 attempt to rescure steelhead in lower Alameda Creek. Photo: Alameda Creek Alliance

Upstream, the Alameda County Resource Conservation District continues to battle flood flows and erosion through Niles Canyon with rock weirs and bioengineering in Arroyo de La Laguna. Weirs installed 5-10 years ago as "band-aids" are still holding up well, according to RCD biologist Leslie Koenig, "Granted we haven't had significant storm flows but so far the projects are still going strong." Koenig also continues to chip away at a plan to prioritize areas of the stream for restoration and tie them to upstream low-impact development and stormwater retention projects in the Livermore Valley.

In the Valley, Zone 7 Water Agency recently got a $500,000 River Parkways Program grant to construct an innovative floodplain and riparian forest restoration project on Arroyo Mocho in 2018. Though other parts of the floodplain have been paved over or confined by suburban development, this reach is a rarity where a wider corridor of open space remains adjacent to a natural creek setting. The plan is to create a "floodable" park with a trail, as well as to enhance streamside shading, instream habitat complexity, and groundwater recharge. According to Zone 7's Elke Rank, the project is not "a one-and-done" solution for the Valley, but rather is one of many addressing regional flooding, stormwater, and sediment management issues.

In other areas upstream and tributary to the Alameda Creek, some improvements have been made for fish passage and steelhead habitat over the past two years. Alameda County succeeded in installing baffles in a culvert under Palomares Road along Stonybrook Creek to allow trout migration through the culvert. They also removed a boulder jam and regraded the creek channel above the culvert. This fall, they will replace a second culvert with a free-span bridge to provide fish passage. "These projects will also reduce the risk of flooding for landowners along Stonybrook Creek," says Jeff Miller of the Alameda Creek Alliance.

On San Francisco Public Utilities Commission (SFPUC) lands in the southern watershed, the Alameda Creek Diversion Dam fish improvements project is under construction, which will result in a fish ladder and screened diversion next year.

Downstream, most of the projects to help steelhead over barriers and around dams, and to slow flows and cool water temperatures, are still inching through design, construction, and permitting processes. The Alameda County Water District recently drafted a negative environmental impact declaration for a pair of fish ladders, including an ambitious one past a rubber dam and the BART wier, as well as for a set of fish screens at the last unscreened diversion point in lower Alameda Creek. Construction of the upper and lower fish ladders is currently scheduled to begin in 2018 and 2019 respectively.

In another bottleneck area for fish on Alameda Creek in the Sunol Valley, PG&E is moving forward with a project to lower a natural gas pipeline currently protected by a concrete mat starting in the summer of 2017. Efforts here to improve fish passage are being coordinated with the SFPUC and the gravel quarry operator.

At the bottom of Alameda Creek, where a major flood control channel continues to collect sediment and require expensive dredging to maintain flood capacity, designs for a more sustainable channel are progressing. "The cost estimate came in at $70 million, which is too much for us to handle alone," says the Alameda County Flood Control District's Rohin Saleh. "We're in ongoing discussions with the US Army Corps about a joint project." The district didn't want to wait too long to get started, however. "We are in the process of going forward with the notches in our hard concrete structures in the channel, in conjunction with a little dredging, in the hopes that more flows and natural morphological processes will take over and begin to reshape the channel. If we get all our environmental clearances we hope to begin the actual construction next year"

At the mouth of Alameda Creek in the South Bay Salt Pond Restoration Project, officials will soon release a draft EIS/EIR for the next phase of the Eden Landing area. Here a priority is to develop more exchange of water and sediment between the creek, the wetlands, and the Bay. "It is all one system, and we want to restore those connections that have been lost," says restoration director John Bourgeois.

ARO

F O L L O W - U P

Slogging Away on Skaggs

Almost three years ago, a key piece in the jigsaw puzzle of tidal wetland restoration projects in the North Bay became part of the San Pablo Bay National Wildlife Refuge, as reported in the March 2014 *ESTUARY News (The Island That Came in from the Cold)*. The 1100-acre Haire ranch on Skaggs Island, acquired by the Sonoma Land Trust with assistance from the US Department of Agriculture's Natural Resources Conservation Service, was transferred to the US Fish and Wildlife Service, opening the door for restoration of the whole 4,400-acre island.

The Navy handed over its part of the island, 3,300 acres of former oat farm turned Navy intelligence outpost, to Fish & Wildlife in 2011.

The restoration process is moving slowly. "We're in very preliminary stages of coming up with what we want to do," says refuge manager Don Brubaker. The current timeline involves a hydrodynamic study by Ducks Unlimited and setting up a technical advisory committee. NRCS had committed funding for restoration of the Haire parcel, but that's subject to time constraints and has to be dovetailed with plans for the rest of the island. Brubaker says the parcel tax approved by Bay Area voters as Measure AA may eventually help pay for restoration. **JE**

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Photo: Colin Talcroft ©2011

B U C K L E R

Desist, Fix or Pay

Countering decades of tidal wetland restoration efforts in the San Francisco Estuary, John Sweeney, the new owner of an abandoned duck club property, severed Point Buckler Island's tidal link with the waters of Suisun Bay and drained the island's marshes in the process of developing a high-end kite-sailing resort. As reported in the June 2016 issue of *ESTUARY News (Buckler Brouhaha)*, the unpermitted work destroyed 30 acres of wetland habitat for at-risk fish and wildlife species and prompted enforcement actions by the San Francisco Bay Regional Water Quality Control Board and the Bay Conservation and Development Commission.

After a hearing on August 10, the Regional Board issued a formal Cleanup and Abatement Order. The timeline: Sweeney is required to submit an Interim Corrective Action Plan by November 10, detailing how Point Buckler Island will be prepared for tidal restoration. The plan must address the control of invasive perennial pepperweed and the improvement of soil conditions.

Next, regulators want to see plans for restoration, and for mitigation and monitoring, by February 10, 2017. Noncompliance would result in progressive enforcement. The order also requires Sweeney to reimburse the Board for the cost of overseeing the cleanup and submit annual monitoring reports. The nonprofit San Francisco Baykeeper praised the decision as a "a victory for the Bay's wetlands."

BCDC's cease-and-desist order, carrying a potential $952,000 fine for violations of state law, will be addressed at an enforcement committee session on October 6 and by the full commission on November 17. The Regional Board will hear testimony on a concurrent enforcement action in December. **JE**

MORE? www.waterboards.ca.gov/sanfranciscobay/water_issues/hot_topics/PointBuckler.shtml

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SAN FRANCISCO ESTUARY PARTNERSHIP
www.sfestuary.org

San Francisco Estuary Partnership
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Oakland, CA 94612

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.

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Bird's Eye View

TEACHABLE , *cont'd from page 12*

San Francisco Bay. I spoke with them recently at their home in Martinez. "This was in 1986," he told me. "It was three clams that the kids found that they couldn't identify. It looked like a clam that had an overbite. One shell is bigger than the other. So I put some students on it, said 'Why don't you kids research this?"

Thirty years later, Ocean 102 is still keeping an eye on *Potamocorbula*, along with the US Geological Survey and other agencies. Increased awareness of *Potamocorbula*'s effects helps policy makers protect habitat and endangered species like the Delta smelt. Environmental groups have begun calling for protection plans that manage *Potamocorbula* and other bivalves that threaten the smelt's food supply. New Zealand, a nation known for its innovative approaches to protecting native species, got out in front by issuing a management plan for *Potamocorbula* back in 2001. Perhaps the most hopeful aspect of the *Potamocorbula*'s invasion is how little we know about the organism. The US Geological Survey's Jan Thompson points out that while mechanisms for long distance transport of the bivalve are in place, *Potamocorbula* doesn't seem to have taken to other west coast estuaries. These estuaries enjoy greater volumes and more natural cycles of freshwater flow compared to the San Francisco Estuary.

John Freytag is also optimistic, but as a teacher, that's kind of his job. In Fall 2015, Ocean 102 found *Potamocorbula* as far east as Antioch, but this Spring 2016, the clam was all but absent. *Potamocorbula's* column in the tally sheet for the Martinez pier was blank. Ocean 102 heads out this September to start a new tally.

TOO CLOSE , *cont'd from page 13*

The federal agency is working with the San Benito County Water District to line up funding. Meanwhile, local anglers and boaters are unhappy about losing access to the lake.

San Justo is 46 miles outside of Santa Clara Water District's jurisdiction—too close for comfort. The District partners with Santa Clara County Parks in a boat inspection program. "They've caught vessels with live mussels and prevented them from entering our reservoirs," says Water Quality Manager Bruce Cabral. Monitoring programs for larval and adult mussels are also in place.

A third potential invasive bivalve, the Asian golden mussel, hasn't been spotted in California waters yet. Keep your fingers crossed. **JE**

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POLARIS AUCTION THIS MONTH!

For almost 50 years, the Research Vessel *Polaris* was the workhorse of the US Geological Survey's research program in San Francisco Bay (*ESTUARY NEWS* March 2016: *Bay Belle Retires, Catamaran Carries On*) Built in 1927 as a luxury craft for tycoon Lee Allen Phillips, the *Polaris* helped generations of marine scientists understand the Bay's natural processes and how human impacts affected them. No longer seaworthy, she was replaced last year by the catamaran *David H. Peterson*. Since no maritime museum or other institution was willing to accept the *Polaris*, the vessel will be sold at auction. According to an agency spokesperson, the new owner will not be responsible for the historic preservation of the iconic ship.

AUCTION: www.GSAAuctions.gov

FRIENDS OF THE SAN FRANCISCO ESTUARY

The Partnership's 501(c)3 "friends" group is looking for a few new members for its Board of Directors. Our current focus is our Freshwater Flows Program — informing and motivating elected officials to advocate for sufficient freshwater flows through the Estuary. Friends of the San Francisco Estuary works to improve the health of the estuary and further the goals of the CCMP. If you are interested or would like more information, contact Mitch Avalon, current Chair of the Board at friendsofsfestuary@gmail.com