

San Francisco Estuary Partnership

**Mokelumne's Pitch
for Wild River Flatlines**

Dry Times for Valley Refuges

**New Technique for Identifying
Plankton by Color**

**PCB Levels in Small Fish
Surprise Scientists**

**Alameda Creek Crawls
Toward Fish-Friendly Future**

**Delta Council Finetunes
Habitat Protocols**

SCIENCE • RESTORATION • WATERSHED • POLITICS • SPECIES • BAY

ESTUARY



NEWS

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Plankton Pigments	3
Lavender Invader	4
New Water Atlas	4
Alameda Creek	5
PCBs & Small Fish	6
Valley Refuges	8
Delta Habitats	9
Suspense for Mokelumne	10
Pelican Movie	11

Around the Bay

BIRDS CROWD ROCK VISITORS & VICE VERSA

Managing Alcatraz — once a federal prison, now part of the National Park system—is a delicate balancing act. As an historic site, its cultural resources come first. But the return of colonial seabirds since the prison closure adds another mandate. Alcatraz hosts San Francisco Bay's largest breeding colony of western gulls; its only colonies of Brandt's cormorants, pelagic cormorants, and pigeon guillemots; and rookeries of black-crowned night herons and snowy egrets (see "Seeing Seabirds," *Estuary News*, October 2010.) They're all protected under the Migratory Bird Treaty. Visitors, for their part, would like more access to areas now off-limits because of nesting birds. They've complained about the aggressive gulls, the smell of the seabird colonies, and the flies they attract, and have sometimes flushed the skittish cormorants off nests. The gulls also interfere with reconstruction of the flower beds tended by prisoners and guards' families. In 2005, the Park Service, the Golden Gate Parks Conservancy, and other stakeholders developed a *Bird Conservation and Management Strategy* to address those conflicts. In the spirit of adaptive management, they've gone back to the table for a ten-year review. Watch for an update once the plan has been revised. **JE**

NEW INTERACTIVE MAP DEBUTS FOR FLOODZONE

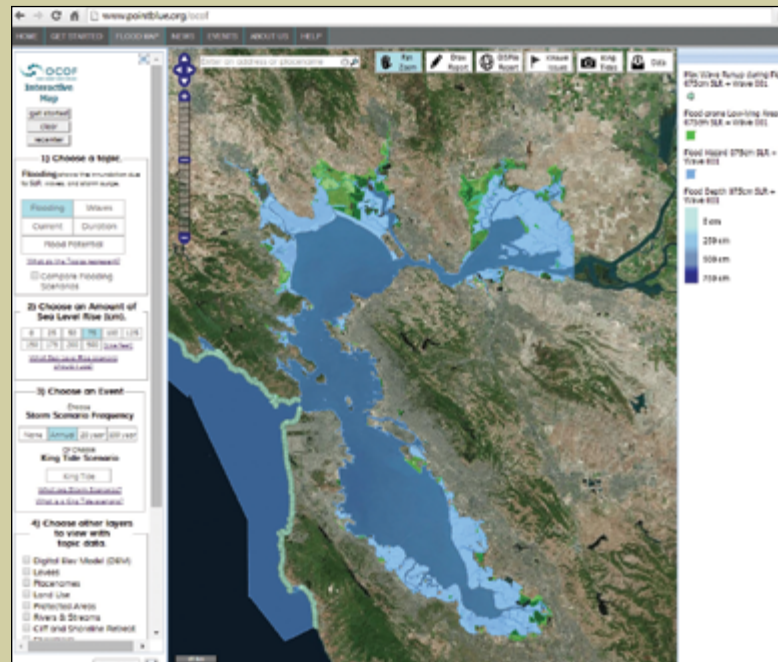
Our Coast, Our Future (OCOF), a collaborative project with many partners designed to help planners and land use managers prepare for rising sea levels and changes in storm patterns, has just added San Francisco Bay data to its online resources (data.prbo.org/apps/ocof). This includes an interactive map of potentially flooded areas, a King Tide scenario for the Bay, and a suite of 40 sea level and storm projections. Workshops and webinars have been scheduled for local users. Coincidentally, the National Oceanic and Atmospheric Administration (NOAA), an OCOF partner, recently listed San Francisco as one of the ten US cities experiencing increased nuisance flooding caused by sea level rise. **JE**

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REDO FOR CCMP — San Francisco Estuary Partnership staff is leading an effort to update the landmark *Comprehensive Conservation and Management Plan*. First approved in 1993, the Plan has resulted in numerous projects and programs that have improved the health of the estuary (see *Estuary News* October 2013). Work now underway will create an update that looks forward to 2050, takes into consideration new ideas and conditions, and emphasizes issues not deeply addressed in past versions, such as climate change and population increase. The new plan will also describe how the Partnership will track progress on priority actions, and be grounded in measures of estuary health laid out in the *2011 State of the Bay Report*. Staff is currently setting committee schedules, drafting workplans, and starting conversations with many organizations, agencies, and individuals about this critical work.



Black-crowned night heron. Photo by Verne Nelson.



Source: OCOF and partners including Point Blue Conservation Science, the US Geological Survey's Pacific Coastal & Marine Science Center, the National Estuarine Research Reserve System, the National Park Service, the Gulf of the Farallones National Marine Sanctuary, and the Bay Area Ecosystems Climate Change Consortium.

REBRANDED RIDGWAY

The California clapper rail, endangered poster child of San Francisco Bay's tidal marshes, is no more. No, it hasn't gone extinct: it's just been rebranded. The American Ornithologists' Union, the ultimate authority on the taxonomy of North American birds, has decided that clapper rails on the Pacific Coast are genetically distinct from Atlantic and Gulf Coast populations and should be classified as a separate species, Ridgway's rail. Research by James Maley and Robb Brumfield of Louisiana State University supports the split (insert your own Abe Lincoln joke here.) The new name honors artist/ornithologist Robert Ridgway, who described the local form in 1874. The species also includes the (former) light-footed clapper rail of the Southern California coast, the Yuma clapper rail of the lower Colorado River's marshes, and three forms that occur only in Mexico. The three found in the United States retain their federal and state endangered status. With their disjunct ranges and sedentary natures, they're unlikely to share genes. Give them a few millennia and who knows—they might qualify as species in their own right. **JE**

SCIENCE

Revealing Plankton Pigments

Keeping tabs on San Francisco Bay's wildlife involves counting plants. That means tracking the relative numbers and types of the microscopic floating plants that feed the Bay. Known as phytoplankton, their number includes diatoms, dinoflagellates, cyanobacteria, and chromophytes, to name a few.

"Some are like the kale of the sea, others are like french fries," says Jim Cloern, a scientist who monitors Bay food webs for the U.S. Geological Survey. Some can also produce toxins, while others cannot. For these reasons, understanding which phytoplankton are in the Bay can help scientists predict booms and busts in fish populations, forecast toxic algal blooms, and warn seafood eaters of potential danger.

"What phytoplankton species are in the Bay has a big economic impact on fisheries, travel, and tourism. For example, you can't allow people to collect mussels during a toxic bloom," says Misty Peacock, a postdoctoral fellow at UC Santa Cruz.

Since 1988, the U.S. Geological Survey has tracked the types of phytoplankton in the Bay by taking water samples at 36 locations from Rio Vista to Alviso. They send two plankton samples from each cruise to a laboratory for microscopic analysis.

Though a tried and true technique, microscopic analysis is also expensive and time-consuming. Technicians must be trained to identify phytoplankton types by sight, and must painstakingly count hundreds of the tiny cells in samples.

Over the past year, Peacock has helped the USGS identify a faster and cheaper plankton-counting method. Known as pigment analysis, this technique deduces which groups are present by identifying their unique photosynthetic pigments. Each pigment reflects different light wavelengths, making them different colors.

While all phytoplankton produce chlorophyll a, each class also produces at least one unique accessory pigment. For example, diatoms are the only phytoplankton that produce

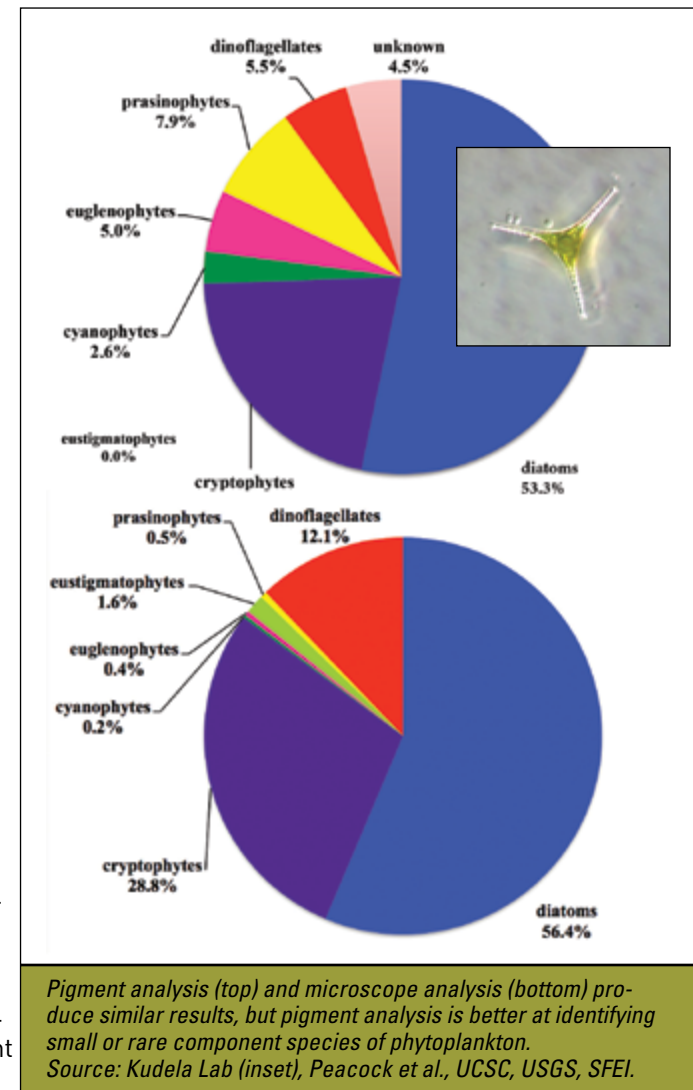
fucoxanthin (brown), while dinoflagellates have a lock on peridinin (brown-gold), and cyanobacteria alone make zeaxanthin (orange).

To obtain samples for pigment analysis, technicians capture phytoplankton in a given volume of Bay water on filter paper — the same process used for microscope analysis. Back at the lab, the plankton are broken up to release their pigments, and suspended in solvent. The solution is then forced through a high performance liquid chromatography, or HPLC column. The column separates the pigments so that each emerges at a different time. As each pigment emerges, a device that analyzes its color detects its presence and records this information as a graph. Each pigment forms a distinctively-shaped peak, and the larger the area under the peak, the more of the pigment is present.

Finding an accessory pigment is like locating a fingerprint at a crime scene. "Even if we didn't see that organism via microscopy but we see their diagnostic pigment in our samples, we know they're still in the water," Peacock says. For this reason, pigment analysis is the method of choice for finding relatively rare and extremely tiny organisms.

The total amount of cells in the sample is determined by analyzing the amount of chlorophyll a present. The proportion of each class of phytoplankton can be determined by the relative amount of its accessory pigment.

Pigment analysis promises to revolutionize our ability to track what's in the Bay at any given time. Because the technique is so economical, the agency can sample up to 15 samples per cruise and obtain a much higher-



Pigment analysis (top) and microscope analysis (bottom) produce similar results, but pigment analysis is better at identifying small or rare component species of phytoplankton. Source: Kudela Lab (inset), Peacock et al., UCSC, USGS, SFEI.

resolution phytoplankton snapshot. Although the technique has been around since the 1990s, Peacock and the USGS are the first to apply it to long-term monitoring in San Francisco Bay.

However, Peacock says, pigment analysis shouldn't replace microscopy but rather should be used alongside it. Pigments alone can't identify a phytoplankton species. That means the technique cannot pinpoint the source of harmful algal blooms, which can suffocate fish and poison everything from pelicans to people.

Yet the technique can guide Bay sampling efforts. "If I saw an increase of cyanobacteria using pigment analysis, I would know it was important to go out and sample more in the Bay. The results can help us decide where the best places to monitor some of these harmful species might be," Peacock says. This would allow scientists to stay on top of an evolving bloom, and alert health authorities accordingly. **KW**

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CONSERVATION

Atlas Pegs Water Prices

In 1979, California produced an atlas for the ages. *The California Water Atlas* used state-of-the-art technologies to produce spectacular maps of runoff and seasonality, stream flows, regional water delivery systems, and water use around the state. A big blue tome roughly the length and height of a couch cushion, the atlas became an instant classic among ecologists and hydrologists alike.

The authors of the atlas — a group that ranged from Governor Jerry Brown, to founder of the *Whole Earth Catalog* Stewart Brand, to California natural resource

director Huey Johnson — had a more radical purpose in mind. They aimed to give the public a better understanding of the state's infamously complex water system.

Thirty years on, most Californians still have only a foggy notion of how water arrives in their taps. Yet it's hard to blame them. The story of California water involves rights that date back to the Mexican ranchos, aqueducts that reach half the length of the state, rivers overdrawn by thirsty farms and cities, and much more.

can outcompete native plants in the high marsh transition zone, reducing habitat value for endangered tidelands species. The good news: control efforts are underway.

Local nurseries once sold both species but they're now off the market. Mistaken for a similar native species, LIRA was accidentally planted at several south bay restoration sites. Like many successful weeds, both invasive sea lavenders are prolific. In a recent article, Boyer and Archbald describe LIRA's seed production as "prodigious" — up to 17,400 from a single plant. Their experimental studies indicate better growth and higher seed output in less saline conditions, suggesting a potential for rapid spread in brackish and freshwater marshes. It's useless as wildlife cover: "It's low-growing," she explains. "It almost looks like an alpine plant." Restoration sites are particularly vulnerable: "They're a clean slate, with no competition. We're concerned for all the restorations that are in progress or coming up."

At Don Edwards San Francisco Bay National Wildlife Refuge, hand removal of LIRA began in 2010. This summer, US Fish & Wildlife Service biologist Rachel Tertes applied herbicides to patches at Coyote Creek before the plants set seed; she's monitoring the results. The San Mateo County Flood Control District is funding eradication projects on mitigation sites, and at least one Invasive Spartina Project staffer is hand-pulling it. **JE**

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SPECIES SPOT

Lavender Lowlife

Invasive *spartina* isn't the only vegetative threat to San Francisco Bay's tidal wetlands. Meet the exotic sea lavenders: attractive little plants, but potentially big trouble (see "Front-line Invaders," *Estuary News*, August 2012.) Two species of *Limonium* native to Mediterranean shores have put down roots here. So far, *L. duriusculum* has been detected only at Strawberry Marsh in Richardson Bay and Guadalcanal Village Wetlands on Mare Island. *L. ramossissimum* subspecies *provinciale* (LIRA for short), on the other hand, is widespread in the Central and South Bay. "It's almost everywhere we look," says Katharyn Boyer of San Francisco State University's Romberg Tiburon Center. She and Gavin Archbald, a restoration ecologist with H. T. Harvey, found it in multiple disturbed and restored sites from the Albany Bulb and San Francisco's Pier 94 down to Greco Island and Coyote Creek Lagoon. LIRA

Now a project known as the New California Water Atlas seeks to make moldering government water information available to everyone. It is transforming columns of arcane data into elegant and intuitive maps accessible online.

"We want to use the tools of the internet to both engage the public but also hopefully make government more transparent and responsive to the citizens they serve," says Laci Videmsky, who leads development of the atlas for the nonprofit Resource Renewal Institute. Not coincidentally, the Institute was founded by Huey Johnson, one of the original atlas authors.

Unlike the original book, which provides a snapshot of two to three years of water conditions, the maps in water atlas 2.0 are always as current as the data available from government agencies.

The new atlas is heir to all the radicalism of its predecessor, this time with a populist twist. Self-described civic hackers do much of the programming out of a sense of public duty and as advocates of open government principles. They use shared, open-source programming platforms to develop apps and websites for community good.

When Videmsky began working on the atlas in 2013, he thought it could be completed in under two years. Then he got a look at his first set of data, on water rights.

"It was definitely an eye opener," Videmsky laughs. "We discovered a lot of water rights are not even in the state's database; they're located on old pieces of parchment in superior court archives in every county, and the state has not gone out and taken note." The atlas project has suggested ways in which the state can use technologies allowing the public to share the data. The state is now beginning to employ some of these new methods.

Another atlas map illustrates how wildly the price of water varies across the state. The data is all crowdsourced. Users can submit information from their water bill and compare costs. The map is the first effort to collect statewide information about the cost of water.

Already the map shows that water users in Los Angeles and parts of Southern California pay far less than more northerly cities, which would seemingly have more abundant water. Why the cost disparity? "We price water not according to scarcity but the infrastructure delivering it to you, so you

continued on back page

CREEKS

Alameda Work Trickles On

Driving down 680 from San Ramon to Pleasanton — with its prettily paved and groomed burbs — you wouldn't guess that this was once a shallow lake and willow marsh. Indeed little trace is left of the vast freshwater swamp called Tulare Lake, just over the East Bay ridges, which once collected all the runoff from Livermore and San Ramon. This marshy ecosystem filtered the rush of water from winter storms so that by the time it exited into the narrows of Arroyo de la Laguna, mingled with Alameda Creek, and spilled into Niles Canyon, it wasn't an unmanageable torrent. But the development of farms and towns on top of this wet spot dramatically changed the hydrology of the northern reach of a vast watershed draining into San Francisco Bay. "When it rains, Niles Canyon gets crazy, there's so much water, so fast," says Tim Ramirez, natural resources manager for the San Francisco Public Utilities Commission, which owns large areas in the watershed.

Of course the loss of the lake happened more than a century ago, and since then throughout Alameda Creek's 700-square-mile watershed dozens of other wet spots have been drained, dams built, creeks buried, and channels reshaped. "The watershed is huge and complex, and all these changes, compounded over time, have left us with a long and arduous path to getting it to function more naturally again. We're going to need the full cooperation of every partner to reach our goals," says Carol Mahoney, a planner for Zone 7 Water Agency out in Livermore.

The creek is the biggest tributary to San Francisco Bay that isn't fed by snowmelt. Its northern sub-watershed is more urbanized while the southern portion is more ranch and recreational open space — but it all comes together in Niles Canyon. Downstream of the canyon, creek waters speed through 12 miles of federal flood control channel — designed to protect Fremont and Newark from high waters caused by rains and tides. In this lower reach there are drinking water intakes, inflatable barriers, steps in the stream called grade control structures, and areas

where sediment collects on the bottom. "It's a big tricky creek that has every kind of problem we face in watershed management statewide somewhere along it. The hopeful thing is that there are only a handful of public agencies responsible for it," says Ramirez.

Over the last couple of decades, many of these agencies, as well as steelhead fans, have sought to tweak the creek's plumbing so it's better able to support fish, absorb floods, and supply water to local communities.

In tributaries upstream of Niles Canyon, the San Francisco PUC recently began a more fish friendly upgrade to Calaveras Dam and is working with the Alameda County Resource Conservation District, Zone 7, and other federal and county partners to address significant bank erosion in places like Arroyo De La Laguna. "It's become this very flashy stream with deep incision during storms — the bank sometimes retreats as much as two feet in one year," says Leslie Koenig, an RCD biologist. With little chance to reconnect with the floodplain, partners have been strategically placing rock weirs in the Arroyo de la Laguna. The weirs divert flows away from banks, slow water velocity, and create back pools for fish. They've also employed some soft bioengineering fixes. "We're doing the best we can to control erosion but if we can't control the hydrology, it's just a band-aid," says Ramirez. Beyond erosion control, slowing down the floods from upstream will also require softening the pavements in Livermore, Pleasanton, Dublin and San Ramon, where remedies such as greener streets and infrastructure are slowly gaining ground.

Downstream there are projects to help steelhead over barriers and around dams, and to slow flows and cool water temperatures. The creek comes out of Niles Canyon into the service area of the Alameda County Water District. Here the district impounds water using inflatable barriers, and then uses it to replenish a groundwater basin where they have local water supply wells. The infusion from the creek helps repel seawater intrusion from the nearby Bay, but the barriers and other in-channel structures are a problem for threatened steelhead migrating through the system. To help juvenile fish on their way back out to the Bay, the district designed a fish screen system for its off-stream diversions. The screens can be rolled in and out of



In 2006 the San Francisco PUC removed Sunol and Niles (pictured) dams from Alameda Creek, alleviating public safety concerns and providing steelhead and other fishes' access to upstream waters. The flood control channel downstream (BART photo) still presents various obstacles to fish. Photos by Brian Sak.

the water on tracks depending on flow levels (see online story for video).

The district is also partnering with public works on a fish ladder so steelhead can get over their middle dam and through flood control structures. "We've made progress but we're not there yet," says the district's Eric Cartwright. "It's complex because it's not a natural channel, it's a flood control channel, with a whole extra layer of permitting."

Along the 12 miles of the flood control channel, the County is also trying to be strategic about improvements. The channel, originally designed by the Army Corps, has to have a very high flood capacity in order to drain such a large watershed. But large channels with wide, flat, sandy bottoms aren't very good for fish. Also sediment keeps collecting in the channel, requiring expensive dredging. The Alameda County Flood Control District found a way around the problem by designing a sustainable low flow channel, and sizing it based on nature and hydrology and sediment transport modeling. "We're helping a naturally formed low flow channel by widening it in some places and making it deeper and steeper in others," says Rohin Saleh, chief hydraulic engineer for the District. The plans he's crafting are designed to flush sediment out faster and reduce water levels during high flood events, as well

continued on back page

CONTAMINANTS

Small Fish Test Helps Target PCB Clean Up

Jay Davis didn't expect much from a pilot test for PCBs in silversides and topsmelt that live on the edges of the San Francisco Bay. The monitoring program he heads only ran the test on these small fish, which rarely grow more than 3-4 inches long, because it was simple to piggyback on an existing study of mercury in the same fish samples. "I thought it wouldn't really be a big deal," says Davis, who is lead scientist for the Bay Regional Monitoring Program (RMP). PCBs, a toxicant linked to cancer, accumulate in fat as bigger creatures eat littler ones, so Davis assumed concentrations would be lower in small fish than in larger sport fish. The pilot study revealed the opposite was true. "This is why we do measurements," he says.

Based on results from pilot tests on samples from six sites, the RMP expanded its testing to 35 sites and confirmed earlier results. Small fish (Mississippi silverside, *Menidia audens* and topsmelt, *Atherinops affinis*) had PCB concentrations up to 1,300 parts per billion — 10 times more than the most contaminated sport fish (including striped bass, *Morone saxatilis*, which have an advisory against eating them and can reach up to two feet long).

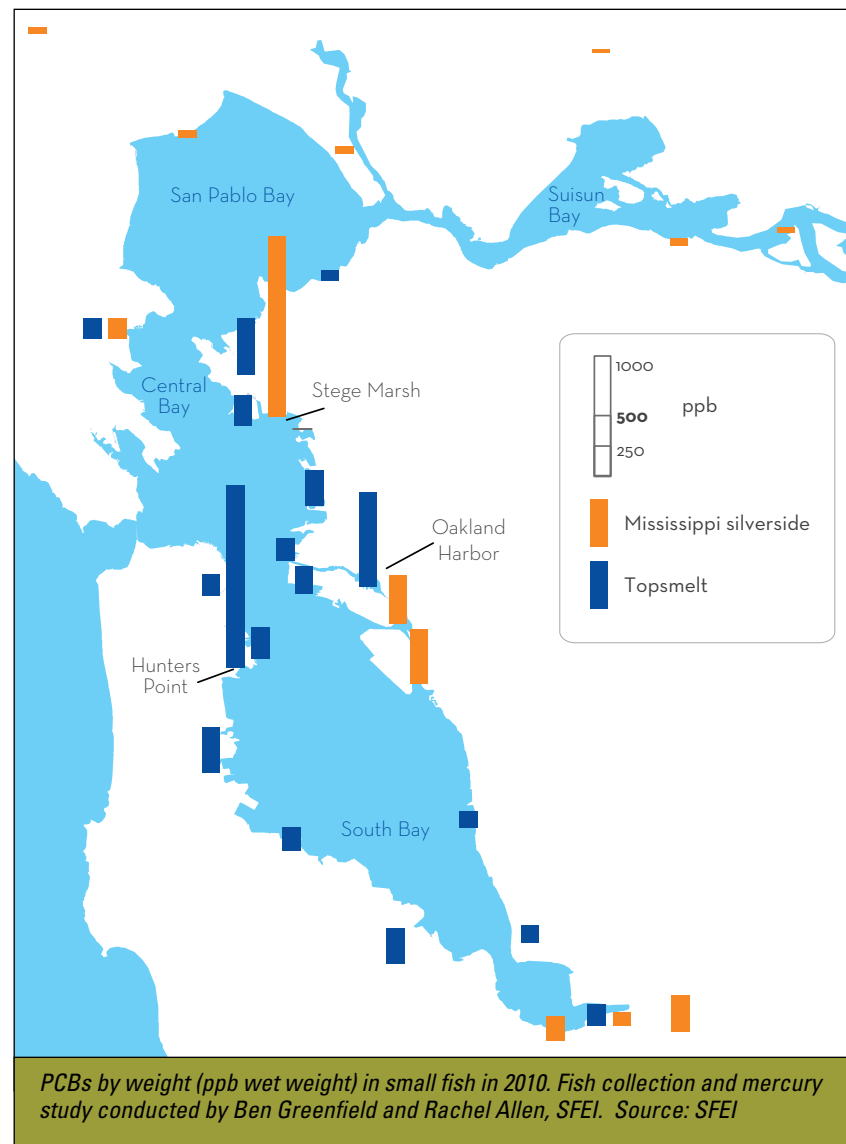
This surprising finding gives us new insights into the ecology of the Bay. "We think this means small fish on the margins are not part of the sport fish food web," Davis says. "Otherwise concentrations in sport fish would be higher." The sport fish food web includes cormorants and seals. These small fish likely belong to a second food web, however, that includes least terns (*Sterna antillarum*) and other fish-

eating species that forage on the edge of the Bay.

While PCBs were banned in 1979, these toxic chemicals are still a problem today. This is partly because they last a long time in the environment, and partly because those in use in the late '70s were grandfathered in and some of these are still in use now, mostly in electrical capacitors and transformers. PCBs stick to soil and hitchhike on sediment that washes into the Bay, forming contaminated hotspots. While much of the PCB-laden sediment migrated downstream in the past, some continues to wash down today from contaminated sites upstream.

The highly contaminated small fish came from known PCB hotspots such as Oakland Harbor and Richmond's Stege Marsh, which is downstream of an electrical yard. Unlike sport fish, which swim the open waters of the Bay and so move in and out of PCB hotspots, small fish on the edges tend to stay in one place. This means small fish in hotspots are continuously exposed.

The newly-discovered link between PCBs and small fish — which is presented in the RMP's recent report on PCBs in the Bay — will help inform management actions and controls. Such actions may derive from initiatives such as watershed planning and implementation of the Total Maximum Daily Load (TMDL) for PCBs regionwide by state water quality regulators. "The current PCBs TMDL is based on a very simple model of the Bay as a big box of uniformly mixed water and sediment," Davis says. "The new report is the basis for a new model that also includes lots of little boxes on the edge."



PCBs build up on the edge because these shallow waters, which are a foot or less deep at the lowest tides, don't mix much with the rest of the Bay. Davis likens the situation to a bathtub ring of hotspots around Bay margins.

"This is where the action is, not only where contaminants come in but also where management can most readily make a difference," says Davis.

Most of the PCBs currently washing into hotspots on the Bay margins likely come from urban runoff or stormwater, which drains into creeks and

channels that feed into the Bay. "PCB levels are quite low in discharges from municipal water treatment plants, which leaves municipal stormwater [as a likely source]," says Janet O'Hara, an engineer at the San Francisco Bay Regional Water Quality Control Board who heads implementation of the PCBs TMDL. "The small fish work gives us more ways to monitor PCBs." Monitoring is key in assessing the success of upstream cleanup efforts.

The RMP's new PCBs report will also inform the upcoming revision of the Municipal Regional Stormwater Permit, which helps implement the PCBs TMDL. "We like the report's emphasis on doing more source control, such as

identifying and cleaning up contaminated properties," says Jonathan Konnan, an engineer at EOA, Inc., an Oakland-based company that helps local governments in the Bay Area manage stormwater pollution. "For example, you can use the history of land use to find likely suspects and follow up by collecting sediment and soil samples in the field."

Identifying and decontaminating upstream PCB sources has the potential to payoff relatively quickly, as clean new sediment covers the contaminated old sediment on the edges of the Bay. Says Davis, "It's conceivable that PCB levels could drop significantly in small fish in less than 10 years." **RM**

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MORE INFO? SFEI PCBs Report www.sfei.org/news_items/pcb-synthesis-report



Darell Slotton and Shaun Ayers drag a bay hot spot for small fish, so they can be tested for mercury, PCBs and other contaminants. Photos courtesy Rachel Allen.

STORM WATER

Newcomb – Not Just LID

Low Impact Development (LID), as it turns out, can have huge impacts on communities. The community around the 1700-block of Newcomb Avenue in San Francisco, for example, no longer floods during storms. And its redevelopment has had myriad unforeseen benefits to local residents.

The project began in 2009. The community began meeting in homes and garages to discuss goals and desired outcomes for their block. By organizing themselves and attending Redevelopment Agency meetings, this small group of San Francisco residents received a Community Challenge Grant to make improvements.

Architecture for Humanity subsequently offered to design the block for residents. Their design featured a traffic calming chicane, streetlights, permeable paving stones, and an array of native gardens and trees. Based on the designs, the Redevelopment Agency, the City of San Francisco, and the USEPA (through a San Francisco Estuary Partnership grant) all contributed funds to pay for the nearly \$1.7 million project.

Though construction ended in 2012 residents continue to meet. The process they went through to win the grant, not to mention the physical changes to their block, created a new sense of community. Sandi Michellotti, a resident on Newcomb, worked hand in hand with her neighbors: "The block is very close now. We go to dinner or out together some evenings, and one neighbor even helped me find a second part time job... We have grown to depend on one another."

Today, Newcomb Avenue no longer floods during storms because the water now has someplace to go other than sheeting across concrete into drains. Instead it filters through 20,891 square feet of permeable surface, 23 new trees, and a plethora of drought tolerant plants.

While professionals speaking of LID normally focus on the benefits of storm water treatment, groundwater recharge, drought tolerant landscaping, and a reduction of sewer flows, the improvements to street-life may be of equal value. The islands of lush green in a sea of grey provide residents with a closer connection to their urban environment by linking it to their natural one. **JM**



Newcomb Street before and after the low impact development project curbing flooding. Photos by San Francisco Planning Department (top) and James Muller (bottom).

DROUGHT

Triage for Valley Refuges

Millions of southbound waterfowl, shrinking water resources: that's the dilemma confronting managers of California's National Wildlife Refuges and State Wildlife Areas faced with monumental drought. So far, San Francisco Bay's wetlands have been minimally affected, although long-term impacts are possible. The crunch is coming in the Sacramento and San Joaquin Valleys, the heart of the Pacific Flyway, where wintering grounds for ducks and geese depend on fresh water deliveries from the Central Valley Project that are subject to across-the-board cutbacks. Biologists anticipate record high numbers this season, and crowded wetlands raise the risk of disease. In the Sacramento Valley, the water needs of rice growers complicate the picture. Some California Department of Fish and Wildlife areas are opening the floodgates now, while water is still available. Elsewhere, US Fish and Wildlife Service planners are developing triage strategies that may limit public access. Beyond hoping El Niño delivers rain, long-term options are unclear.

The Bay's federal wetland refuges — San Pablo Bay in the north, Don Edwards in the south — are lucky. "We have the ocean," says San Pablo Bay refuge manager Don Brubaker. Eric Mruz at Don Edwards also sees little immediate effect. "It's hard to judge how the drought is affecting tidal marsh species, because our monitoring is at such a coarse level," Brubaker adds. Changes in salinity with reduced freshwater flushes may be a problem, and lower sediment loads from upstream may delay the buildup of the marsh plain in restoration sites—"but we're talking about something 70 years out."

It's different in the Valley. San Luis and Merced National Wildlife Refuges rely on CVP water. "We have 65 percent of our normal water allocation," explains Fish and Wildlife outdoor recreation planner Jack Sparks. "In practice, it's actually more like 50 percent." Sparks says his agency has some discretion over where the water goes: "With the reduced supply, we're looking at parts of the refuges that tend to hold water well because of soil conditions and will give us the biggest bang for the buck

for wildlife." The whole grasslands complex, including federal refuges, state wildlife areas, and private hunting preserves, attracts a million ducks and geese in a typical winter. San Joaquin River National Wildlife Refuge alone hosts most of the global population of Aleutian cackling geese, listed as endangered until 2001; restored habitat on the refuge aided their recovery.



Greater white-fronted geese.
Photo by Verne Nelson

In the Sacramento National Wildlife Refuge Complex (Sacramento, Delevan, Colusa and Sutter refuges), triage is also on the table. "Based on a 75 percent allocation for Sacramento, Delevan, and Colusa, we expect not to be able to flood some wetlands this fall," says assistant manager Chris Barr. "Those that will be flooded historically have had the highest quality habitat and best use by wintering waterfowl." Because of its lack of water delivery infrastructure, Sutter may remain dry except for a few units on the outside that can be flooded with purchased water from an irrigation district. That refuge is expected to be closed to hunters, and wildlife viewing opportunities will be limited. At least the complex has a reliable, if curtailed, water supply under existing contracts.

Keeping three million geese and a million ducks fed through a potentially dry winter will be a challenge. "The effect of the drought will be felt later in the season when the birds are getting ready to return to their breeding grounds," Barr continues. "With less food throughout the winter months, they may return in a weaker state"—and produce fewer goslings and ducklings. Refuge managers are also worried about crowding. In a normal year, waterfowl spread out

of the federal and state lands into winter-flooded rice fields. This year, though, fewer acres will be flooded after the rice harvest, concentrating the birds on remaining habitats. FWS plans to monitor the refuges closely for signs of avian botulism and cholera, diseases associated with crowded conditions.

Federal and state agencies are coordinating their response, but there are some differences in their approach. "Our strategy is to flood up early because we have the water allocation available now — use it while we have it," says California Department of Fish and Wildlife spokesperson Jason Holley. State Wildlife Areas in the Sacramento Valley like Gray Lodge and Upper Butte Basin are getting water now, about a month and a half ahead of schedule. Allocations for Gray Lodge will be cut by 25 percent. "We will be employing the most efficient water saving strategies we can that provide the highest benefit to wildlife," CDFW deputy director Dan Yparraguirre stated in a press release.

In a category of its own, the Cosumnes River Preserve is managed by a partnership between federal and state agencies with Ducks Unlimited and The Nature Conservancy. Its 2000 acres of managed wetlands draw 100,000 waterfowl in a typical year. "We'll attempt to flood up all our acreage," says wetlands manager Mariah Brumbaugh, who works for the Bureau of Land Management. In this front-loaded strategy, they've already started flooding but are not taking water from the usual source. The river is already dry; this year's water comes from sloughs feeding the Mokelumne. If the drought continues into next year, some wetland habitat may be converted to upland.

Everyone agrees this is the worst dry spell since the 1970s, with more demand for non-wildlife water uses. "We've been here before," Barr notes. "Our concern is over the long haul — how to plan for increased frequencies of severe drought as a result of climate change and how to be efficient with water management so it will be there for agriculture, fish, wildlife, and other beneficial uses." **JE**

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HABITAT

Defter Delta Restoration

An issue paper endorsed by the Delta Stewardship Council this August seeks to spark progress throughout the myriad stages of habitat restoration. As public and private interests gear up to help endangered fish and migrating birds by restoring habitats in six priority zones of the Delta and Suisun Marsh, this paper lays out tools and concepts for getting the most out of these investments and learning from our mistakes. The paper details steps for achieving effective restoration, reviews barriers such as conflicts with existing land uses and the complexity of permitting processes, and recommends strategies for addressing these challenges. Just 19 pages with well-organized links and numerous tangible examples, it's a smooth overview of ways to organize our thoughts and actions as California embarks on large-scale restoration in the Delta with few pennies, failing species, and ambivalent local landowners.

"We've tried to tease out the Delta Council's role in making restoration more efficient and effective," says the council's Jessica Davenport, who wrote the issue paper. The evolving role seems to be to facilitate the use of best available science and adaptive management, among other things. The Council also wants to help restoration project proponents ensure their proposals are consistent with *Delta Plan* regulations and implement the *Delta Science Plan*. To this end, the Council has been finetuning performance measures and hosting early consultations between regulators and habitat designers. "We want to avoid the kind of sequential redesign that often happens with each permit hoop because it's inefficient," says Davenport.

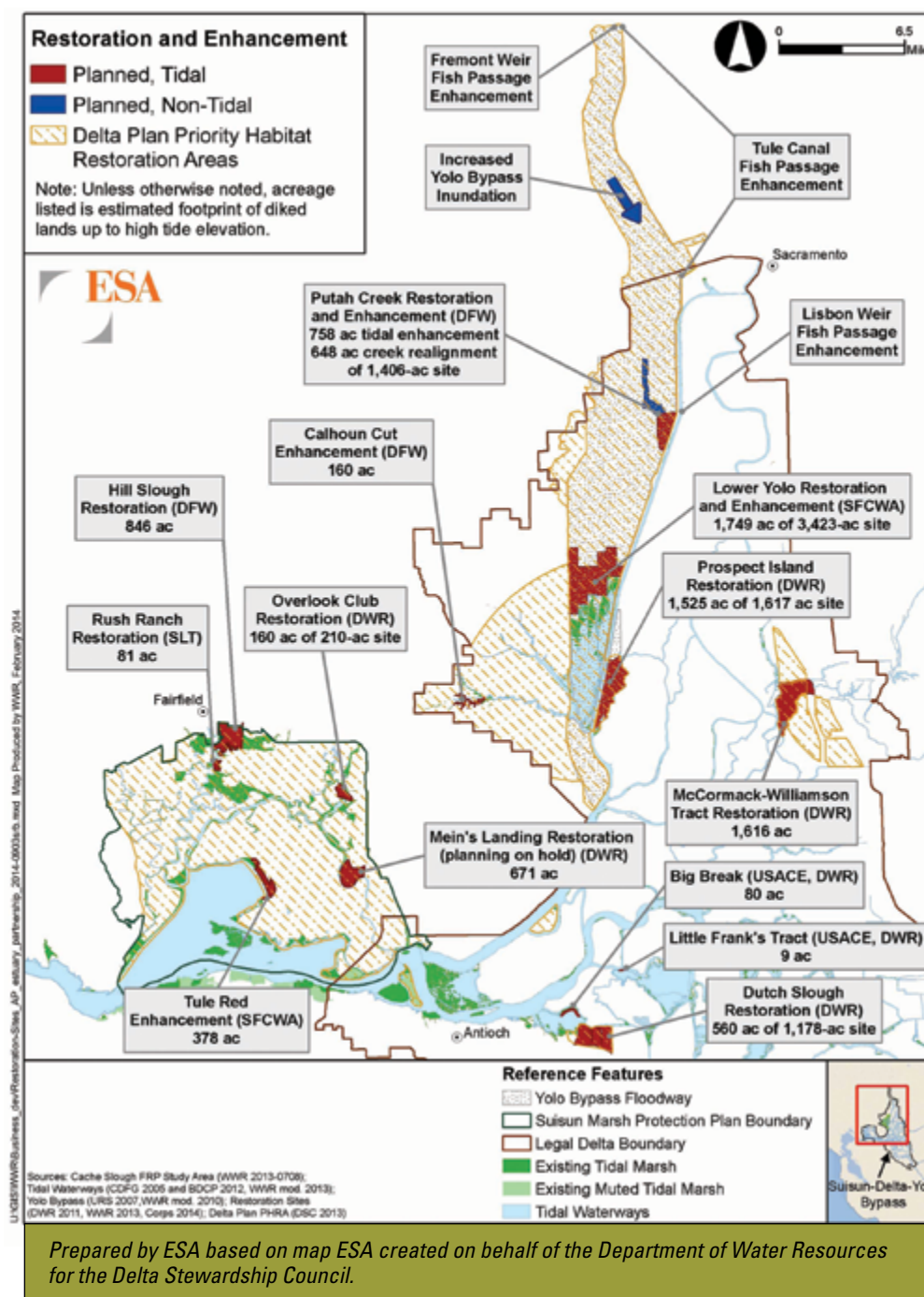
Though scientists today know better what information regulators need to issue permits, the nuances of how to track performance and manage adaptively remain fuzzy. "Everyone wants to do adaptive management and use best available science but we still don't have a good definition of what these are, so science continues to dribble into practice," says ecologist John Wiens, a member of the Delta Council's Independent Science Board from Oregon State University. Reviewing the new issue paper, he thinks it maps out some substantive first steps to addressing the board's recommendations.

Beyond a more systematic approach to using science, the science board also called for stronger local involvement in habitat restoration. Indeed, one problem encountered has been a lack of willing sellers of properties in the priority zones. The paper offers Yolo Bypass as an example of what we need to do more of in the future. The Bypass is a large area that is both farmed and used for flood management. Yolo County recently got state and federal funding to hire UC Davis researchers to evaluate

the impacts of fish habitat restoration proposals on local landowners and the agricultural economy in the area. The funding for science made an enormous difference in the county's ability to coordinate habitat projects while helping their community feel comfortable with restoration proposals. "Projects almost always fail without serious local input," says Petrea Marchand, a consultant for Yolo County. "There's real power in including these types of partners."

The paper highlights how support is building for a single plan for the Yolo Bypass that integrates flood protection, habitat restoration, water supply,

continued on back page



LEGISLATION

Wild River Lands in Suspense File

Remember that chart showing how a bill becomes a law in your high school civics textbook—all those boxes and arrows? Odds are it didn't include the Suspense File of the Assembly Appropriations Committee, a legislative limbo where bills can expire without ever coming to a vote. That was the fate of Senate Bill 1199, a measure introduced by State Senator Loni Hancock (D-Berkeley) in April to add portions of the Mokelumne River to the California Wild and Scenic Rivers System. Supported by Friends of the River, the Foothill Conservancy, and the Calaveras County Board of Supervisors, SB 1199 cleared the Senate in May. In the Assembly, Appropriations Chair Mike Gatto referred the bill to the Suspense File because of its alleged fiscal impact. On August 14, the committee debated and voted on some—but not all—of the 43 bills in suspense. SB 1199 was not among them. And that was the end of the road for this legislative session.

Through a series of dams operated by the East Bay Municipal Utility District (EBMUD), the Mokelumne supplies water to Senator Hancock's constituents and other Alameda and Contra Costa County residents. There are also seven dams and a major diversion point upstream of the section proposed for wild and scenic designation. Protected status for the remaining free-flowing stretches has been on the table since a US Forest Service and Bureau of Land Management study in 1985. The federal Wild and Scenic Rivers System is more protective than the parallel California system. When the climate in Congress dimmed prospects for federal status, river advocates looked to the California legislature. Hancock took action because no Senate or Assembly members from the Sierra foothills were willing to sponsor a bill. 1199 would have protected 37 miles of the North Fork and mainstem Mokelumne, including the three-mile Electric Reach, a Class II+ paddling run.

The bill found broad support in Calaveras, including the Board of Supervisors. Foothill Conservancy director Cecily Smith attributes this to local memories of the damming of the Stanislaus River, which failed to produce the recreational revenue projected by dam proponents: "The dam killed the most popular white-water rafting river in the West. Afterward, the area never recovered the same level of economic activity." The Sierra Club, the Planning and Conservation League, the Sierra Nevada Alliance, Native American tribes,



sport fishing groups, and Calaveras County businesses also signed on in support of the bill. But water agencies in Amador, Calaveras, and San Joaquin counties, participants in the Upper Mokelumne River Water Authority (UMRWA), lined up against it, as did the Amador County supervisors. The Amador Water Agency in particular remained implacably opposed, despite the assurance of proponents that nothing in the bill would interfere with the existing or future rights of foothill water agencies.

EBMUD's position shifted over time, as they seemingly tried to accommodate their upstream partners without alienating the enviros. The district's Board of Directors had previously supported limited protection for the Mokelumne, then voted to oppose Hancock's bill because of language that would have constrained the agency's ability to expand Pardee

Reservoir and what they perceived as a flawed "stakeholder process" that excluded upstream water agencies. When the Pardee issue was resolved by amendment, the board endorsed the measure conditional on further amendments. Their new wish list, detailed in a June 26 letter to Hancock, asked for exclusion of the commercial Roaring Camp Resort from the wild and scenic designation and a commitment that the state would not seek federal wild and scenic status for the river. Then in a July 29 email, EBMUD spokesperson Abby Figueroa wrote: "The amendments we would still like to see are those that would conceptually address the concerns of the UMRWA..." Hancock was prepared to offer amendments if the bill had cleared the Committee.

The circumstances under which 1199 was placed in the Suspense File are unclear. According to the Appropriations Committee's web site, any bill with an annual cost of more than \$150,000 is sent to the Suspense File. Although no fiscal impact had been found for previous Wild and Scenic River bills and the counterpart Senate committee found none for 1199, Assembly Appropriations staff cited "unknown cost pressures" (see online version of this story for more detail). In a post-mortem press release, the enviros state that neither the Department of Water Resources nor the Department of Corrections and Rehabilitation had provided a fiscal analysis to the committee. Smith says the costs estimates came from Jack Gualco, a lobbyist for numerous water agencies including Amador County. Evans charges that the bill's opponents "used a procedural strategy based on bogus fiscal impacts."

When asked why 1199 was not brought up for consideration and what Gualco's role was, Assemblyman Gatto responded by email: "...the bill had substantial costs to the state and its taxpayers, and significant local opposition.... Your sources are inaccurate."

According to Smith: "The Senator's amendments addressed all opponents' concerns except the water agencies' desire to have their projects exempted from review by the Secretary of the Department of Water Resources. The Wild and Scenic Rivers Act requires this review to ensure that proposed projects will not adversely

continued to back page

WILDLIFE

Pelican Dreams

California brown pelicans have not done as well as expected since being removed from the U.S. Endangered Species List in 2009, says marine ornithologist Dan Anderson. This year Anderson reported a breeding failure in Mexico's Gulf of California where 90 percent of pelicans breed. He says a warm water cell brought August-like conditions in April and the pelicans headed north to search of food about six weeks early.

Anderson is one of the scientists in Judy Irving's *Pelican Dreams*, a documentary that premieres at San Francisco's Balboa Theatre on October 24, 2014. Irving had already begun to shoot pelicans before making her award-winning film, *The Wild Parrots of Telegraph Hill*, but didn't have a storyline until a juvenile pelican landed on the roadway of the Golden Gate Bridge and didn't budge until it was removed by security. *Pelican Dreams* follows the rescue, rehabilitation, and release of that pelican, which Irving calls Gigi.

Gigi is cared for at the International Bird Rescue in Fairfield, California. As she swims in the pelican pool, we learn more about pelicans and how they end up there. Many of the adults (those with white and yellow heads) and juveniles (brown heads) are there as a result of injuries caused by fishhooks and fishing line. Some of the juveniles, like Gigi, are malnourished due to a lack of food. It's hard to fish if you're a pelican.

Irving knew from the start that she wanted to capture their athletic feeding dive, the height of which is determined by the depth of the baitfish the pelican is after. In the film a juvenile pelican copies an adult's practiced dive with its aerial half twist, nosedive, and last-minute wing tuck. After slicing into the water they both open their massive two-gallon sized pouches, but the mature pelican gets a fish while the juvenile does not.

In the film, we follow Irving to the Channel Islands, the only place in the United States that California brown pelicans breed today. On the steep and cacti dotted slopes of Santa Barbara Island, Irving shows us mating birds with pouches that blush and eyes that change color from brown to blue. Next

we go to Baja California where Dan Anderson counts breeding pelicans each spring. We also learn how DDT nearly wiped out this ancient species until it was banned and the bird listed as endangered in 1970.

Irving's film about pelicans is more meditative than scientific, more ode than ornithological profile. It's dream-like quality can be traced to a "magical and mysterious" close encounter that Irving had with a pelican in 1998 while filming in a thick fog above Rodeo Lagoon, she says.

Pelicans seen in the Bay Area are either roosting or stopping for a snack



while migrating in their non-breeding range from central Mexico to Vancouver, Canada. Anderson says there's no reason to worry about the population of pelicans at this stage. Low breeding numbers are consistent during

El Niño events, though this year was different. "Birds from sooty shearwaters in New Zealand to pelicans in the Gulf of California showed El Niño-like affects ahead of when El Niño was predicted to set in," he says.

In addition to the film, Irving is producing clips and additional shorts for use in museums, nature centers and education with a grant from the Coastal Conservancy. **AG**

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WATER FRONT

Wooden Ways Weather Well

On May 31st of 2014, the sailing yacht *Freda* trawled the shallows of the Richardson Bay and then returned to dock. While such a minor voyage may not sound like cause for fanfare, hundreds gathered to watch. The event's significance did not lie in modern grandeur, but rather in living history.

Freda was built in Tiburon in the late 19th century by a barkeep with a passion for sailing. Her return to the water makes her the oldest active vessel of her kind on the west coast, and was only possible because of an exhaustive restoration effort that began after she sank in 2004.

Wooden boats like *Freda* are becoming a rarity on the San Francisco Bay. Fortunately, places such as the Spaulding Wooden Boat Center in Sausalito, which spearheaded the restoration, are hard at work preserving the area's longtime association with wooden boat design.

The center's namesake, Myron Spaulding, was an icon in the sailing world. As a foster child, he was compelled to put bread on the table while also pursuing his love of the water.

Trained to play the violin from a young age, Spaulding provided for his family the only way he knew how: Working as a concert violinist.

He might have been a professional musician, but it was through nautical artistry that Myron left his impression. He built his first boat in a high school woodworking class, and, in the 1950s, purchased the land where the Spaulding Center now resides.

Spaulding excelled at building boats suited for the unique conditions of the San Francisco Bay. Some of his original boat designs, such as the Spaulding 33, can still be seen out on the water.

After his death, Spaulding's widow Gladys turned the boatworks over in trust to become a nonprofit dedicated to preserving not only wooden boats, but also the relevant skillsets necessary to build and maintain them. Run mostly by volunteers, the Center leads youth boat building programs and works to instill Myron Spaulding's passion in future generations.

Today, demand for hand-crafted wooden sailboats is on the decline. However, the Spaulding Center remains a bastion of local tradition, ensuring that boats like *Freda* remain the pride of the San Francisco Bay. **MHA**

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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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ATLAS, *continued from page 4*

end up with situations where people in Seattle pay more for water than people in Las Vegas," Videmsky says.

The atlas team soon hopes to launch a groundwater map that would show where aquifers are located and how much water each contains. Once again, the information is incomplete. "The state collects it, drillers have to submit it for regulatory measures, but we are the last state in the West to continue to make that data private," Videmsky says. Making this data public could greatly improve how California manages this hidden resource. "Researchers now only have a two-dimensional perspective. They need this missing underground component to fully understand the hydrodynamics," he adds.

The new atlas is popular with journalists. And other states have contacted the institute about launching water pricing maps of their own—a practice the programmers encourage.

"Hopefully we can use the atlas as an educational tool," Videmsky says, and "as a conversation starter about why these problems exist in the first place." **KW**

ATLAS <http://ca.statewater.org/>

CREEKS, *continued from page 5*

as help fish. "We're close to finding the sweet spot," he says.

At the bottom of the flood control channel, meanwhile, the State Coastal Conservancy is eager to breach levees between the channel and its salt ponds. With more connectivity to the creek and the Bay, the restored ponds may serve as estuarine transitional habitat and nursery grounds for outmigrating steelhead smolts. Add some innovative new levees with broad backsides and the combination could also protect nearby suburbs from storm surges, high tides and sea level rise.

"Making sense of all that is going on along Alameda Creek is like trying to explain quantum physics to a kindergartener. It's a tough subject to tackle," says Mahoney.

ARO

DELTA HABITATS,

continued from page 9

recreation and local sustainability. "If it's successful, it could be a model for other parts of the Delta," says Davenport. **ARO**

SUSPENSE, *continued from page 10*

impact the free-flowing character and extraordinary values that make a river eligible for the Act's special protections." Such an exemption, she adds, would have made the Mokelumne "a Wild and Scenic River in Name Only."

"Protection for the Mokelumne River deserved a straight up and down vote in the Assembly on its merits," says Evans. "The bill's demise, at least for now, is a classic example of politics triumphing over good public policy in the California Legislature."

"I am very disappointed," Hancock commented after 1199's death by suspension. "However, I remain committed to the goals of designating portions of the river as Wild and Scenic and insuring that the East Bay continues to have a source of safe and clean water." It is unclear at this point whether Hancock will reintroduce a Mokelumne bill next year. **JE**

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THERE'S MORE TO THESE THREE

STORIES! To see the extended online versions of the stories on Alameda Creek, Delta Habitat paper, and Mokelumne River click here or go to <http://www.sfestuary.org/estuary-news/>