

San Francisco Estuary Partnership

Paddling the Bay's water trail...

Restoration in a straightjacket
— from canal to meander on
Florida's Kissimmee River...

Currents versus catamaran ...

Back to the future
for the Habitat Goals.



SCIENCE • RESTORATION • WATERSHED • POLITICS • SPECIES • BAY

ESTUARY



NEWS

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IN
BRIEF

COMMUNITY WATER SECURITY

As persistent drought threatens the West, local governments are responding with a tool kit of adaptations. In a report entitled *New Visions, Smart Choices: Western Water Security in a Changing Climate*, the Sausalito-based nonprofit Carpe Diem West highlights the water security strategies of ten communities, from San Diego, California to San Antonio, Texas. In reducing its dependence on Southern California's Metropolitan Water District, San Diego County has scaled down residential water use, brokered transfer agreements with Imperial Valley farmers, and pushed seawater desalination. San Antonio has embraced conservation and reuse, with "purple pipelines" supplying recycled water to industries and golf courses. Other cities have forged watershed-level partnerships with federal agencies and farming and ranching interests. Collaborative ventures in Colorado and New Mexico involve thinning watershed forests considered at risk for catastrophic fires. **JE**

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TRASH STICKS AROUND ON

SEAFLOOR There's no such place as "away." Our trash not only covers a huge patch (twice the size of Texas) of the North Pacific, it's piling up on the deep sea floor. Kyra Schlining of the Monterey Bay Aquarium Research Institute documented the problem by analyzing 18,000 hours of video footage from remotely operated vehicles. This yielded 1,500 observations of deep debris at sites from Vancouver Island to the Gulf of California. Over 1,150 trash items were recorded in Monterey Bay alone. Plastic items accounted for a third of the trash seen; half of those were plastic bags, which pose a choking hazard to sea turtles and other creatures. Metal debris made up almost a quarter. Much of the trash appeared to have come from land, rather than passing ships. Schlining and colleagues found debris more frequently in the depths of the Monterey Submarine Canyon, 6,500 feet below sea level, than in shallower waters. Ironically, she says, the bulk of it could have been recycled. But in the cold, dark, oxygen-poor depths, plastic debris may last for decades. **JE**

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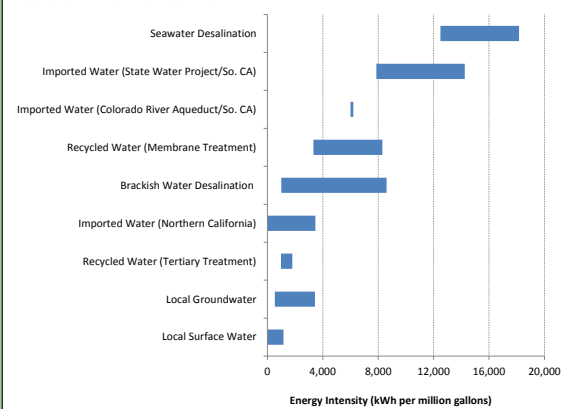
HIGH-RISK ROUTES FOR INVASIONS

A global database of cargo ship movements recently gave three European scientists a clearer picture of how invasive aquatic species disperse through ballast water transport. The international Automatic Identification System provided data on 32,511 ships that visited 1469 ports in 2007 and 2008. Bernd Blasius of Carl von Ossietzky University in Oldenburg, Germany and colleagues, reporting in *Ecology Letters*, say they were able to identify high-risk invasion routes, bio-invasion hot spots, and major source regions for potential invaders. As the San Francisco Estuary Partnership's Karen McDowell notes, predictions from their model agree with local field observations. Among other findings: intermediate trade routes (about 6,000 miles, the distance from San Francisco to Pusan, South Korea or Kobe, Japan) were the most significant vectors for organisms stowed away in ballast tanks. Next, they hope to analyze how new trade routes through the opening ice in the warming Arctic could impact aquatic communities. **JE**

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COMPARISON OF ENERGY INTENSITY OF CALIFORNIA WATER SUPPLIES

SOURCE: PACIFIC INSTITUTE



DESAL HOGS ENERGY Sea water desalination may be part of San Diego's water security portfolio, but it's a two-edged sword in a broader climate-change context. That's the conclusion of the Pacific Institute's new report *Key Issues for Seawater Desalination in California*. Author Heather Cooley says the institute's analysis shows the process is an energy hog. Using 15,000 kilowatt hours of energy per million gallons of water produced, desalination is more energy-intensive than tapping local surface and groundwater sources (up to 3,400 kWh), reusing wastewater

(1,000 to 8,300 kWh), or even relying on State Water Project imports (7,900 to 14,000 kWh.) According to Cooley, banking on desalination would expose water utilities to the risk of rising energy prices, especially in dry years when hydroelectric power is more expensive. Desalination can also increase greenhouse gas emissions, counter to the reductions mandated by California's Global Warming Solutions Act. That could be mitigated by making desalination plants more energy-efficient, powering them with renewable energy, or purchasing carbon offsets. **JE**

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FATE OF HISTORIC PARCEL

With the parcel of land at 900 Innes Avenue up for sale, San Francisco has an opportunity to bridge a gap in the Bay Trail and make the entire India Basin shoreline accessible to the public. The Tenderloin Neighborhood Housing Clinic currently owns the



Photo: Steve Bowles

land, which includes an official city landmark called the Shipwright's Cottage. The cottage is all that's left of a complex where wooden boats were once built. Jack London's *Snark* (the ketch in which he sailed the South Pacific), the sailing scow *Alma*, World War II Victory ships, and other historic vessels came from the India Basin works. Maritime history aside, the site is also known for its current wildlife; seventy-five bird species have been observed in the Basin's restored tidal marsh and mudflat. Working with community groups, the San Francisco Parks Alliance is pushing for city acquisition of 900 Innes for San Francisco's Blue Greenway, a corridor of wetlands and other open spaces from China Basin to Candlestick Point. The Greenway already includes Heron's Head Park, where endangered California clapper rails have nested. According to the Alliance's Matthew O'Grady, "It's critical that San Francisco be as strategic as possible with what little open shoreline we have left, so that the Blue Greenway and this section of the Bay Trail can be part of the community fabric." **JE**

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H Y D R O L O G Y

Bay versus Boats

In light of the two recent crashes, one deadly, much has been made of the relative safety of the new America's Cup boats on the San Francisco Bay. Are the \$10 million catamarans, known by the class name AC72, simply too fast and too light to sail safely under any conditions? Or are local conditions responsible?

The pattern of surface currents on the Bay is uncommonly complex due to the narrow opening of the Golden Gate and the varied geology and bathymetry of the inner Bay, says US Geological Survey coastal geologist Patrick Barnard. "It's never really unidirectional if you go across the west Central Bay," he said. "There's always currents going in the opposite direction" (see graphics).

These currents move swiftly — up to 2.5 meters per second at the mouth of the Bay — and change direction on a dime, making it rare to encounter "slack" water. Where opposing currents converge, he says, sailors can expect choppy water and even eddies. All this is compounded by tidal shifts and the powerful gusty winds blasting through the Golden Gate.

However, it's unclear how much these conditions impact the AC72, especially when it floats over the water on massive hydrofoils at speeds



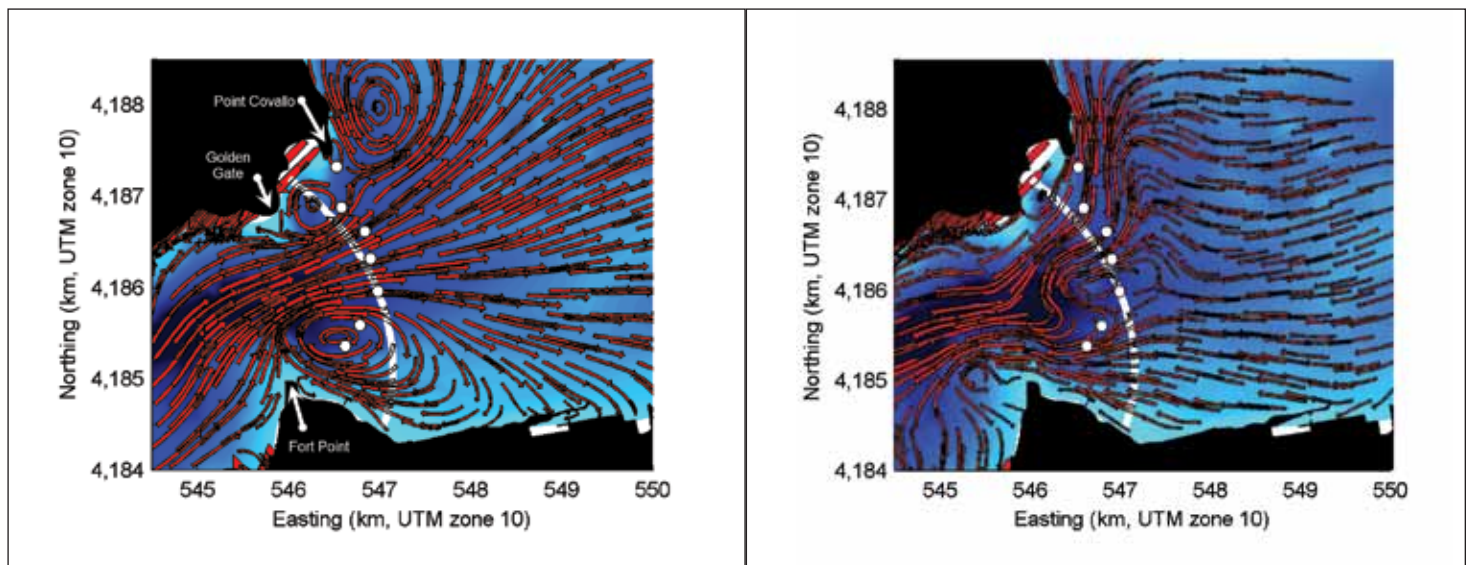
Photo: Guilain Grenier

of up to double the wind speed. John Arndt, of the Marin-based sailing magazine *Latitude 38*, says the AC72 was designed in part to suit San Francisco Bay, and that typical conditions are unlikely to be a safety factor for America's Cup sailors. However, he does acknowledge that the complex interaction of surface currents adds to the challenge of the race. "The current is what makes it interesting sailing on the Bay; it adds another level of intrigue," he says.

Local sailing expert Kimball Livingston agrees that the Bay's complex currents need to be accounted for, but thinks that their influence on

the AC72 is limited. "If you're going 40 mph, the tidal component is going to be a lot less," he says. "The boats are so fast that it takes a very large tidal component to override other factors."

Ultimately, both suggested that final blame for the two crashes to date may lay with the boats, either due to design shortcomings or structural flaws. "You're not supposed to break a boat when you have a crash," Livingston says of the Artemis Racing incident on May 9. "There was something else that went on." **NS**



Scientists can get a sense of flow directions and currents by tracking sediments suspended in the water. These two charts show simulations for a flood tide and the onset of an ebb tide under the Golden Gate Bridge. Note the formation of eddies immediately inside the Golden Gate on the bay side of Pt. Cavallo and Fort Point at flood tide. During the transition from flood to ebb tide (right panel) transport is complicated by the presence of rock outcrops and deep channels that make up the seabed at the Gate. (White lines and circles show areas where measurements were obtained.)
Source: Erikson, L.H., et al, USGS, as submitted for Marine Geology, Special Issue on San Francisco Bay.

WETLAND SWINGERS: After sinking 24 sediment cores into South Bay marshes, US EPA's Elizabeth Watson and UC Berkeley's Roger Bryne suggest that the 1800s historic bayland that looms large in the region's collective unconscious (and conscious) goals for wetland restoration represents not some ancient marsh, but a relatively new thing. Indeed most of these marshes formed rapidly during the recent Little Ice Age, when copious rain and runoff loaded the shoreline with sediment. "We've got to stop thinking of our wetlands as fragile," says aquatic biologist Peter Baye. "On the contrary, the new evolutionary models of the ecology and geomorphology of Bay marshes suggest that rather than maintaining some idealized equilibrium, these wetlands have been lurching back and forth between alternative states of brackish and salt marsh, and through prolonged droughts and deluges, for thousands of years. We're just not used to thinking of these disruptions as being part of the history of the marshes." This new research comes on the heels of a decade of paradigm-shifting studies of the region's more ancient ecological and climatic history that underscore the need for adaptive management in the future. **ARO & PB**

KRILL BONANZA: The seabird colonies on the Farallon Islands may be catching a break this year, thanks to favorable ocean conditions. "It looks like there is a lot of upwelling and abundant krill," says Point Blue Conservation Science biologist Russ Bradley. This has allowed some species to get a jump on the breeding season: "Cassin's auklets had their earliest year in a decade. Common murre laid the earliest egg ever observed on the islands." Brandt's cormorants, which experienced high chick mortality in recent years, also started breeding and seem to be having better luck. Bradley is hedging his bets: "The question is whether [the krill bonanza] translates to more schooling forage fishes later in the summer, and whether species like western gulls and Brandt's cormorants continue poor productivity or 'bounce back' this year." **JE**
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STURGEON SIGHTED IN

SAN JOAQUIN: The San Joaquin River may be a badly degraded waterway, but it still feels or smells right to white sturgeon. As reported in the current *Interagency Ecological Program Newsletter*, US Fish and Wildlife Service biologists have documented for the first time that these huge archaic fish are spawning in the San Joaquin, reinforcing previous anecdotal evidence. Fertilized sturgeon eggs were collected on artificial spawning mats made of furnace filter material. Spawning occurred at one Stanislaus County site in 2011 and four sites in 2012. This indicates that white sturgeon use the river in both wet (2011) and dry (2012) years, not just in high-flow years as previously speculated. It's hoped that further research in the San Joaquin will help improve spawning success and survival of sturgeon hatchlings through habitat restoration and appropriate water management. **JE**
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Courtesy Aquarium of the Bay

NO TRENDS FOR MERCURY IN

FORAGE FISH: Mercury, one of the Bay's legacy contaminants, was the focus of a recent SF Estuary Institute study. Ben Greenfield and colleagues looked for seasonal and spatial patterns in mercury concentrations in three species of forage fish: topsmelt, Mississippi silversides, and arrow goby. All three are food sources for fish-eating birds. The group's article in *Science of the Total Environment*, shows the difficulty of generalizing contaminant trends across species or locations. No consistent regional trends were apparent over the six years of sampling. Greenfield says this was not a surprise: "Mercury is highly variable over space and time, and it may take decades for long-term trends to be seen." Gobies and topsmelt showed different seasonal trends, probably related to habitat. The sedentary burrow-dwelling gobies had highest mercury levels in late summer and early fall, while the more mobile topsmelt peaked in late winter and early spring. Location was important for silversides: in Alviso Slough, concentrations increased

over the sampling period. This may have been related to lower dissolved oxygen in the river channel, causing increased methylmercury production. Since mercury bioaccumulation trends are specific to site and fish species, Greenfield recommends that water-quality and restoration managers consider a site's management objectives in deciding which species to monitor. **JE**

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FLAME RETARDANTS FALLING IN

FOOD WEB: Polybrominated diphenyl ethers (PBDEs), chemicals used as flame retardants in furniture, electronics, and other products, were a major health concern for San Francisco Bay when alarmingly high concentrations were reported in local wildlife and humans in 2002. Since then, the major US manufacturer stopped producing two of the three PBDE formulations, and state and federal rules restricted their use. The payoff, according to a new draft report by Rebecca Sutton and colleagues at the San Francisco Estuary Institute, is a dramatic decline in PBDE levels in the Bay's food web over the last ten years. Concentrations fell in mussels and clams, the eggs of cormorants and terns, and sport fish, where levels were below recently developed human health advisory guidelines. The final report will be available later this year. **JE**

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SPLITTAIL SURGE: Sacramento splittail, a large California-endemic minnow, had a banner year in the Yolo Bypass during the last wet pulse, according to sampling data from the Department of Water Resources supported by the Interagency Ecological Program. From October 2010 through September 2011, 11,295 juvenile splittail were caught in the researchers' rotary screw trap near the Lisbon Weir, the highest number since monitoring began in 1998. The Bypass has been recognized as good splittail rearing habitat. The new peak in water year 2011 is attributed to early pulse flows in winter that brought up spawning adults, followed by a longer-than-usual period of floodplain inundation. The splittail has undergone a long-term range contraction and was at one point listed as threatened. **JE**

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I N T E R V I E W

Back to the Future for Habitat Goals

Scientist Letitia Grenier is coordinating the 2014 update of the *1999 Baylands Ecosystem Habitat Goals*. The Goals created a regional vision for restoring 100,000 acres of tidal marsh around San Francisco Bay, an acreage scientists agreed would be big enough to sustain endangered marsh species. Today, climate change and the prospect of a 2-5 foot sea level rise over the course of the next century have changed the environmental context of the Goals, and the prospect of achieving them. Not only will the water be rising, the processes influencing our wetlands will change as we experience new extremes, more frequent storms, and seasonal shifts in when the snow melts and swells runoff. Grenier has been tasked with managing the five science teams working to update the Goals. New sections will describe the evolution of marsh habitats under different climate change and sediment supply scenarios, the terrestrial-estuarine transition zone and the services it provides, risks to wild plants and animals, and carbon sequestration. Grenier is a biologist specializing in landscape-scale planning for restoring natural systems, not to mention a new mom, and formerly led the SF Estuary Institute's Conservation Ecology Program. The draft goals update has been completed and the final is due out early next year.

What are your basic recommendations in Goals update?

First, we need to get better organized and be more integrated in planning and implementing the revised Goals. We will need regular meetings of agencies that have regulatory authority over how things go down so they can sort out disagreements and be more flexible with permitting projects. Second, we may need to change our policies to adjust to the changing environment. For example, we have a policy around sediment that's based on way the system worked 20 or 50 years ago, but it's not necessarily the right policy, environmentally, into the future. Third, we need our own "fire department" to respond to catastro-



phe. We know something will happen soon, probably a big flood. So our community of stakeholders needs to think through the likely scenarios, be prepared with a plan for what to do, know who to call when the disaster comes, and make sure to get invited to the emergency meetings. Then we can say, "Here's a plan that could be cheaper for you than throwing up a sea wall, because it incorporates natural processes and is much more likely to produce a good ecological outcome."

What's wrong with a big sea wall?

The minute you build that big levee, you've got flooding problems on both sides. Big storms will not only affect the water level outside levee, but also inside, by dumping a lot of water that runs off the land and gets stuck behind the levee. From the ecological, and economic, perspective, it's better and cheaper to have a long sloping levee, buffered by wetlands, than a seawall with deep-water next to it.

With sediment in short supply, how can we build wetlands, let alone levees?

We'll need the bulldozers and dredges, but we also need to work with the natural forces of the planet, like streams and tides, to move the sediment where we want it to go. If we were allowing our watersheds to work the way they naturally do, instead of through dams and culverts and im-

Tern for the Best

Less than a year after its steep rocky shoreline was replaced with a sand and oyster-shell beach, Marin County's 17-acre Aramburu Island is already attracting colonial seabirds. Up to 50 Caspian and Forster's terns dropped by this spring, and Rachel Spadafore of the Richardson Bay Audubon Center and Sanctuary says courtship and mating were observed among the Caspians. Males flew in with fish, which they offered to hopefully receptive females; mating often ensued.



Photo: Kerry Wilcox

No terns actually nested, however; they may have moved on to the established Caspian colony on nearby Brooks Island. "We're still excited about this, though, considering we haven't even finished revegetating yet!" Spadafore says. "It's a great sign for the project." Audubon is considering deploying tern decoys to convince the birds to stick around.

Caspians, the world's largest tern species, are striking to look at, with their shaggy black crests and coral-red daggerlike bills. They have no special status but like all colonial waterbirds, they're vulnerable to loss of roosting and nesting habitat. Over the last century, these terns have shifted their breeding locations from interior wetlands to estuaries, including those significantly affected by human activity, like San Francisco Bay.

Other species have also discovered the new beach, including oystercatchers, willets, sandpipers, whimbrels, and brant. The project, launched in 2010, was funded with a variety of funds from private and community foundations, local government, and clean up and spill fines. **JE**

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ESTUARIES ELSEWHERE

Everglades Ease into Restoration

Writer and filmmaker Bill Belleville has made a career out of water. From the Dutch Antilles to Russia's White Sea, Belleville has paddled and scuba dived places most people only dream about. But close to his Florida home, the sight of the partially restored Kissimmee River, channelized concrete on one side, green meandering stream on the other, was as memorable as anything he'd ever seen.

"I went up there and paddled," Belleville says. "We could see the canal on one hand, and in the other direction was the river, and it was all the difference in the world."

The partially restored Kissimmee River is a stark symbol of the choices facing Floridians. Black-necked stilts, storks, herons, cranes and spoonbills have returned to the 43 miles of restored river, 320 species in all. But the Kissimmee is only part of the giant plumbing system that filters water to the Florida Everglades. In this ever-growing state, high demand for developable land means that full-scale restoration isn't always possible. In some parts of Florida, putting the pieces together requires mimicking natural systems instead of restoring them.

Like California, Florida built its economy on the control of water. Historically, the Kissimmee River drained to Lake Okeechobee, which seasonally overflowed its banks,



The C-38 canal, backfilled to reclaim the floodplain and meandering oxbows of the original Kissimmee River.
Courtesy South Florida Water Management District.

sending sheet flows south to the Everglades and west to the Gulf of Mexico. But over the last century, channels and levees drained 50 percent of the state's wetlands, allowing them to be converted to sugar farms south of the lake and cattle ranches to the north. Big sugar is the most pressing problem: nutrients, notably phosphorus, threaten to convert the famous Everglades "river of grass" from sawgrass to cattails. But draining land for ranches north of Okeechobee also disrupted the natural hydrology.

Now the state is trying to reverse more than a century of environmental damage. While there has been only halting progress on ambitious deals

have worked with Big Sugar to institute farming practices that minimize nutrient pollution.

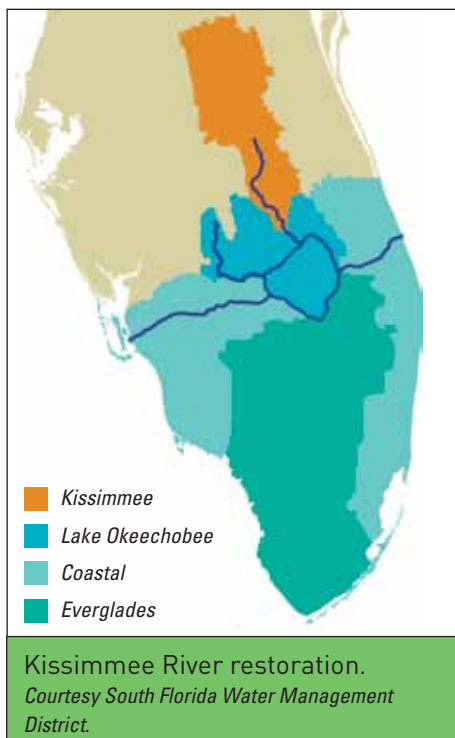
Cattle ranches in north Florida are another story. Many ranchers are struggling economically, and, as the housing market improves, developers are eyeing vast tracts of agricultural land in the Kissimmee Basin. Outright purchase of the land surrounding the Kissimmee River may solve part of the problem, but probably won't be sweeping or rapid enough to save the region. In early 2012, the Department of Interior established an Everglades Headwaters National Wildlife Refuge and Conservation Area in the Kissimmee Basin with an initial donation of 10 acres. That may sound tiny, but eventually, the headwaters protected area is projected to include 150,000 acres, including 100,000 acres of ranchland protected by easements.

The Interior Department's plan is a tacit recognition that outright purchase of large tracts of ranch land doesn't seem possible, politically or economically. Instead, the race is on to persuade ranchers to sell conservation easements, which means their land can become part of the headwaters protected area, as well as to restore wetlands on their property. Bill Belleville calls restoration "a work in progress." One of Belleville's recent films was a profile of Carey Lightsey, a rancher whose family's holdings include 36,200 acres in Florida and Georgia.



Roseate spoonbill. *Courtesy South Florida Water Management District.*

to purchase land from the state's two major sugar growers, former Florida governor Charlie Crist, who once promised to be "the Everglades governor" is planning to run for office again and finish the job. In the meantime, state agencies



Nearly a decade ago, Lightsey, who not only breeds cattle but also runs hunting trips on his land (Johnny Depp was one of his clients) became one of the first of the region's landowners to protect his ranch through conservation easements.

As many have noted, Lightsey, who has won many awards for his work, sold development rights to his land when real estate values in Florida were sky high.

"I can't understand why more ranchers don't do this," Lightsey says. "You have to focus on the big picture. You can't think the whole thing is about money."

But setting up conservation easements to fend off development is not enough. Many ranchers are working with the Natural Resources Conservation Service to do low-tech restoration work: digging ditches and building weirs to trap water. These simple measures create wildlife habitat and have the additional benefit of recharging groundwater.

In these days of scarce government funding, the farm bill has proved essential to Florida's conservation efforts. Jenny Conner-Nelms, the government relations director for the Florida Nature Conservancy, has been instrumental in developing the strategy of funding restoration through the farm bill's wetland reserve program, which has yielded \$269 million to protect 50,000 acres in conservation easements in northern Florida.

"We have been extremely fortunate," says Conner-Nelms. "Many people don't realize that the farm bill is the largest amount of money from the federal government for the environment."

When it comes to persuading ranchers to participate, it helps that the actual restoration is a fairly low-tech affair that doesn't require major changes in agricultural practices, according to Greg Knecht, Director of Protection at the Nature Conservancy's Tallahassee office. Initially, Knecht says, some ranchers were dubious. But as pastures became healthier and the water table rose, the program has gained adherents.

"The farmers are frustrated sometimes," says Knecht. "It's a case of 'first you told us to drain it, now you're telling us to fill it in?' But the reality is that water is going to drive the future of everything that happens in Florida." **SZ**

SOUTH FLORIDA WATER DISTRICT:
www.sfwmd.gov

FURTHER READING: *The Swamp*, by 2009 State of the Estuary conference speaker Michael Grunwald; and for those with patience and a taste for great literature, *Killing Mr. Watson* by Peter Matthiessen.

BIG SCREEN

Colorado River Story Parallels Our Own

Anyone who knows the ins and outs of California's water wars, and the lay of the land and water for the much-managed Sacramento-San Joaquin River system, will appreciate the new movie *Watershed*. Produced by the Redford Center and Kontent Films, the 54-minute film takes on the tough task of making "a positive movie about western water," says director Mark Decena. The main premise is the need to get two percent of the flow of the mighty Colorado — which flows 1,400 miles through seven states, from headwaters in the Rockies all the way into Mexico — to make it all the way to the river's delta in the Gulf of California. So much of the river's water is harnessed that there is little or nothing left for this dried out delta, once a two million acre wetland.

Finding this two percent, it turns out, is more about the conservation and stewardship ethics of users upstream than anything else, and the movie tries to show that. The movie tells the water story from multiple points of view at all scales — from the Navajo woman in New Mexico remembering her ancestors' tales of how rain comes from the sky because of a great celestial love affair to the water choices made by organic farmers, city mayors, gas drillers, fly fishermen, and a Los

Angeles family that's taken to riding bikes and irrigating their garden with water from their showers.

When the lights came back up, this viewer was struck by several things. Instead of all the tired trade-offs and non-negotiables of the Western water wars, I got humor and hope and chutzpah. I enjoyed the use of artsy animations to get tough science and water development history across. And while the jumps in the storytelling, as the camera moves back and forth up and down the watershed, were confusing at first, in the end they succeeded in conveying a strong sense of watershed. Namely, how water connects landscapes and people.

I was also struck by the parallels to our own experience with the San Francisco Estuary. The stories and some of the details may be different, but core truths are the same: big rivers harnessed and compartmentalized so they can water big ag and big cities; and the small but inexorable push back from people who'd like to save the fishing and habitats and ecology of these great river systems. As both California's and Colorado's systems face the prospect of a drier climate, less fresh water runoff, and increasing demand out West, the solutions may prove similar. Every user has to conserve and recycle at every scale. And ever user has to remember what they use affects those downstream, who might be able to reconnect the dregs of a mighty river with the ocean, and begin to restore the wasteland of its delta, with just two percent of flows. Go figure. **ARO**

COMMUNITY SCREENINGS FREE
<http://watershedmovie.com/>

Paddling At Last

The Invader Crab

By Charlotte Witter, Student,
Santa Clara University

I'm a European green crab,
so call me Lou

If you need to find me
I live at Elkhorn Slough

I used to live in Europe and Africa
in the North

But invaded the rest of the world
when I decided to go forth

First I travelled to the East Coast and
then to the golden state

I started my journey in the 1800s and I'm
still here to date!

They loved me in Europe and
called me a "native"

But now in California they think
I'm invasive

My official name is *Carcinus maenas*

Just because I've invaded
doesn't mean that I'm heinous

Me and my crab friends are declining,
that you are taught

We personally don't like that
because we like it here a lot!

With estuaries, tides, and
a deep habitat

The life of the green crab,
you really can't beat that!

If you're looking for the big ones,
such like me

Go to deep muted tides
and there you will see!

Or if you are looking for
where abundance is high

You can find us at the estuarine
where we little crabs lie

In the future although my friends
and I will decline

Come to the Slough, educate yourself,
and take the time

Get to know the species around
where you live

Because you affect the future and it's
your turn to give

If you want to help more
grab a map and a kit

We're all one ecosystem
and so it's definitely worth it!

The dock is getting smaller and smaller as I paddle away. I have been waiting for this view for a long time. As planner for the San Francisco Bay Area Water Trail I visit many launch sites around the Bay. During these landside visits I cannot help but steal furtive glances at the water, wishing I could put myself in a boat and explore the waters beyond. And here I am at last, in a kayak, watching the dock at Tidewater recede, and the view of San Leandro Bay get bigger.

Tidewater Boating Center, the first site to be included in the Water Trail network, is owned and managed by East Bay Regional Parks and located at the southern end of the Oakland Estuary. The Water Trail is a new, growing, regional trail. It's not exactly a trail in the literal sense, but a series of launch sites around the Bay, like Tidewater, for non-motorized small boat users. I like to think of it as a web that you can explore for as little or as long you like, and go in all different directions anchored by the network of launch sites. Today I head towards Bay Farm Island and the open bay.

cormorants diving. A group of rowers passes by, moving quickly in a synchronized dance.

This is a complex landscape. San Leandro Bay is nestled between residential communities, shoreline parks, the Bay Trail, and the Oakland Airport. It also provides important habitat for migratory and resident birds, including the endangered California clapper rail. Urban and wild meet here, and the Water Trail user gets to soak it all in — even becoming part of the scenery.

I raft up with my partner to eat lunch. This pause from paddling allows me to notice movement in the shallow water. I train my eyes on the water, and soon spot it again. A leopard shark darts by! And then another, and soon a dozen more. They are beautiful, primal, almost exotic.

As I sit watching leopard sharks cruise by our boats, I am impressed by how interesting this landscape is, and by how many ways people can enjoy the shoreline. The San Francisco skyline and Bay Bridge form a striking backdrop. Nearby is a sandy

beach with families enjoying themselves. Bikers and joggers are using the Bay Trail.

Back onshore I am grateful for the dock, parking lot, restrooms, and all the features that allow me to get on the water safely and comfortably. But next time I go on a site visit, I

will not be able to resist daydreaming about being on the water. **GB**

Water Trail: www.sfbaywatertrail.org



Photo: Galli Basson

As I look out on the water I see thousands of shorebirds. They fly close together, and like a school of fish, a sudden change in direction causes the flock to change from gold, to white, and back to gold. During our paddle we are accompanied by chattering terns flying overhead and

Cap & Trade Roadshow, Six Months Later

In the last six months, California has held three very special auctions, and the items in question are much harder to put your finger on than the gilt rim of a tea cup. In this auction, the objects are less tangible — the so called greenhouse gases, or GHGs, known to warm earth's atmosphere — but more likely to influence the course of human history than any mahogany credenza or dueling pistol.

When it passed the California Global Warming Solutions Act in 2006, the golden state firmly embraced the singular role

of leading our frustratingly reluctant nation on climate change action. AB 32 set the goal of returning the state to 1990 emission levels by 2020 and launched a dozen different initiatives to get there, from renewable energy investments to a low-carbon fuel standard. It also created the nation's first economy-wide cap and trade program for emissions.

"Cap and trade covers 85% of emission sources in California. If we get rid of it, we're probably looking at command and control from the Air Resources Board," said Jane Luckhardt, a Downey Brand lawyer and one of 15 speakers at a Bay Planning Coalition workshop on cap and trade hosted by URS Corps in Oakland this June.

The program is basically a market in which you can buy and trade emissions. The main premise is that while one entity, say an oil refinery, might be able to reduce its GHG emissions 50% by replacing some ancient boilers with newer technology for a reasonable cost, another entity, say a cement maker, might have very few options for reducing emissions. So the latter can buy credits from the former, or other traders, during the new auctions.

"Initially any industrial facility that generates 25,000 or more metric tons of GHG comes under

the cap," explained environmental and sustainable development lawyer Cleve Livingston, another one of the speakers. In 2013, these included oil refineries like Valero, Chevron, and Shell, cement manufacturers, big power plants, and co-generation facilities at various universities. Under the cap, these emitters have three years to show compliance, and can either buy allowances from other



industries, invest in energy efficiency, or purchase offsets (dairy methane capture programs, urban tree planting, or forest management — blue carbon credits from wetlands are not quite yet auction-ready). "The point is to allow industry to find the most efficient measures to reduce carbon," said Livingston.

The state has held three auctions in the last six months, with prices settling in between \$10-\$14 per metric ton. In the most recent auction, the state approved 81 entities to bid in the auction for 14.5 million MT in 2013 allowances, and 9.56 MT in futures for 2016. In this last auction alone, they sold 100% for 2013, and 80% for 2016, and raised \$117 million to help the state advance AB 32 and prevent climate pollution. Governor Brown is already angling to borrow the auction money, arguing that other AB 32 spending programs are "not ready yet for prime time," according to Luckhardt.

At least 25% of funds raised from the auctions are supposed to go to climate pollution reduction related projects in the most impacted

communities. But first these communities have to be identified. Speaker John Faust from the state's Office of Environmental Health Hazard Assessment described the screening method his team is developing, which uses 18 environmental and socio-economic indicators ranging from exposures to pesticides, toxics, and ozone to the presence of impaired water bodies or toxic clean up sites. Indicators also try to take into account the sensitivity of specific communities due to poverty, asthma, low birth weight, or the presence of lots of children or elderly people. Faust showcased the new screening tool at the workshop, which maps these communities based on ZIP code. A first version of the tool was released in April, but the team is still considering improvements.

Other speakers covered what Bay Area local and regional agencies are doing in terms of transportation and sustainable development planning, how the state may be impacted economically by AB32, how California's food processing industry is responding, and how groups like the Environmental Defense Fund are both championing and watchdogging the program. Not only can the program serve the public trust, but it is also an opportunity for private speculation that makes some wary.

At press time there was some uncertainty about the nitty gritty of the future cap and trade program as Morningstar Packing and the

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	Contributions to GHG Emissions 2002-2004 Average	2020 Projected GHG Emissions	2020 GHG Emission Targets
Capped Sectors		511.7	365
Transportation	38%		
Electricity	23%		
Industry	20%		
Commercial/Residential	9%		
Uncapped Sectors		84.3	57
Agriculture	6%		
High GWP	3%		
Recycling/Waste	1%		
TOTALS		596	422
<i>California's GHG Emissions (in million metric tons of CO₂ equivalents). Source: Livingston</i>			

INTERVIEW - *continued from page 5*

permeable surfaces, they'd be delivering more sediment to wetlands, which could help them build up their elevations naturally. We also have all these erosion-control programs to prevent sediment from getting into streams, because it's important at certain times for fish or water quality. We may need to find creative solutions. And lastly, we need to think about dredging in the Bay and in flood control channels. Sediment is sometimes dredged and dumped in place A instead of place B,

because it's cheaper. With sea level rise, we need to think of sediment as a precious resource that should be managed regionally and strategically. It should be placed in the right spots to preserve our baylands and our low-lying built up areas. We also need to think of the fresh water coming off the land or out of our wastewater pipes as it's own precious resource. Instead of piping it out into the Bay, maybe we can put it back where it used to go, into the back of a marsh. So every decision we make around retooling an infrastructure project like a bridge, or protect-

ing a wastewater treatment plant that will be below sea level soon, needs to incorporate solutions that think about sediment and water in a new way.

Can our endangered marsh species be as flexible as we're trying to be?

Maybe, maybe not. One of our bet-hedging tools is to include a lot of variability in restoration projects we design. So then if you're an animal, and something changes, you can go to a different part of the marsh. If there's a wet year or a dry year you can stay in the zone that's comfortable for you. Or if there are lots of different marshes around the Bay, in a good year or a bad year you can reroute yourself. Also, if you have this diverse environment out there, you're supporting different physical variations, or phenotypes, of your animal. Then if something happens – a bottleneck in the environment, a year with this kind of food or that kind of food, then your phenotype that's adapted to those conditions, the wetter year, the bigger nut to eat, whatever it is, that one survives. What we want is to promote the greatest genetic and phenotypic variability we can get in our wildlife populations. It's like having a stock portfolio that's very broad. No matter what's up or down, you've got everything going on, so you're going to make some money every year.

Is 100,000 acres of tidal marsh still the magic number?

In terms of where the Goals are going, this project is set up to figure out how to achieve the Goals in the long run. We know they could still be achievable for several decades, and we know we may have to make some big changes to achieve them for the next century. And since we still want to have our wildlife populations, and all the ecosystem services of those wetlands for those decades, our recommendation's going to be charge on ahead, but do it wisely. Make sure to consider some of the information we'll be providing in the update about good places to do certain kinds of things, and how to implement projects that will be resilient in the long term.

Will the Goals offer a new prescription for where to build and where to breach?

We've discussed where our role stops. We do want to highlight low slope areas around the edges of the

ON THE JOB

Cargill's Go-To Guy: Pat Mapelli

As a boy, Pat Mapelli always knew when it was time to run home. He could hear the 3:30 pm boiler whistle at Cargill's saltmaking facility from almost anywhere in Newark, and he knew that's when his mother got off. Mapelli went on to work at Cargill too, and found he had a knack for fixing things – whether it was the packaging line inside or the solar operations outside.

Cargill harvests about half a million tons of salt from its bayshore crystallizers each year. Since the 1970s, it has also donated and sold 90% of its original salt pond holdings to the public for wetland refuges, open space, and trails. Mapelli's job these days is to manage Cargill's properties around the Bay, as well as to help resource managers and restoration consultants "fix things" on their new properties.

"No two days are the same," says Mapelli, a fit, can-do engineer who also coaches soccer. "I often get calls from Fish & Wildlife or Ducks Unlimited, saying 'Hey can you come take a look at something for us?'" One day the call was from a frantic California Dept. of Fish & Wildlife employee who'd dropped his keys in the Bay and was stuck out on a levee between

locked gates. "We're used to this kind of challenge. We went out there with a magnet on a pole, and dragged and dragged the Bay for those keys. Then we called out the divers we use to do pipe inspections. They spent about half a day out there before they found them."

The magnet on the pole is just one of the many tools Cargill's invented for its salt pond work, all of which have to be metal so their magnets can find them. "You can't get that stuff at Orchard Supply or Home Depot. You become very resourceful in the field because if something is not working, you can't just call the plumber or the handyman," he says.



Photo courtesy Cargill Incorporated.

Mapelli also knows everything there is to know about bay mud: "It's fairly impermeable material. If you work it properly it can be your best friend. If you don't pay attention to it, it can be your worst enemy." He's cleaned trash racks and water siphons in every kind of weather, and even

knows how to slide big equipment and work crews over slippery levees in the rain.

Early in his career, when he moved from working inside the salt refinery to working outside on the solar evaporation ponds, his perspective changed: "Out there there's no walls, no ceiling. Your senses became very keen."

Mapelli is proud of how he and his company have contributed to Bay restoration efforts. "We didn't just sell the land and cut and run. We like to think we're a resource for wetland managers." **ARO**



Graphic representation of the historical (ca. 1850) tidal-terrestrial transition zone in the South Bay, based on historical soils maps and topography, new habitat maps, and other documentation. According to a 2013 report from the SF Estuary Institute, the transition zone extended bayward with the effects of local rivers and streams on Bay salinity, and landward with Bay effects on soil salinity, groundwater height, and flooding. The zone was characterized by a great diversity of habitat types, grading from saline and brackish tidal marsh to seasonally flooded wet meadows, vernal pool complexes, grasslands, and riparian forests. Steep lands bordering tidal marsh—somewhat similar to the levee faces that constitute most of the transition zone observed today in the South Bay—were rare, comprising less than 10% of the historical zone in South Bay. The width of the zone varied with physical setting: the zone could be miles wide in flat areas with large amounts of freshwater runoff, and only a few feet wide in very steep settings with no runoff. Options for rebuilding the T-zone in the future, as a necessary adaptation rising sea levels, are explored in the update of the 1999 Habitat Goals. Graphic Source: SFEI (Beller et al. 2013): http://www.sfei.org/TZone_SouthSFBay

Bay and river valleys where marshes can transgress. If you can find them, you should acquire them for the public and preserve them in perpetuity. But we're not going to tell people to make room for a setback levee in a specific location by removing houses. We're trying to present options based on science, like: "If you take this approach you might end up with some wetlands in 2110 that might be a buffer against flooding across the Napa Valley; or if you take this approach with a sea wall, you're going to have waves that will bounce back and forth, and actually get higher because of geometry, and you'll have a different kind of risk of flooding behind the sea wall."

Did we meet the 1999 goal of connecting big expanses of habitat?

We've made a great start, but there's more to do. It's always easier to get your own restoration project done than to coordinate and connect it to a bunch of other projects. With climate change, we need connectivity even more, not just for the old reasons, but also if conditions change, connected habitats give wildlife a way out. The reality of our urbanized shoreline, however, is that we've squeezed nature into too small a space. As sea level rises, there's going to be this squeeze, and this squeeze is going to create more of a

problem with connectivity. If we don't achieve natural systems that are connected, we might have to expect more intervention – like active translocation or captive breeding.

Do other estuaries have Goals like we do?

Not that I know of, but other estuaries like Washington's Puget Sound and Maryland's Chesapeake Bay have thought through a future climate change process. There are different science questions and different ecosystems, but everybody ends up with the same principles. What's interesting in California is our really strong environmental ethos, which has also resulted in overlapping jurisdictions among our many environmental management agencies. It's a positive and a negative. It creates a decisionmaking complexity that can be good, but is also takes more time, like democracy. But it's nice, because everyone seems to have a shared goal of doing something good for the environment. I don't get that same feeling from other places. How do you plan for climate change if you're not allowed to use the word climate change? How do you plan for coastal protection if the government agrees they will protect everyone's private property on a barrier beach? If you're going to focus on saving every human structure, are there any resources left to think about doing things in a different way? **ARO**

NEW ON-LINE ECO-ATLAS TOOLS

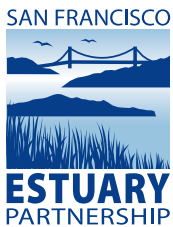
Those protecting wetland resources must often prioritize restoration projects based on the likelihood of success and on complex trade offs between development needs, species protection and flood control. This June, the San Francisco Estuary Institute unveiled a new suite of advanced technology tools to aid such decision making. Among those tools is the California-wide EcoAtlas. The Institute's acting director Meredith Williams says that by compiling state and federal maps and data about wetlands, EcoAtlas gives site visitors access to salient information about the condition and extent of streams, wetlands, lakes, and their surrounding riparian areas. This map-driven, easy-to-use tool contains many advances including: a new statewide base map (CARI) of aquatic resource extent; maps that peer through time, revealing the historical extent of aquatic resources; information about restoration projects (maps, activity logs, permit details, contact information, and file libraries); data about wetland condition including results of wetland health assessments (using CRAM); and water quality data. One of the most novel elements of the EcoAtlas is a Landscape Profile tool. This tool invites users to identify an area of interest—for instance, a county, congressional district or watershed – and compile reports about that area. EcoAtlas is one of several recently improved web tools, which, according to US EPA's Jared Blumenfeld, "will empower Californians to access information about the value and health of their waters."

Web Link: www.ecoatlas.org

LUOMA'S NEW HAT Marine biologist Sam Luoma is wearing a new hat these days, as a member of Save The Bay's board of directors. Luoma worked on chemical contamination issues for the US Geological Survey for 32 years, including as a lead author of an early Estuary Partnership Status & Trends report.

JOURNALISM ACCOLADES

ESTUARY News editor Ariel Rubissow Okamoto and her co-author Kathleen Wong were honored in April with The Bay Institute's Harold Gilliam Award for Excellence in Environmental Reporting for their book *Natural History of San Francisco Bay*.



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www.sfestuary.org

San Francisco Bay and the Sacramento-San Joaquin River Delta comprise one of 28 "estuaries of national significance" recognized in the federal Clean

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

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CAP & TRADE - Continued from page 9

California Chamber of Commerce are arguing that allowances held back and auctioned by the air board amount to the imposition of an illegal tax. Their cases go to court this August. Speakers also expressed some worries about "leakage" — where a big employer like Sacramento's Campbell soup factory moves out of state or out of country to avoid expensive retrofits. Everyone mentioned the need for a national GHG control program to reduce leakage to other states like Texas, where climate change does not officially exist.

"Some argue emissions reduction strategies will be an economic disaster, but others argue it will be one of the greatest shots in the state's economic arm in generations," said Livingston. "Somebody's got to be on the leading edge, and though some companies may move out, others may move in. Within the next few years, the results of our efforts will get much clearer, but until then the jury is out." **ARO**

BPC Workshop Video and Power-points: <http://bayplanningcoalition.org/2013/05/cap-and-trade-how-it-works-and-how-to-make-it-work-for-business/>

EDF: www.edf.org/climate/california-climate-action