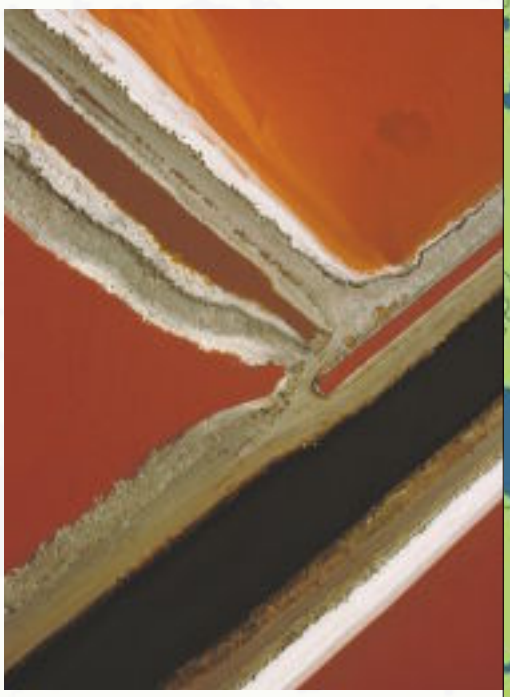
SOUTH BAY CHALLENGE

Reclaiming the SALT PONDS FOR PEOPLE AND NATURE

I never wove baskets out of marsh reeds or stuck my hand in the silky mud of the Bay in search of a clam. I never hunched in a blind hunting a red duck for my mantel or a white plume for my hat. I never scraped salt from the shoreline to season my meat or watched a grizzly gorge on salmon at the mouth of a stream. But I grew up at the edge of this extraordinary Bay, with the ebb and flow of the tides in my veins, and the tinkle of the wharf's boat riggings in my dreams. And I can also remember a time when it stank like a men's room and sported concrete blocks and no-trespassing signs all along its shores, robbed of the 180,000-acre blue-green weave of water and plants that circled it 200 years ago. So now the prospect of what we, the people of San Francisco Bay, are preparing to do takes my breath away.



In 2003, our tax dollars and the diligence of many citizens, both public and private, bought us the last large chunk of bayshore where the tides could still rework their marshy magic. In this calico quilt of ponds once owned by Cargill Salt, we have a rare chance to restore a working ecosystem in the heart of a metropolis: an opportunity to fuse a 20-year hodgepodge of efforts to save a wetland here, a mudflat there, into a whole lost landscape of tidal wetlands.

As we explore in the pages that follow, the results of this grand initiative are not a foregone conclusion. But we should not be intimidated by the project's complexity into thinking small, or only within the narrow window of current constraints. The real challenge will be to find the place between what was and what is on this landscape, where the tidal ecosystem can be reborn on a significant scale without hurting the birds and beasts that have grown used to its current contours. We may shine and we may falter, but we will certainly pioneer a whole new level of thinking and knowledge about restoration. And renew ourselves and our Bay in the endeavor.

Ariel Rubissow Okamoto, Guest Editor

A TALL ORDER

The Art and Science *of Wetland Restoration*

By Glen Martin

It lies at the heart of one of the country's most densely populated regions like a great, if somewhat tarnished, sapphire: San Francisco Bay. For more than a hundred years it has endured siltation, dredging, draining, diking and pollution. More than 90 percent of this estuary's rich marshlands have been lost, and water quality, fisheries, and wildlife have all suffered dire declines. But finally, the Bay stands poised to reclaim its ecological heritage; it is now the centerpiece of one of the most ambitious environmental restoration programs in the country. A coalition of government agencies, local communities, and environmentalists are marshaling their resources to turn 16,500 acres of salt evaporation ponds ringing the South and North Bay, until recently owned by the Cargill Corporation, back into wildlife habitat.

When the project is completed—which may take decades and cost millions—it is likely the Bay will more closely resemble its original state than it has at any time in the past century. Thousands of acres of new tidal marsh will grace the shoreline, nurturing juvenile fish and shellfish, filtering pollutants from creeks and urban runoff, and sheltering endangered birds and mammals.

"There is really nothing in the country comparable to this project," says Denise Reed, a professor of geology and geophysics at the University of New Orleans who serves on numerous scientific advisory panels on wetland rehabilitation for the Atlantic, Gulf, and Pacific Coasts, including one for the Bay's salt pond project.

It's not just that this particular estuarine project is so large, says Reed. A 16,000 acre restoration would be huge for any region, she notes, "but we also have to consider the urban context. This won't simply restore critical ecological components—it will also give a great number of people a direct relationship with the process." No other large urban area has a resource equivalent to the salt ponds, says Reed.

"In New York, Jamaica Bay is the only significant project under way," Reed says, "but it's tremendously degraded, and only consists of a few hundred acres. Seattle lost huge amounts of wetlands around Puget Sound, but today only patchwork restorations are possible. Yet here, in San Francisco Bay, we can work with an entire landscape. It's really quite thrilling."

It is the essential nature of south San Francisco Bay's salt ponds that make it possible to even contemplate such a grandiose effort. This vast complex of evaporators—created by dredging and filling swaths of the Bay's salt marsh, seasonal wetlands, creek corridors, and uplands—has been used for salt production for more than a century. The Cargill Corporation acquired them from Leslie Salt in 1978. In 2003, state and federal agencies—with assistance from several local private foundations—purchased 1,400 acres of these ponds in the North Bay and 15,100 acres in the South Bay for $100 million. The goal now is to transform the ponds into a landscape that incorporates diverse wetland types and habitats of concern, including ample salt marsh, of course.

The dream of restoring a significant portion of the Bay's tidal marsh was first articulated in 1993 by the Baylands Ecosystem Habitat Goals Project, an ad hoc group of scientists, resource managers, and environmentalists. In 1998, the group presented its formal recommendations, including, among other things, the restoration of between 95,000 and 103,000 acres of tidal marsh (originally, the Bay supported 187,000). Ideally, the team opined, the new tidal wetlands would take the configuration of large chunks of marsh (2,000 acres or more), connected by corridors sufficiently large to allow the easy passage of wildlife.

Now it's showtime, and the stage—the South Bay salt pond complex—is being readied for the first performance. No one quite knows what will happen when the curtain goes up, but the excitement levels for players and observers alike are high. With much hoopla, top regional managers opened the screw gates to the Alviso pond system this July in a first step toward long-term public stewardship, allowing the tides to go both in and out of this once closed system and the ponds to stop making salt.

Salt pond restoration has been addressed before in the Bay Area. In the North Bay, 10,000 acres of ponds acquired ten years ago continue to stutter toward the tides. Only a single pond, Pond 2A, has been restored to tidal marsh so far. On another pond, bureaucrats and environmentalists remain at odds over how to remove bittern—highly concentrated salt-production residues. As for the rest of the ponds, locals have signed off on tidal marsh restoration for 3,000 acres and infrastructure repair for another 1,700 acres, and construction should begin next year.

Salt pond restoration has a more established track record in the South Bay, and in particular at the Don Edwards National Wildlife Refuge. Founded in 1974 and administered by the U.S. Fish and Wildlife Service, Don Edwards was the country's first urban national wildlife refuge. This 30,000-acre preserve, cheek-by-jowl with the ponds currently targeted for restoration, has grown by bits and pieces over the years; most of the land, not surprisingly, was obtained from Cargill.

While Cargill has maintained salt production rights on many of these ponds, the refuge has restored a few to tidal marsh, a boon to the California clapper rail and the salt marsh harvest mouse, both listed species that have suffered precipitous declines due to tidal wetland destruction. Most notable among the restored tracts is LaRiviere Marsh, a 100-acre demonstration project near the refuge's visitor center. The site was graded to a more natural topography and the levees breached. From that point, the Bay was left to do most of the work.

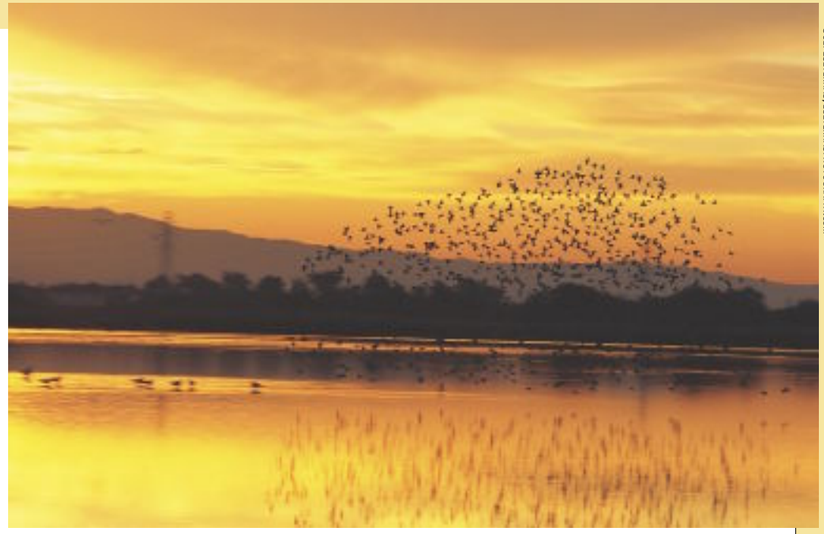
Managers discovered a great deal about restoration from LaRiviere, says refuge chief Clyde Morris. And yet, much remains to be learned. And the first years of the surrounding salt pond restoration effort, he intimates, will be a groping toward enlightenment.

"This isn't going to be a matter of devising a full-blown strategy and then executing it all at once," Morris says. "For the first few years, everything will be strictly pilot projects. We're going to be monitoring the hell out of them, and applying the lessons we learn on an ongoing basis. Will it be challenging, even difficult? Yes. Can it be done? Yes."

Morris notes that Don Edwards Refuge must respond to a number of different imperatives and he is convinced the South Bay salt pond restoration effort will have to dance to the same multiuse tune. Given the way things are shaking out, he estimates the final configuration of the South Bay project will run to about two-thirds restored marsh to one-third managed ponds, with a wide range of subhabitats incorporated in the edge zones.

"We need the salt marshes, not only for our listed species, but also for their function as fish nurseries and pollutant filters," he says. "On the other hand, ponds managed for wildlife—not salt—are essential to our shorebirds."

Shorebirds, in fact, constitute the main argument for resisting the temptation to convert all the ponds into tidal marsh. Research by ornithologists, including Sarah Warnock, a biologist for the Point



Suzi Eszterhas, eszterhasphotography.com

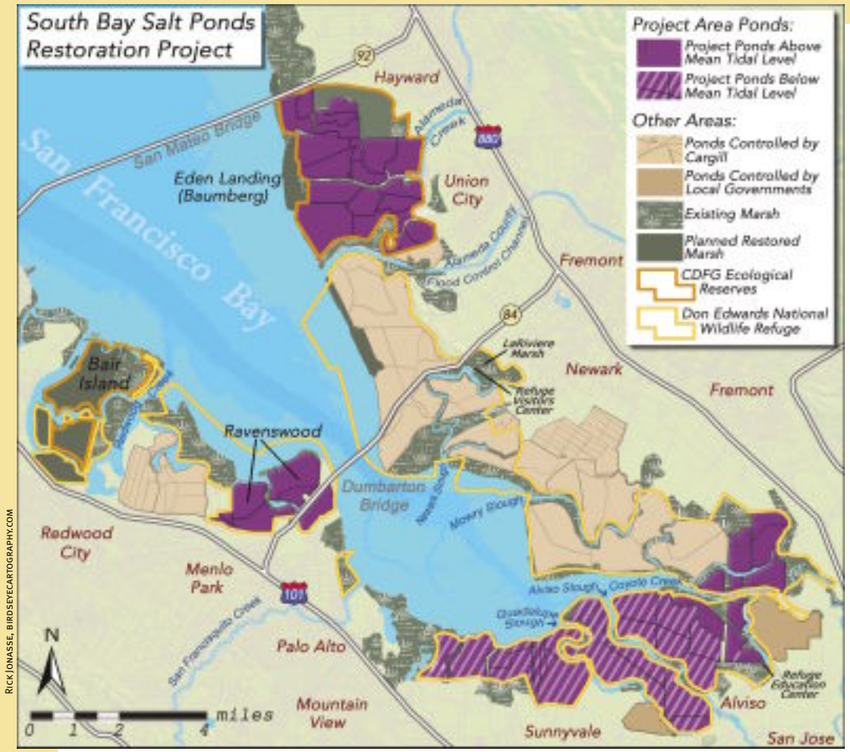
Sunset on a salt pond in the Don Edwards San Francisco Bay National Wildlife Refuge in Newark. These ponds are essential habitat for a variety of shorebirds, including the dunlins and western sandpipers in this photo.

(previous page) Tidal marshland along Guadalupe Slough in 1857, as rendered in a new GIS data set based on the historical United States Coast Survey maps of the South Bay. The image, covering about 500 acres, highlights the complex tidal channel networks and marsh ponds characteristic of large natural tidal marshes. The blue represents water; the green is vegetated marsh plain. *Courtesy San Francisco Estuary Institute.* (Inset) Aerial view of red salt ponds. © *Herb Lingl, aerialarchives.com* «» (below) Aerial view of the South Bay salt ponds, looking north. The town of Alviso is in the lower left, along Alviso Slough. Guadalupe Slough is to the left, Coyote Creek and Mowry Slough to the right. The ponds south and east of Coyote Creek are included in the restoration process; the ponds to the north are being retained by Cargill. The differing colors of the ponds indicate different stages in the evaporation process. The red ponds along Mowry Slough have the highest level of salinity; the color is caused by the algae, microbes, and brine shrimp that thrive in these conditions.

Saul Chaikin

Suzi Eszterhas, eszterhasphotography.com

Biologist Sarah Warnock holds a western sandpiper that has been captured at a study site at a decommissioned salt pond near the Coyote Hills. After catching the birds in mist nets, biologists attach tiny color-coded leg bands that allow identification from a distance. The study will contribute to a data set that tracks the migration patterns of these diminutive shorebirds through various refugia along the Pacific Coast.



RICK JONASSE, BIRDSEYECARTOGRAPHY.COM

Reyes Bird Observatory, indicates the ponds are not merely convenient habitat for shorebirds; they are absolutely essential.

The ponds, says Warnock, provide critical foraging habitat and shelter for at least 20 species, but western sandpipers are particularly dependent on them. In spring, she observes, their numbers on the ponds can swell to 700,000—a significant percentage of the population on the Pacific Flyway, a critical migratory route. One of the compelling reasons to study western sandpipers is that they're a keystone species, says Warnock; their numbers say a lot about shorebirds and their habitats in general.

The ponds are of particular importance to shorebirds in the winter. During big storms, Warnock says, the birds are driven off their foraging grounds in more exposed locales. Back before the West Coast's tidal areas were subjected to dredging, siltation, development, and other indignities, there were sufficient expanses of flats situated leeward of wind and weather to protect the bulk of the sandpiper population. Now, in California at least, the salt ponds are about all that's left of this unique "storm shelter" habitat.

Birds, wildlife, and fisheries stand to be the big beneficiaries of the restoration, of course, but there are other constituencies with stakes in the Baylands. And if the project is to succeed, say its supporters, their concerns must be addressed. Recreation is a case in point.

"These restored lands will be an oasis in an urban landscape, a tremendous source of solace for many people," says Morris. "So providing access is extremely important: We have to determine appropriate uses, and make sure the opportunities to pursue them exist, whether it's bird-watching, bicycling, fishing, or duck hunting."

Flood control is also a hot-button issue for the South Bay wetland project. In the past, the ponds have provided low-lying communities like Alviso protection from inundation. "If you completely eradicate the flood control component, you have a no-starter for restoration," Morris observes. "You simply don't want to contribute to flooding in Alviso—that's a basic reality." But if some of the ponds are configured with flood control and marshes in mind, he says, they can be managed as both wildlife habitat and de facto bypasses, where flood waters and exceptionally high tides can sheet out rather than swamping houses, offices, and communities.

There are other challenges to meet in restoring these ponds, among them exotic species. The Bay is hardly a pristine system. Hitchhiking opportunists from around the globe have displaced indigenous species. Oyster drills, Manila clams, and Asian clams have supplanted native mollusks. Mitten and green crabs are competing with hometown Dungeness and red rock crabs. In any restoration scenario, exotics constitute a potential wet blanket.

Among Morris's most significant concerns is the eastern red fox, a canid that is far more disposed than the smaller native gray fox to forage in wetland areas. When the red foxes come in, the rails disappear, he observes.

More problematic than the fox, even, is Atlantic cordgrass—*Spartina alterniflora*—and its numerous hybrid forms. It differs from the native West Coast cordgrass, *Spartina foliosa,* in its exuberance. Western cordgrass more or less stays put, but Atlantic cordgrass is almost metastatic in its growth. Planted in San Francisco Bay in the mid-1970s as part of an early restoration project, it has the potential to turn the entire intertidal zone into an unruly and biologically impoverished greensward.

One of the challenges to restoring populations of endangered native species in tidal wetlands is the presence of the eastern red fox, an exotic species seen here feeding on a California clapper rail.

COURTESY U.S. FISH & WILDLIFE SERVICE

PHIL ROBERTSON

Bicyclists on the Bay Trail near Pond A12 in Alviso ride by the clamshell dredge used by Cargill to maintain the salt pond levees.

"It grows so densely that it chokes off the little dendritic sloughs that characterize our native cordgrass and pickleweed marshes," says Marc Holmes, the Bay restoration program director for The Bay Institute, based in Marin. "Clapper rails, particularly, need that slough environment; it's their primary habitat."

Once Atlantic cordgrass gets established, warns Holmes, aggressive—indeed, virtual scorched earth—tactics are required to remove it. "We're talking about significant spraying and excavation," he says. "Half measures won't work." On the plus side, project planners are taking the spartina threat seriously indeed. A special program, the Invasive Spartina Project, has been funded to deal with it.

Morris emphasizes that any control program must be considered open-ended: "Controlling exotics will be an ongoing process. Once they get into a system, it's unlikely you'll ever wipe them out completely."

Then there is the problem of mercury methylation. South Bay sediments are distressingly rich in mercury, in large part the result of a now-decommissioned cinnabar mine on the upper reaches of the Guadalupe River. Research has demonstrated that wetlands can augment the "methylation" of mercury. That's because bacteria convert elemental mercury, which is generally inert, into methylmercury, a form that insinuates itself into living tissue with potentially catastrophic results. Microbe populations typically are higher in wetlands than open water, causing some concern that the restoration might increase the release of bioavailable mercury into the environment.

Lynne Trulio, the lead scientist for the restoration project and the chairwoman of the environmental studies department at San Jose State University, says more research needs to be done on the methylation process and then integrated into the restoration plan. But she doesn't expect mercury concerns to utterly derail wetland restoration around the Bay, a possibility that has occasionally been bruited about in the press.

"Personally, I want to see an overall improvement in ecological functioning in the South Bay, and I think we're heading in that direction," Trulio says. "We know we don't know enough about the restoration process; that's why the first phase essentially will consist of pilot projects, intensive monitoring, and collecting data."

A key element to restoring marshlands is sediment. Many of the ponds have subsided deeply through their years of salt production, some up to 10 feet below natural marsh elevations. Turning those impoundments from lakes to marshes will require vast amounts of clean fill. Why? In the simplest terms, mud and silt are needed to fill some ponds, to bring their bottoms closer to natural marsh levels. Otherwise, they'll simply stay deep bodies of water; plants won't grow and the ponds will never become marshes. And it's not clear if there's enough mud to go around. Millions of cubic yards of the stuff are needed.

"There have been conflicting predictions of the amount of sediment available to the system from both natural and artificial sources," observes Michelle Orr, an engineer for the San Francisco hydrology firm of Philip Williams and Associates. Orr is charged with figuring out the best way to move water and sediments through the project area. She must figure out where to breach levees so restoration goals are achieved in the most efficient way possible.

Some sediment will be available for artificially raising the levels of some of the shallower ponds, Orr says, but importing large quantities of sediment is prohibitively expensive. Most of the sediment for the project will have to come in on the tides through levee breaches, and researchers are now calculating just how much sediment they may get from this natural source. But even then, there is not enough to realize a complete tidal marsh restoration scenario. The ponds that are lowest are unlikely to become tidal marshes. Deep ponds they are, and deep ponds they'll probably stay—inappropriate habitat for clapper rails or western sandpipers, but diving ducks like canvasback, redhead, and greater scaup will be pleased.

Orr is working on a restoration scheme that will encourage the mud to migrate where it's needed. "The restored ponds will become a new tidal sink for sediment," she says, "but it won't happen overnight. Time is an extremely important element in this process. For some of the subtidal areas, it will take years, decades even, to transform them from shallows and mudflats into vegetated tidal marsh. But that isn't necessarily a bad thing. As the restoration proceeds, we'll be providing a *(continued on page 32)*

Another exotic species that poses a serious challenge to wetland restoration is *Spartina alterniflora* and its many hybrids, which grow aggressively in expanding rings, colonizing mudflats and other marsh habitats.

STEPHEN JOSEPH, STEPHENJOSEPHPHOTO.COM

ONCE AND FUTURE BAY

Lessons from history for *revitalizing the Bay*

by Robin Grossinger and Peter Baye • design by Ruth Askevold

How relevant is the historical South Bay landscape to modern wetlands management and restoration? Are the Bay's native habitats simply like the Pleistocene megafauna—museum display material, interesting perhaps, but gone for good, with no place in a modern urbanized estuary? Or are they a key to true restoration of natural estuarine communities and ecosystems, the clues to a diverse South Bay landscape, the habitats that will make our restoration efforts produce more than generic, monochromatic parcels of pond or pickleweed? Do they even perhaps provide practical models for reconnecting human culture to the Bay waters lapping at the feet of our cities?

In the following pages, we illustrate a former and hidden landscape, concealed from view by its rarity yet in many ways poised to return. These subtle patterns are revealed through a combination of historical research—analysis of early maps, photographs, written materials—and present-day field observation. Together, these lines of investigation confirm both remnants and reassertions of the historical landscape. Most important, this perspective reveals natural, persistent relationships between habitats and physical processes—salinity gradients, tides, wave energy, groundwater emergence—most of which remain intact in some form today, ready to reassert themselves with a little help. In effect, these patterns "fit" the South Bay landscape into its physical setting, creating the context for diverse plant and animal species and for the human activities that have shaped Bay Area culture for several thousand years.

Background map from U.S. Coast and Geodetic Survey, T-2252, 1896, courtesy NOAA.

FORGOTTEN HABITATS of the SOUTH BAY

FRESHWATER ECOTONES

It's easy to forget that the saltwater tides weren't the only source of water to the bayshore marshlands. In fact, one of the major causes of the diversity of the historical South Bay landscape was the influence of local freshwater creeks. Major creeks delivered sediment from local watersheds for marsh development and created ecological gradients of fresh-to-brackish-to-salt marsh at creek mouths—habitats that have been almost completely lost. Away from the larger creeks, fresh water entered the marshlands through seeps, springs, and overland flows during floods, creating dramatic variations in marsh form and ecology. While the freshwater flows from local watersheds have been heavily constrained, there are still numerous sources of fresh water to the South Bay—from flood control channels to treated sewage effluent—that could be redesigned to support natural ecotones.

In a few places, large creeks connected to major sloughs. Alameda Creek joins the marsh at Union City in 1857 (left), and lower Coyote Creek, circa 1905, flows toward the creek's juncture with a tidal slough (below).

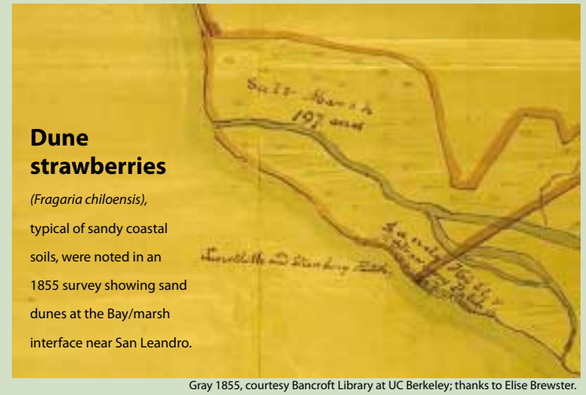
But most South Bay creeks historically spread into seasonal wetlands adjacent to the marsh. Creeks near Burlingame fan out onto the alluvial plain in 1896 (above).

Map of Alameda Creek from U.S. Coast Survey, T-635, 1857, courtesy NOAA; photo of Coyote Creek by Alice Iola Hare, circa 1905, courtesy Bancroft Library, University of California, Berkeley; portion of USGS 1896 San Mateo map courtesy Earth Sciences Library, University of California, Berkeley.

Thanks to Matthew Booker, Tom Burns, Josh Collins, Chuck Striplen, and Trish Mulvey. SFEI research on the historical South Bay has been supported by the Alameda County Flood Control and Water Conservation District, City of San Jose, Santa Clara Valley Water District, and the U.S. Fish and Wildlife Service San Francisco Bay Program.

BEACHES

Variations in wave energy, shoreline orientation, and subtidal substrate led to discrete patterns of sand beaches, sandy marsh edges, and oyster shell beaches around the South Bay. The sandy beaches at the northern end of the South Bay were habitat for many plants specific to sandy marsh edges, including several that are now regionally extinct along the Bay shore, such as the dune strawberry (see right). Commonly located at the bayward edge of wide marshes, the beaches provided safe haul-out sites for harbor seals and may have been important nesting habitat for the now-endangered snowy plover. One South Bay beach, at Coyote Point, is still popular with swimmers today. And the beaches continue to come back, re-forming themselves at the Bay's edge.



Dune strawberries *(Fragaria chiloensis),* typical of sandy coastal soils, were noted in an 1855 survey showing sand dunes at the Bay/marsh interface near San Leandro.

Gray 1855, courtesy Bancroft Library at UC Berkeley; thanks to Elise Brewster.

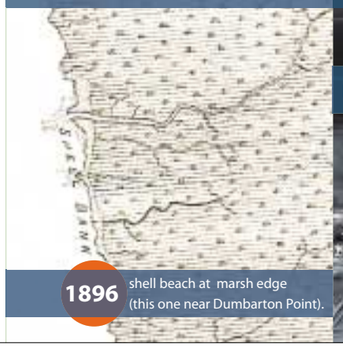
The beach-dune complex mapped in 1855 (above right) is now the mouth of a flood control channel. However, a similar habitat returned nearby, just south of San Leandro.

Sandy bay beaches and sandy salt marsh edges were the historic habitat of California sea-blite *(Suaeda californica),* an endangered species that became extinct in S.F. Bay. Its experimental reintroduction has begun, but successful recovery depends on restoring bayshore beaches, its obligate habitat.

Peter Baye

Left to right, from U.S. Coast and Geodetic Survey, T-2353, 1896, courtesy NOAA; photo by George E. Russell, circa 1920, courtesy California State Lands Commission; photo by Peter Baye.

Despite a century of being mined from the Bay for cement production, oyster shell fragments continue to wash up on the bayshore, creating shell beaches like the one below in Foster City.



1896 shell beach at marsh edge (this one near Dumbarton Point).

1920s cement factory on the Redwood City marshes processes shell deposits.

2001 shell beach near Foster City.

FORGOTTEN HABITATS

of the SOUTH BAY

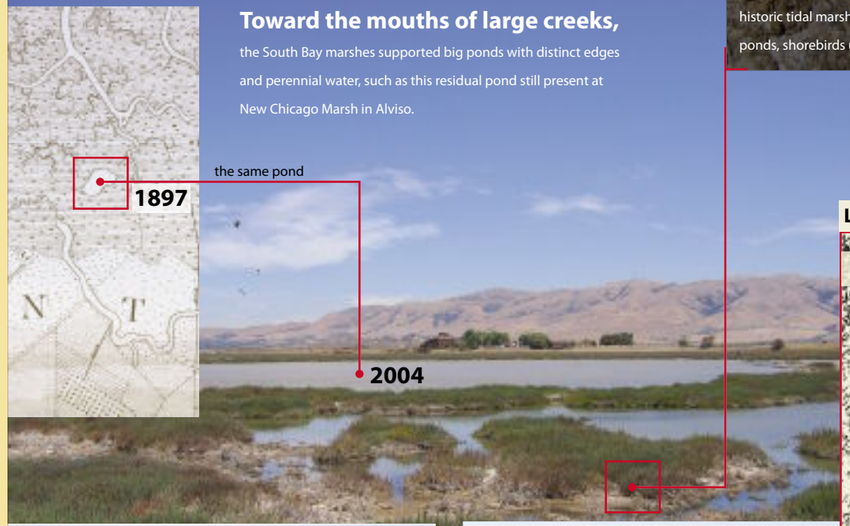
More than *pickleweed and cordgrass*

SALT PONDS, *SALINAS*, AND MARSH PANNES

A dominant feature of the South Bay marshlands was the thousands of shallow pannes and *salinas* gracing the vegetated plain. *Salinas* were the largest of the natural pondlike features; smaller pannes were found in the marsh interior. Together these features supported waterfowl, shorebirds, and, at their edges, distinctive plant communities—sometimes in the same place at different times of year.

Map below from U.S. Coast and Geodetic Survey, T-2313, 1897, courtesy NOAA; photos by Robin Grossinger.

Bird tracks and salt crystals at the historic tidal marsh pond below. Prior to the artificial salt ponds, shorebirds used the natural ponds of tidal marshes.



Toward the mouths of large creeks, the South Bay marshes supported big ponds with distinct edges and perennial water, such as this residual pond still present at New Chicago Marsh in Alviso.

Brackish tidal marsh pond, at Limantour Estero (Point Reyes), is analogous to ponds that could return toward the freshwater end of local salinity gradients.

Peter Baye

Ponds cover much of the marsh plain along a tidal slough in Morro Bay (San Luis Obispo County).

Peter Baye

Mature marsh plains are heavily patterned with many plant species. This close-up of a residual historical marsh at upper Newark Slough illustrates a tangle of varied creeping salt-tolerant herbs, saltgrass, and grasslike plants, rather than solid stands of pickleweed.

At the natural, gradual tidal marsh–grassland edge, annual spring wildflowers like smooth goldfields (*Lasthenia glabrata,* shown above from Petaluma) were historically abundant.

Photos by Peter Baye

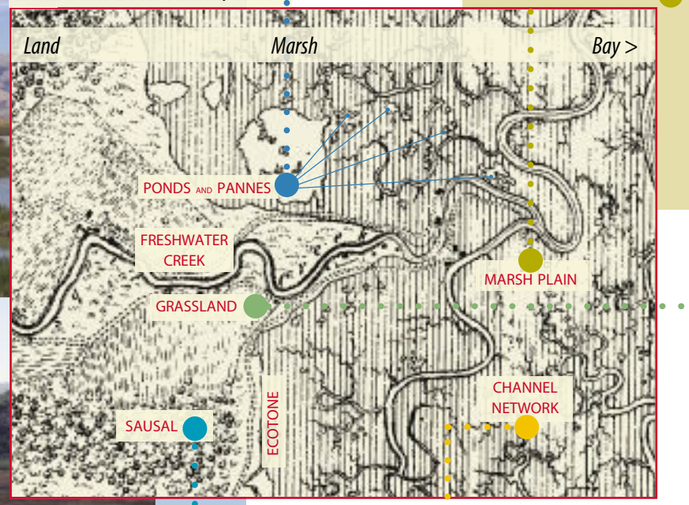
THE DIVERSITY OF THE MARSH PLAIN

While we tend to envision vast, monotypic plains of pickleweed fringed by cordgrass—and have largely aimed for such in restoration efforts to date—both historical and present-day evidence suggests a much more diverse plant community once covered the bay-side marsh plain. Pickleweed and cordgrass are major—but not the only—components of a robust tidal marsh landscape.

Peter Baye

Near Fremont, vernal pool complexes graded into the marsh. While we have only limited remnants of these wildflower rich habitats today, early botanical descriptions reveal a diverse assemblage of species such as *Downingia pulchella,* shown above from marshes near Sears Point.

LANDSCAPE PATTERNS, 1857



From U.S. Coast Survey, T-676, 1857, courtesy NOAA.

GRASSLAND/MARSH ECOTONE

Because the landward edge of the marsh was impacted by Euro-American development so early and extensively, its characteristics have largely been erased from local memory. A rich plant community was found at the terrestrial edge of the South Bay, where tidal marshes graded into low-gradient grasslands and seasonal wetlands.

Peter Baye

SAUSAL/MARSH ECOTONE

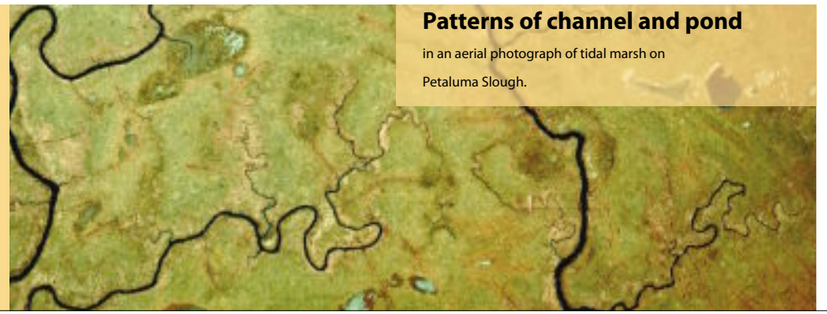
Sausals constitute an important ecological node in the South Bay landscape. These were dense groves of willow trees up to 30 feet high, situated around seeps and springs at the landward edge of the marsh. These groves ranged in size from 10 to 200 acres. Amid wide grasslands and marshes, the *sausals* provided valuable tree cover and riparian habitat for songbirds and amphibians. Today, one of the few residual *sausals* is located near Coyote Hills, where it occupies a small fraction of its historical extent but has expanded in recent years with the return of near-surface groundwater.

From U.S. Coast Survey, T-664, 1857, courtesy NOAA.

CHANNEL NETWORKS

Twice each day the tides pulsed water through 3,000 miles of sinuous South Bay sloughs, ranging from 1 to 1,000 feet wide. Estuarine fish followed the tides to feed in the marsh sloughs. At the highest tides, water spilled onto the marsh plain and refilled the ponds.

Laurel Collins



Patterns of channel and pond in an aerial photograph of tidal marsh on Petaluma Slough.

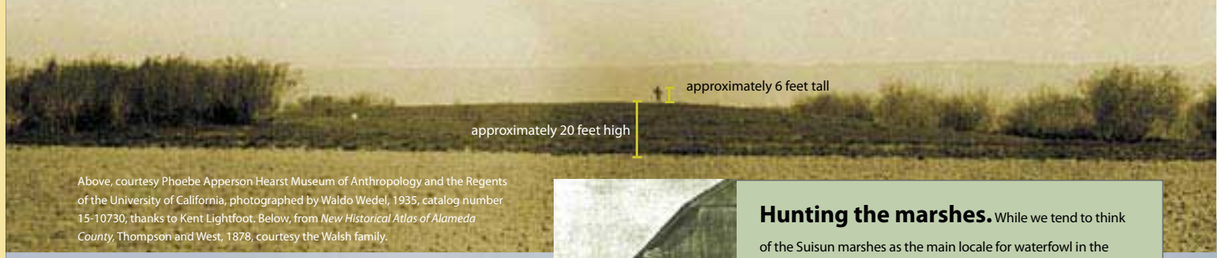
THE LIVING BAYSHORE

Links between *people and the Bay*

Throughout history, people have interacted with the Bay largely through the diverse wetland habitats along its edge. These transitional environments of mudflat, marsh, channel, pond, and beach provided the practical and functional connection between the adjacent valleys and plains—where people live—and the Bay's waters. More recently the Bay has become primarily an open-water landscape, with relatively few of these transitional, human-scale gradients between land and water. With the loss, the Bay has become somewhat of a backdrop, largely inaccessible without a boat, a reliable background image for tourist postcards, picture-perfect views, and "splash-ball" home runs. With these changes and little in the way of locally consumed resources, the Bay no longer sustains a tangible connection to most of the surrounding population. Restoring the South Bay landscape is also about restoring the connections between people and the Bay.

Shellmounds reflect the value of South Bay habitats and species.

These massive mounds of shell, bone, soil, and artifacts were often several stories high, constructed by native peoples largely from Bay resources. Shellmounds tend to be located at the Bay's edge in areas of high ecological diversity; native peoples likely enhanced that diversity through land management practices. The distribution and contents of the South Bay shellmounds provide valuable long-term evidence of how the local indigenous people incorporated the bountiful resources of the Bay into their diet, commerce, and spiritual practices. While ongoing development continues to threaten these historic features, the salt pond restoration process provides an opportunity to reincorporate an understanding of these cultural and ecological landmarks into a restored landscape. Below, a person standing on a shellmound near Coyote Hills in 1935 gives an indication of how vast these features were.



Above, courtesy Phoebe Apperson Hearst Museum of Anthropology and the Regents of the University of California, photographed by Waldo Wedel, 1935, catalog number 15-10730, thanks to Kent Lightfoot. Below, from *New Historical Atlas of Alameda County,* Thompson and West, 1878, courtesy the Walsh family.

Roads follow landings to the Bay.

Historically, the broad marshlands of the South Bay moved vast amounts of water in and out of their channels each day, sustaining large tidal channels that scoured access to the deeper bay. Early landings—Alviso, Union City, Redwood City, Roberts Landing (below, near San Lorenzo)—were usually positioned along these natural access points linking land and water. With the diking of large areas of marshland, the natural channels filled in, but restoration promises to reestablish some of these natural corridors of human movement.

Hunting the marshes. While we tend to think of the Suisun marshes as the main locale for waterfowl in the region, most of the Bay's tidal marshlands were productive waterfowl habitat well into the 20th century. The journal *Overland Monthly* described "hundreds of shooting clubs and resorts… [from] San Leandro Bay down south to Alviso" in 1910, prior to the construction of most of the salt ponds. The several hundred citizens currently identified as members of local hunting clubs are testimony to the persistence of hunting in the South Bay.

Photo of duck hunter from *Overland Monthly,* November 1910, No. 5, Vol. LVI.

ONCE AND FUTURE BAY
Lessons from history for revitalizing the Bay

Salt pond history – *models for reintegration*

The development of artificial salt ponds has resulted in the most extensive transformation of the South Bay landscape. However, salt ponds were—and can be again—a natural part of the tidal marsh ecosystem. While we typically frame restoration options as salt ponds versus tidal marsh, history provides robust examples of their integration, through both natural process and local tradition.

Through the 19th century, salt farming was a small-scale, traditional activity, beginning with the Ohlone people, who harvested salt for local use and regional trade. Only in recent generations has South Bay salt production become a consolidated, industrial operation. Other solar salt harvesting regions around the world maintain popular brands of sea salt that celebrate local history and tradition. Could demonstration salt farming with traditional techniques be a way to reconnect people with the South Bay landscape, through hands-on activities and local products? A "boutique" line of natural S.F. Bay salt? Annual salt festivals celebrating the edible product of our region's salty tides and Indian summer?

From *New Historical Atlas of Alameda County,* Thompson and West, 1878.

Map of Crystal Salt Works from *New Historical Atlas of Alameda County,* Thompson and West, 1878; map of Crystal Salt Pond from U.S. Coast Survey, T-635, 1857, courtesy NOAA.

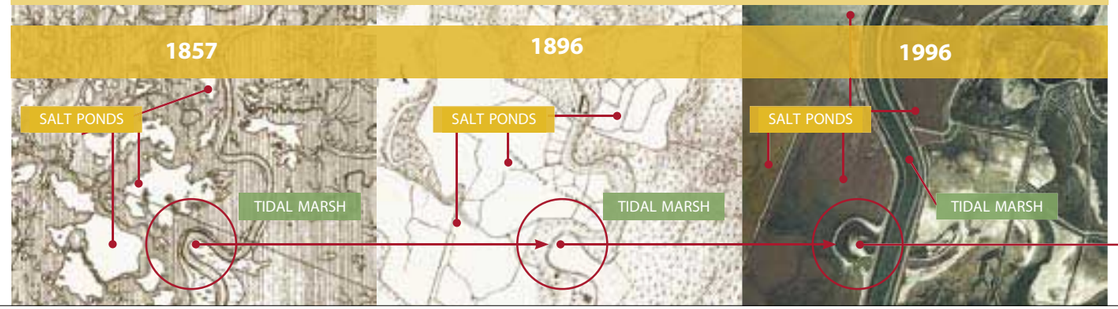
Large historic salt ponds were called *salinas* by Spanish settlers and "hot ponds" by Americans. These broad, open-water areas of the marshland captured water during high tides, which then evaporated during the dry, windy summer months. The salt pond industry expanded from native management of the salt ponds into one of the largest industrial solar evaporation complexes in the world, largely shaping the landscape we inherit today.

The extensive Crystal Salt Pond,
a *salina* covering more than 1,200 acres near Hayward (1857).

Crystal Salt Works
on a natural *salina* near Newark (1878).

From U.S. Coast Survey, T-635, 1857, courtesy NOAA; from U.S. Coast and Geodetic Survey, T-2252, 1896, courtesy NOAA; 1996 air photo courtesy BCDC and NOAA.

Evolution of salt ponds. During the past 150 years, the *salinas* were subdivided and expanded, transforming a marsh with scattered ponds (1857) into ponds with fringing marsh (1996). The smaller, late 19th-century salt works, independently managed at scales of 20 to 1,000 acres, demonstrate an intermediate level of management with a range of ecological and cultural benefits. The historical character and landscape position of these features provide evidence for the integration of modern salt ponds into a diverse South Bay landscape. (The channel meander circled in red provides a common reference point between the images.)



VOICES FROM THE FIELD

BAY ACTIVIST

Florence LaRiviere

When Florence LaRiviere heard last year that 16,000 acres of Cargill's salt ponds had been acquired for restoration, the longtime Bay advocate rejoiced. "This work will start changing the land and the waters back to what they looked like a long time ago. It's very, very heartwarming to me," the 80-year-old great grandmother says. Her voice is soft, but the steely determination and shrewd analysis that have sustained her through more than four decades of grassroots activism come through in her words.

"This is the first time we've had real evidence that we're going to have some changes here," she says, venting frustration over Cargill's continued right to make salt on many lands that are now part of the refuge.

LaRiviere and her husband, Philip, were among those who helped lead the public charge to acquire these ponds and transform them from salt production to their natural state. In the late 1960s, they went door-to-door handing out brochures about the Bay, took classes on tideland ecosystems, and used their new knowledge for lobbying and public education.

Rob E. Hoar

As cofounders of the Citizens' Committee to Complete the Refuge, they embraced an impossibly ambitious dream: returning every open acre of San Francisco Bay shoreline and salt pond back to wildlife habitat. "It has always been a small group," she says of the committee. "But you only need a small group if they know the land and really care about it."

The campaigns of this small group have been phenomenally successful. The LaRivieres have been instrumental in establishing the Don Edwards San Francisco Bay National Wildlife Refuge, protecting Bair Island from developers, and stopping a development planned for Mayhews Landing in Newark. Later, a neighboring 102-acre tract of restored marsh was named in their honor.

Though delighted by the plans for this larger restoration, Florence LaRiviere has no intention of hanging up her activist's spurs. For example, she still wants several thousand acres of salt ponds in Redwood City and Newark not included in the agreement added to the refuge.

LaRiviere attributes her perseverance to the vision of what a healthy Bay could be. "The mayor of Fremont, Gus Morrison, once said we were undaunted by success," LaRiviere says. "It's true. We're never satisfied."

SHRIMPER

Tom Laine

Tom Laine knew the salt ponds long before they were making salt. "I was born here in 1937, and I've been on the Bay since I was five," the Alviso native says. "I know what the Bay is supposed to look like." He remembers the stands of tules and marsh grasses that once screened his little town from the expanse of San Francisco Bay. But by the time Laine entered high school, Alviso had traded its natural wetlands for flood protection and thousands of acres of salt ponds.

As a young man, Laine founded a business behind the new levees. He contracted with Leslie Salt to clear the ponds of trapped fish, then trolled their waters for coral-pink brine shrimp, towing a fine mesh net behind a raft. In nearly 25 years of working these ponds, Laine has netted a phenomenal harvest: One pond yielded 500,000 pounds of shrimp—used for fish bait—in 42 days. "Salt making enhanced my livelihood," he admits.

Phil Robertson

But the ponds nearly suffocated the area's few remaining marshes, says Laine. "Bay water never reached the marsh; it never got flushed." Sediment from local streams piled up, burying the rocky habitat needed by local oysters and leaving the boats in Alviso's yacht harbor high and dry. Even the South Bay's once-brackish waters retreated before the freshwater discharge of local sewage plants.

Now restoration means that many ponds will be returned to tidal play. And Laine is among the stakeholders helping to shape the restoration plan. He's been going to planning meetings for the past year, and intends to keep participating for at least another year or two. "My main goal is, everybody has to be able to use it. And the way it's set up right now, it's a win-win for everybody. The South Bay was once spawning grounds for halibut, striped bass, sturgeon, and smelt, which need brackish water, and they will come back. The birds are going to get to feed their babies on the brine shrimp ponds. The kayakers, walkers, and birders will all get to use it. I say open up the ponds and let the tides take them back."

INVITATION TO A RESTORATION

How to Get *Your Feet Wet*

By Susan Pultz Williams

Planners designing a strategy for one of the biggest wetlands recovery projects ever undertaken in this country—the South Bay salt pond restoration—want to hear what folks like you and your neighbors have to say about it. You may have ideas about how the project can achieve its goals of creating habitats for a rich diversity of birds and animals, bolstering flood protection for low-lying urban neighborhoods and opening up new levee-top trails and wetland waterways for the public to explore. Specifically, you may be picturing a bird-watching blind, a hiking trail, or a kayak launching dock in the marsh close to your home. Or wondering whether the new levees will be as strong as the old ones or if new wetlands will spawn swarms of mosquitoes. Or worrying that sensitive nesting plovers will be disturbed by the increased foot and two-wheeled traffic. Whatever your concerns or questions, restoration planners are ready to share information and to listen.

Tracy Grubbs

Participants at a May 2004 meeting of the Recreation and Public Access Work Group study a map of the salt pond restoration project.

But first, go see the restoration site for yourself. Docent Eileen McLaughlin says that her favorite spot on the Bayfront Park tour is a lookout point where you can see the lush marsh of Mountain View's Greco Island and a salt pond side by side. "Here's where the challenges and opportunities of the restoration are most apparent," she says. Another highlight is a short side trip down to the edge of a salt pond where you can touch or even taste the salt that encrusts the banks, watch brine flies skittering along the water's surface, and spot tiny orange brine shrimp swimming near shore. Those interested in a more virtual tour can arrange for a speaker to give a slide show at their workplace, school, or community center.

Once you're up to speed, you can attend one of any number of stakeholder meetings, work group meetings, and large public workshops. Steve Ritchie, who is managing the restoration project for the California Coastal Conservancy, says, "The most useful thing that folks can do is to make themselves heard."

Now is the time to get involved, as planning for the restoration is under way. The plan will operate on the concept of "adaptive management"; it will be broken down into phases, and the first phase will be much better defined than the later ones. Scientists know very little about how to return a completely transformed shoreline to some semblance of its former marshy self; so, they'll monitor the first restoration phase thoroughly from the start, and the lessons learned will guide work on the later phases.

Once the plan has been completed (scheduled for 2008), you can lend a hand with the actual on-the-ground restoration and maintenance work; there will be far too much of it for paid public employees to handle alone. The project's lead scientist, Lynne Trulio, says that they'll need help planting native grasses and shrubs, weeding out invasive plants, and leading tours. They may also need help with counting birds, testing water quality and overseeing habitat development. In fact, local residents like you will have to be stewards for the marshes, to help them grow and flourish—well, forever.

Courtesy U.S. Fish & Wildlife Service

A group explores a tidal channel in the Don Edwards S.F. Bay National Wildlife Refuge at high tide.

John Cang, johncangphoto.com

A baby avocet walks through a cloud of brine flies on a Cargill salt pond. Restoration planners must keep in mind the habitat needs of shorebirds like this one.

To jump into all this, you'll need to know who's in charge and who's involved in what tasks. That may be a challenge, because there are so many agencies and institutions working on the restoration. As Clyde Morris of the U.S. Fish and Wildlife Service (FWS) explains, "It's a huge project so a lot of people have to be involved. It makes things time-consuming, but it's worth the effort".

Guiding the process is a Project Management Team made up of staff from three lead agencies: the California Coastal Conservancy, the U. S. Fish and Wildlife Service, and the California Department of Fish and Game (DFG). The latter two agencies actually own the salt ponds and are gradually taking over management from Cargill Salt. The conservancy, meanwhile, oversees contracts with all of the consultants, technicians, and scientists.

The team's job is a balancing act, says member Carl Wilcox of DFG. "The biggest problem we face is how to provide public access that's compatible with wildlife habitat. How much access to provide, and where, could become major debates." Another challenge will be to manage the vast amount of scientific research needed to inform the restoration effort. "We have to figure out how much it will cost and where we can get all of that money," says Ritchie.

The team has pulled together a number of expert groups to advise them. Picture the team as the earth and the groups as satellites circling around it and beaming information and ideas back home. The satellites come in three types: government advisers, scientific consultants, and the public.

On the government side, an Executive Leadership Group, made up of heads of the three core agencies on the team, meets from time to time to address stubborn issues. When regulatory disputes arise, an Executive Council, composed of staff from state environmental agencies, advises the team. To engage neighbors, a Local Government Forum pulls in officials from South Bay cities. Paula Bettencourt of Mountain View Community Services says, "The salt ponds are our neighbors. Local elected officials and city staff need to stay in good communication with the team to understand how the restoration will impact their cities."

On the research side, 16 local scientists have been entrusted with ensuring the plan is scien-

Today, Laine's son has inherited the family shrimping business. Despite plans to restore some salt ponds, Laine is sanguine about the fishery's prospects. "We're not going to lose the brine shrimp. Many ponds will remain. As long as you keep the water moving, to bring nutrients in, it's impossible to fish the pond out."

REFUGE VOLUNTEER

Eileen McLaughlin

Julie Kitzenberger

The baylands' swampy smells and power lines are distasteful to many. But to Eileen McLaughlin, Don Edwards National Wildlife Refuge was unknown territory to be explored. This energetic woman started volunteering at the refuge in 1998, going out to closed areas of the refuge on airboats with biologists to help replant native species, and turning up on rainy nights to count salamanders. Her efforts have been richly rewarded by Mother Nature; she's had up-close sightings of gray foxes and "a pair of jackrabbits swimming, their black-tipped ears flat atop their backs, when a high-high tide flooded their marsh."

In addition to helping scientists, McLaughlin gives bird walk tours, trains other docents, and leads the Wildlife Stewards, a group that recruits new volunteers for the refuge. Recently, she has been providing tours of the refuge's newly acquired salt ponds, focusing not on wildlife but on the details of the restoration project. "People are curious about what is going to happen, how soon, and what's going to change about their access to the Bay," she says.

To McLaughlin, the best part of leading refuge walks are what she calls "aha! moments." There was the time when a man who regularly fishes from a local pier came on a tour. Upon seeing one of the salt ponds filled with startling red-orange water, he said "It looks like they've gotten around to adding the iodine again." McLaughlin was able to explain to him that the garish colors are due to the growth of salt-tolerant algae and bacteria, not added chemicals. She also recalls a lifelong South Bay resident saying he had never seen a healthy tidal marsh before being shown Greco Island, the largest surviving tidal marsh in the South Bay, on a recent tour. "It's very rewarding to see people's minds open to new possibilities," she says, and she looks forward to taking people out again and again as the possibilities embodied in the restoration process unfold on the refuge landscape.

Suzi Eszterhas, eszterhasphotography.com

Rob E. Holt

(above) A biologist and research intern from the Point Reyes Bird Observatory head out to a study site on a decommissioned salt pond near Coyote Hills. (right) On July 19, 2004, public officials and members of the press gathered to witness the first step in the salt pond restoration process, the breaching of the levee separating Pond 3A and Guadalupe Slough.

tifically sound. Lead scientist Trulio says, "The science team's role is to identify what we do and don't know and to figure out what we need to know." Trulio adds that a National Science Panel, with seven wetlands experts who have managed large projects in other regions, will oversee the local scientists and "provide a sort of peer review." Finally, various technical consultants will assess environmental impacts and design the restoration.

On the public involvement side there's the Stakeholder Forum. Its 29 members represent community organizations, business interests, environmental groups, and local government. This forum has regular meetings that are open to the public, and also breaks down into work groups on public access, habitat restoration, flood control, and funding.

Members say that participating in a work group takes time but definitely makes a difference. Longtime Alviso resident George Trevino, who has seen his neighborhood under water from time to time, says that the flood control work group brings up lots of information that influences planning, such as how waterways have changed over the years, which levees have silted up and which ones have flooded the most.

The habitat work group has also left its stamp on the plan. Member Melissa Hippard, of the Sierra Club, says that her group persuaded the team to add the least tern to the restoration plan's list of protected species. While the least tern isn't deemed a threatened or endangered species, local birders have noticed its numbers dwindling.

According to the Bay Institute's Marc Holmes, a member of the funding work group, the group's job couldn't be more critical. He says, "We're figuring out how to make a case to Congress and the state for getting the kind of money that other projects—like the Everglades restoration—have gotten. The salt ponds restoration could cost millions every year for decades, so this is a major task."

Next on the agenda is the task of sketching out up to 10 alternatives for the restoration; then, over the next year or so, the project team will zero in on the best one.

A first stab at defining these alternatives will take place in fall 2004. After that, the team will look at the alternatives from every imaginable angle—migratory bird protection, predator control, nuisance species management, sediment availability, and flood protection, for example—to narrow them down to the five or six best approaches. Next, the state and the feds will dissect the alternatives through their formal environmental review process and by late 2005 will suggest a "preferred" approach. During the next two years, engineers will draft blueprints, and the team will dot the i's and cross the t's with permitting agencies. It will also line up enough money to cover phase I at least. Dirt, mud, and water won't start getting moved around in a big way till 2008.

How To Jump In

Take a Salt Pond Tour
Offered twice a month on weekends, docent-led salt pond tours begin at Mountain View's Bayfront Park. Contact Carmen Minch at (510)792-0222, ext. 38, for information.

Attend a Workshop
In spring 2005, the project team will hold public workshops in different cities around the South Bay to let people know where the project is going. Go to www.southbayrestoration.org for dates, times, and locations.

Plunge into the Planning
To really delve into the nitty-gritty of the restoration plan, you can attend the large stakeholder meetings or join one or more small work groups on habitat, public access, flood control, and funding. Go to www.southbayrestoration.org for dates, times, and locations.

Invite a Speaker to Your Community
If you're too busy to attend a workshop or meeting, you can have a speaker present a 30-minute slide show at your school, church, workplace, or club. The speakers bureau is provided through a partnership between the San Francisco Bay Joint Venture and the restoration project. Call (415) 883-3854 or contact cwarner@sfbayjv.org.

Who's in Charge?

California State Coastal Conservancy
The conservancy's mission is to protect the California coast and improve public access to it. In 1998, the nine counties of the San Francisco Bay region were added to the conservancy's mission. The conservancy has provided advice and funding for about 1,000 projects to date, partnering with local governments and nonprofits on everything from constructing short stairways down to the ocean to acquiring oceanfront open space and restoring wetlands.
www.coastalconservancy.ca.gov

United States Fish and Wildlife Service
The Fish and Wildlife Service protects animals and their habitats by acquiring wetlands, fish habitats, bird refuges, and waterfowl nesting lands for restoration. It also manages national wildlife refuges and fish hatcheries, provides technical advice to other government agencies, and oversees compliance with the National Environmental Protection Act (NEPA). In the Bay Area, FWS manages Don Edwards and San Pablo Bay National Wildlife Refuges.
www.fws.gov

California Department of Fish and Game
This agency protects and manages the state's flora and fauna by acquiring land and water rights. It also monitors the activities of other government agencies that could impact wildlife, enforces hunting and fishing laws, and conducts research on rare and threatened native species.
www.dfg.ca.gov

SCIENTIST

Howard Shellhammer

Howard Shellhammer is known as the champion of a very rare mouse. A world expert on the endangered salt marsh harvest mouse, the former San Jose State biology professor has studied these diminutive rodents for over four decades, and spoken out often on their behalf.

Defending the mouse "is a way to defend marshes," Shellhammer says. "Because if the marsh supports this mouse, it will also likely support the California clapper rail and salt marsh wandering shrew, two other species of concern."

Since Shellhammer began studying them in 1961, the mouse's numbers have dwindled at an alarming rate. Small populations survive today in isolated marshes scattered around the Bay. The primary reason for their decline is loss of habitat. Even though they are good swimmers, the mice need a zone of upper marsh thick with salt-tolerant plants in which to take cover during high-high tides. This habitat has been reduced by development and subsidence to strips just a few feet wide on the steep sides of levees.

Sandra Clark

According to Shellhammer, the pending large-scale conversion of salt ponds back to marsh is the potential life raft that could keep the salt marsh harvest mouse—and its complex wetland habitat—alive.

"I hope it will hang on," Shellhammer says. "I'm arguing as much as I can for complete marshes with adequate escape cover for the mice. I'd like to see fairly large marshes with complete habitat zones included in this restoration process. Right now, small populations disappear in bad years and since they are often separated by too much unsuitable habitat the marshes don't get restocked. Increasing the size and connectivity of the marshes would prevent genetic stagnation and increase the mouse's effective population numbers."

Shellhammer says he can finally see the light at the end of the tunnel. "I think of them as the 'once and future marshes.' Once they were much bigger and more complex than today, but I think someday in the future they will be that way again. And as I get older, I get more confident that this will happen."

by Kathleen M. Wong

(continued from page 21)

succession of niche habitats that different species will be able to exploit."

One pilot project that should demonstrate this successional process is Eden Landing, also known as the Baumberg tract, an 832-acre property acquired from Cargill by the California Department of Fish and Game in 1995. Biologists began working on restoration plans immediately after acquisition, says Carl Wilcox, the agency's habitat conservation manager for the Central Coast region. The site, Wilcox observes, is ideal for an initial project: While challenges exist (for one, the epicenter of the exotic spartina invasion lies next door), they aren't overwhelming, and the payoff should be considerable. "Most of the ponds aren't terribly subsided, so we aren't too worried about sediment availability," Wilcox says. "We're going to monitor the whole project closely, compiling data on biological responses that can be used in the larger restoration process."

Research and experimentation are nothing if the results aren't put to good use by the public powers that be. Diplomacy has been described as the art of the possible. Increasingly, it seems the same may be said of ecological restorations. People who become involved in such projects tend to have high ideals, and that's a good thing. But sometimes—no, make that most times—those ideals may be pulling in tangential directions. A good restoration is the axiomatic win-win situation: Everybody gets something. At the same time, it has to be remembered that when everybody gets something, nobody gets everything. Still, in this particular project, many of the stakeholders are getting more than they ever thought possible. Achieving that reality has been quite a dance.

"It's all a matter of trying to balance opportunities and constraints," observes Steve Ritchie. As the California Coastal Conservancy's executive project manager for the South Bay salt pond restoration, Ritchie oversees the entire project.

"In order for this to happen at all, we have to actively engage the public," he says. "We have to solicit ideas and put them on maps. People with different points of view have different anxieties. We have to address them all." Generally speaking, says Ritchie, "The dialogue has been civilized. We're continuing to take pains to make sure people understand they will be heard, that their viewpoints will be incorporated to as great a degree as possible."

Within these constraints of basic public acceptability, he adds, it is essential that the restoration be driven by science, not narrow constituencies. Such an ambitious project, Ritchie emphasizes, amounts to a launch into the unknown. The target is clear: a healthier, cleaner, biologically richer Bay. But at this point, the trajectory parabola is uncertain. The only sure thing is that it will take a great deal of work, a ton of money, and a significant quantum of time to reach the destination.

"As we change the landscape, we have to track the results of our actions so we can replicate desired effects and avoid undesired ones in the later stages," Ritchie says. "We're all going to learn as we go. And that means we'll all be learning for many, many years."

The Writers:

Biologist **Peter Baye** has studied coastal vegetation in the United States, Canada, and Britain. Currently a private consultant, he has also worked for the U.S. Army Corps of Engineers on environmental assessments of North and South Bay salt ponds and for the U.S. Fish and Wildlife Service on regional wetlands planning and endangered species recovery.

Robin Grossinger directs the Historical Ecology Program at the San Francisco Estuary Institute, where he studies the transformation of California landscapes since European contact. His current research focuses on support for wetlands and creek restoration in the South Bay, Rodeo Lagoon, the Napa Valley, and the Santa Clara Valley.

Glen Martin, an environmental reporter for the *San Francisco Chronicle,* regularly covers wetland and fisheries issues. His work has appeared in numerous magazines, including *Audubon, Discover, Science Digest,* and *Outside.* He also wrote National Geographic's *Guide to Wildlife Watching.*

Susan Pultz Williams is a freelance environmental writer who regularly covers wetland and water issues for publications such as *Estuary.* She previously worked as a planner for the Metropolitan Transportation Commission.

Ariel Rubissow Okamoto is a Bay Area freelance writer and editor who has covered restoration science and the San Francisco Bay estuary for many years. She was managing editor of *Estuary* for ten years and edits reports for CALFED Bay-Delta Authority. She also created the first guidebook on the Golden Gate National Recreation Area (reissued by Golden Gate National Parks Conservancy in 2004).

Kathleen M. Wong grew up next door to the San Francisco Bay National Wildlife Refuge and then became a science writer specializing in natural history and the environment. She is currently a senior editor at *California Wild,* the magazine of the California Academy of Sciences.

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The Coastal Conservancy is a California state agency that acts with others to preserve, protect and restore the resources of the California coast and San Francisco Bay. Our vision is of a beautiful, restored and accessible coastline. For more information, visit www.coastalconservancy.ca.gov and www.southbayrestoration.org.

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Bay Nature and the ***Don Edwards San Francisco Bay National Wildlife Refuge*** are sponsoring a hike to visit several salt ponds and wetland restoration areas on Saturday, October 30. We will meet at the Refuge's Environmental Education Center in Alviso at 10 a.m. For details, visit the Upcoming Events page at www.baynature.com.