

# CALIFORNIA Waterfront Age

Spring 1989

Vol 5 No 2



## **Guidelines for Contributors**

*California Waterfront Age* is glad to consider contributions of articles and shorter items related to the California coast, and especially to its waterfronts. We aim to provide a forum for the description and discussion of public programs and private initiatives relating to waterfront restoration and development, coastal resource management, and economic development.

We will consider articles of up to 3,000 words on the following subjects:

1. Economic development, project finance, waterfront restoration, the impact of changing uses.
2. Land-use conflict resolution.
3. Water quality, resource restoration, enhancement.
4. Maritime industries.
5. Tourism, waterfront parks, public access.
6. Environmental education and occupations.
7. Cultural and historical issues.

We will also consider the following shorter features:

**Conferences:** We publish announcements and summaries of waterfront-related conferences.

**Book reviews:** We seek relevant reviews, about 500 words long, of current books and other publications of interest to our readers.

**Essays:** Reflections on themes related to waterfronts are welcome. They can be verbal, photographic, graphic, or in cartoon form.

Interested contributors should call or write the editor. Send self-addressed stamped envelopes with submissions.

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To receive *California Waterfront Age*, or for information on the programs or projects of the State Coastal Conservancy, please send a note with your name, organization, address, and affiliation (civic group, government agency, consultant, development/financial, maritime industry, other) to:

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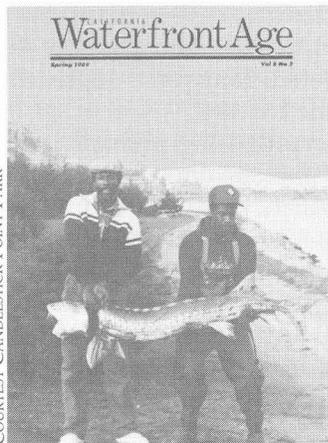
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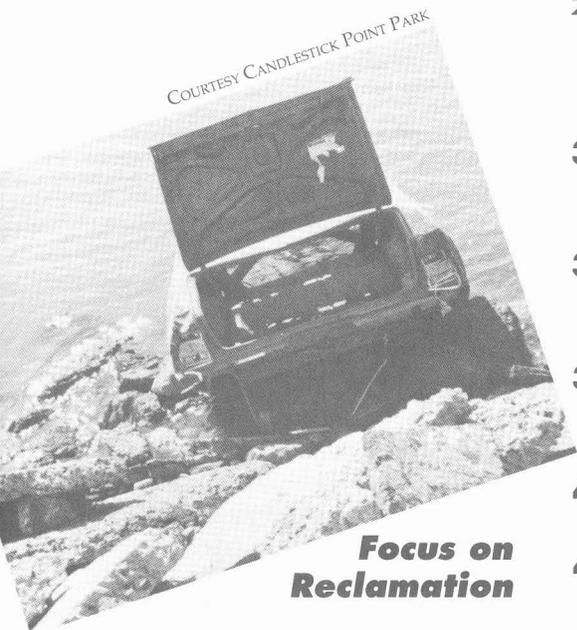
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This fabulous sturgeon really was caught off Candlestick Point, in 1985.



COURTESY CANDLESTICK POINT PARK

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## **From the Executive Office** by Peter Grenell

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**T**his issue of *California Waterfront Age* looks at two forms of recycling: use of treated waste water for wetland enhancement and reclamation of urban dump sites for public recreational use. We are beginning to confront the environmental consequences of the technologies we have used for so long and with such exuberance to create our version of the "good life." Improvements in the "quality of life" based on the economies of mass consumption are coming up against distinct limits. Our waste problem has begun to look unmanageable.

The pressures that continue to drive development that destroys our natural resources also push us to seek quick solutions to problems we can no longer ignore: wastewater disposal, for instance, and the need to provide "breathing room" for urban populations. One imaginative but uncertain approach to the first of these problems is to channel treated waste water (formerly known as sewage) into urban marshes. It is an option under consideration in Santa Rosa, a rapidly growing city that epitomizes the predicament we increasingly find ourselves in as a society and a civilization.

Santa Rosa must choose among unpalatable alternatives. Shall it run its effluent into the ocean or into San Francisco Bay? Shall it spend even more money for better (in technical jargon, "tertiary") treatment, or shall it limit its own growth? One proposal would channel sewage into one of the most beautiful and pristine estuaries on the Sonoma coast, the Estero Americano, which the Coastal Conservancy has been helping county agencies and citizens groups to restore. Another would put treated effluent into a marsh that would flush into the Bay and, in the process, provide some benefits to wildlife. This solution has only a limited capacity, however, and may require eventual growth limitations.

In view of our still rudimentary knowledge of wetland ecosystems and the impacts of treated sewage on them, the use of marshes as wastewater recipients appears to be more of a crisis response right now than a well-considered, long-term approach to a systemwide concern.

More promising, perhaps, is our reclamation of garbage dumps and landfills for use as public parks. Several successful examples exist, and some are described in this issue. These efforts are akin to the reuse of old strip-mining areas, quarries, and similar despoiled natural areas, and as such, should be promoted where possible. Here too, however, utmost caution is required. We keep discovering how little we still know about the hazards we thought we had buried and keep confronting again.

Buckminster Fuller's "Spaceship Earth" metaphor made clear years ago that we must continue to find new uses for everything we produce on this planet. In small, inadequate, but promising ways, we have begun to recycle, to conserve, and to restore.

As we struggle with our overwhelming waste problems, we come to understand that we must attend most urgently to what is now called "source reduction": we must produce less garbage. The streets of Bombay have less litter than many North American cities, a function of both the lack of a large packaging industry for consumer goods (old kerosene tins and newspaper do quite well) and of efficient human and animal scavenging operations. In our own cities, voluntary waste recovery activities recently have emerged, not so much because people's consciences prompt them to recycle as because there are now many immigrants and street people amongst us who collect what others throw away and survive on the proceeds of their efforts.

*Continued on Page 48*

# **Ebb and Flow**

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## **LA County Access Program**

In the first phase of a comprehensive access improvement program to provide new and safer public access to Los Angeles County beaches, the Coastal Conservancy in January authorized up to \$434,000 to the County's Department of Beaches and Harbors to construct six public access ramps at Redondo State Beach and three beach stairways at Nicholas Canyon County Park near Malibu.

Lack of access from an existing service road to the beach at Nicholas Canyon has created hazardous conditions for beach users. At Redondo Beach, beach ramps are deteriorating with slope erosion and heavy pedestrian use.

## **Otay River Valley**

The Otay River Valley in south San Diego County offers an unsurpassed opportunity to create a regional park with a natural riparian corridor, restored wetlands, and a linear trail connecting San Diego Bay with Otay Lake, about ten miles inland. In March, the Conservancy authorized up to \$50,000 to the city of Chula Vista to prepare a resource enhancement plan for the Otay River Valley.

The valley itself has been used extensively for sand and gravel extraction and other industrial purposes. But portions of the river are still bordered by fragments of natural riparian woodland, and small pocket marshes remain, evidence of once extensive wildlife areas. Salt ponds and their dikes in the valley provide some of the most important wildlife habitats in San Diego County. The dikes provide the only known nesting areas in the United States for elegant terns and black skimmers, and also nesting areas for four endangered species: the Light-Footed Clapper Rail, California Least Tern, Snowy Plover, and Belding's Savannah Sparrow.

To preserve and enhance the Otay River Valley's recreational and resource amenities has long been the dream of local citizens, elected officials, and agencies. The Otay River Valley resource enhancement plan will be a cooperative planning effort with active involvement by the cities of San Diego and Chula Vista and the county of San Diego. The plan will recommend development strategies to facilitate private development while minimizing impacts to natural resources, identify areas for habitat restoration and enhancement, and recommend public recreation and access improvements that would be compatible with development and habitat constraints.

## **Venice Pier**

Also in March, the Conservancy authorized up to \$30,000 for an engineering feasibility analysis for the Venice Pier, a popular fishing pier located on the most frequented beach in Los Angeles, in the heart of the metropolitan area's main beach recreation area. The pier has been closed for two years.

In the past year, the Conservancy has worked with the city of Los Angeles to evaluate pier restoration, repair, demolition, and replacement. The Conservancy and the city Department of Recreation and Parks jointly sponsored a public workshop on the pier in September 1988. More than 150 people attended to testify about their preference for various pier alternatives. The city will undertake an engineering analysis of the pier structure and evaluate the cost and feasibility of restoration alternatives. Joint funding of the engineering analysis by the Conservancy and the city is the best possible way of ensuring that both local and state goals are met in the evaluation and development process. A comprehensive engineering feasibility study is needed to identify options

for pier restoration and to provide accurate cost estimates. If the proposed engineering analysis determines that restoration is unfeasible, it is expected that the pier will be demolished.

### **Marina Dunes**

The Conservancy has authorized up to \$100,000 to the Monterey Peninsula Regional Park District for the acquisition of a 7.13-acre accessway site through the Marina Dunes in the city of Marina, Monterey County. This opportunity purchase will open the northern half of the 812-acre Marina Dunes to public access and serve as a catalyst for resolving other land use issues in the dunes.

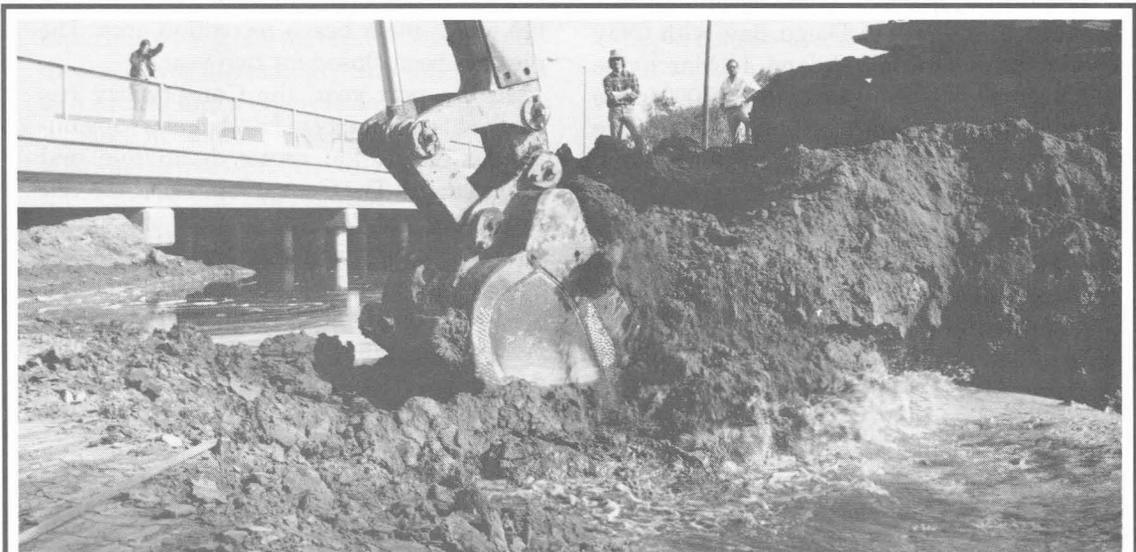
This area has historically been used for sand mining, and public entry was restricted. The Marina Dune Coastal Restoration Program, funded in part by the Conservancy, has generated considerable interest in preserving and restoring these dunes, which

provide habitat for five rare and endangered species. Landowners and resource and regulatory agencies have already agreed in concept which areas should be restored, which areas are suitable for development, and how restoration will be financed. However, it has been difficult to find an ideal vertical access point through these dunes that does not conflict with habitat restoration or development. The property to be acquired with funds authorized in January provides the desired access corridor to the sea without disturbing sensitive dune habitats.

### **Soquel Creek Lagoon**

Also in January, the Coastal Conservancy authorized up to \$30,000 to the city of Capitola to prepare an enhancement plan for the Soquel Creek Lagoon. The lagoon has been a focus of the city's recreation-based economy since the development of Capitola as a beach resort in the 1870s. In recent years the lagoon

COURTESY HUNTINGTON BEACH WETLANDS CONSERVANCY



On February 17, bulldozers breached a levee of the Talbert flood control channel in Huntington Beach, allowing the tide to return to 24 acres of historic wetland. The Huntington Beach Wetlands Conservancy is restoring the marsh in a \$488,000 project under contract with the Orange County Flood Control District. The State Coastal Conservancy provided vital technical and financial aid.

has deteriorated, both in terms of its aesthetics and recreational value and in terms of the habitat value it provides. The city and the Conservancy are jointly funding a broadly based plan to resolve conflicts and develop a program to restore the lagoon.

### **Tomales Bay**

With up to \$14,500 authorized in March, the Point Reyes National Seashore Association will construct a trailhead, parking area, overlook, and trail between Highway 1 and the eastern shore of Tomales Bay, just north of Point Reyes National Seashore in Marin County. Because there is no formal access to the "Martinelli" property (now owned by the National Park Service) from Highway 1, some visitors use the hazardous road shoulder and illegally cross adjacent private property. A trailhead with parking area and access trail will provide paved access from Highway 1, and also a gravel parking lot for 12 cars, as required by Caltrans. Parking for the disabled and access to a scenic overlook will be made available. Signs will direct visitors.

This project is the first step in developing a network of trails in West Marin County, as proposed by the National Park Service. Eventually, as funding becomes available, this access trail will be linked to other parts of Point Reyes National Seashore, Golden Gate National Recreation Area, and state parks. The nonprofit Point Reyes National Seashore Association will monitor the facilities for public use.

### **Famosa Slough**

The city of San Diego will prepare an enhancement plan for Famosa Slough as an open space wildlife preserve with up to \$39,000 authorized by the Coastal Conser-



**Scouts raise the flag as the Coastal Conservancy transfers the historic Indian village of Tsurai to the city of Trinidad. The Environmental License Plate Fund made the transfer possible.**

vancy in January. Before buying the slough property, the city of San Diego had approached the Conservancy for help in developing a new enhancement plan to restore the slough and adjacent channel to a brackish marsh environment with tidal action.

Famosa Slough has been the subject of considerable controversy for many years. It is a remnant of a large wetland complex that was dredged and filled to create Mission Bay Park. With few protected tidal marsh habitats in the vicinity, the slough is an important foraging, resting, and preening area for migratory waterfowl and other wetland associated birds. Plans to develop upland portions sparked community debates in the early 1980s and even resulted in state legislation aimed at forging an accommodation between development and preservation interests. The Conservancy's funding of a plan for an open space wildlife preserve is an important step in the city's efforts to acquire and protect the property. □

## Conference Log

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### **Ecological Restoration Conference**

The newly formed Society for Ecological Restoration and Management held its first conference January 16-20 in Oakland, bringing together over 400 scientists, planners, conservationists, horticulturalists, wildlife experts, and others to discuss restoration of ecosystems. The society's diverse concerns range from political and philosophical implications to the scientific and educational aspects of restoration.

One plenary session dealt with attempts to restore forests, prairies, wetlands, dunes, and shrublands throughout the United States. Another debated the effect of fires on the Yellowstone ecosystem. Some speakers argued that human interference through 100 years of fire suppression caused the severe fires of last summer and that continued human efforts are needed to restore the burned area. Others defended the National Park Service's "Let it burn" philosophy, which allows naturally caused fires to burn parkland, except for structures, and provides for no restoration after the fire.

Specialized sessions covered a variety of ecosystem restoration projects. Presentations concerning California included a review of ten years of erosion control and reforestation at Redwood National Park, removal of non-native eucalyptus and restoration of oak woodland in Annadel State Park and Elkhorn Slough, flood control and riparian forest creation on the San Diego River, comparison of the ecological function of a natural and man-made marsh in San Diego Bay, and sand dune restoration in Humboldt Bay.

Numerous presentations addressed restoration projects designed to benefit endangered animal or plant populations. Many speakers had pioneered methods to establish a certain plant or study a particular endangered species. Speakers offered spe-

cific practical advice on successful planting techniques, weed control, erosion control measures, predator control, monitoring and maintenance, and many other field techniques. Costs for various types of restoration, uses of volunteer labor, and funding sources were also discussed. Often such information is never published. Restoration practitioners can exchange their stories of success and failure only at such conferences.

The society is currently soliciting new members and establishing a nationwide directory of restoration projects and the people involved in them. For more information, contact the Society for Ecological Restoration and Management, 1207 Seminole Highway, Madison, WI 53711. (608) 263-7889.

*Laurel Marcus*

### **From Rails to Trails**

Imagine a biking/hiking trail from Cape Cod to Monterey; from the Great Lakes to the Grand Canyon. Imagine thousands and thousands of miles of equestrian, skiing, hiking, and biking trails creating greenbelts all over this country. The Rails to Trails Conservancy has done more than imagine. It points to 2,400 miles of rail trail already in existence in 31 states, including California, and hopes to double that amount by century's end.

The Rails to Trails Conservancy is a national nonprofit organization that offers technical assistance to local governments and nonprofits involved in providing public access trails. Founded in 1985, it has provided direct legal and procedural assistance in the creation of several trails and has held comprehensive seminars for public officials, including one on February 23, in Rancho Cordova, near Sacramento.

This one-day seminar gave extensive coverage to pitfalls as well as opportunities. In what is known as railbanking, when a rail-

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road is about to abandon a particular rail line, local jurisdictions can, if they act really fast, set up a deal whereby the rail corridor can be put to an interim use as a public trail until such time as the railroad needs to use the corridor for a railway again. That need may never come up, of course, so "interim" can mean "forever." The railroad company must be willing to enter into such an agreement, but some that have been are apparently very pleased with the results.

Of course, care must be taken to prevent situations such as the one that occurred recently in Seattle. There, citizens and elected officials were unpleasantly surprised to learn that Burlington Northern Railroad had sold the right of way underlying the long-proposed extension of the 10-year-old, much used, Burke Gilman Trail to a developer with condos on his mind.

Still, in concert with the National Trails System Improvement Act of 1988, which covers the public use of abandoned federally granted rail corridors, railbanking is a very helpful tool in the trail-creating business. The federally granted rail corridors are to be returned to public ownership automatically (according to the abovementioned Act), but the other abandoned lines must be purchased.

This brings up another elegant little twist to this whole idea of rail trails: to finance trail maintenance, or just to raise money, the agency or organization that buys an old railroad right of way can usually lease an underground easement to telecommunications companies for fiber optics lines and other transmission needs.

Finally, people living near these rail trails have found that the local economy is greatly enhanced by trail users. Not only is there the obvious increase in patronage of local markets, cafes, overnight accommodations, and so on, but there is also an increase in property values of homes near popular trails.

Perhaps because the trails are so well used, the feared rise in trespassing, vandalism, and general thuggery muggery has not materialized.

For more information, contact the Rails to Trails Conservancy, 1701 K St., NW, Suite 304, Washington, DC 20006.

*Karen Rust*

### **State's Future Discussed**

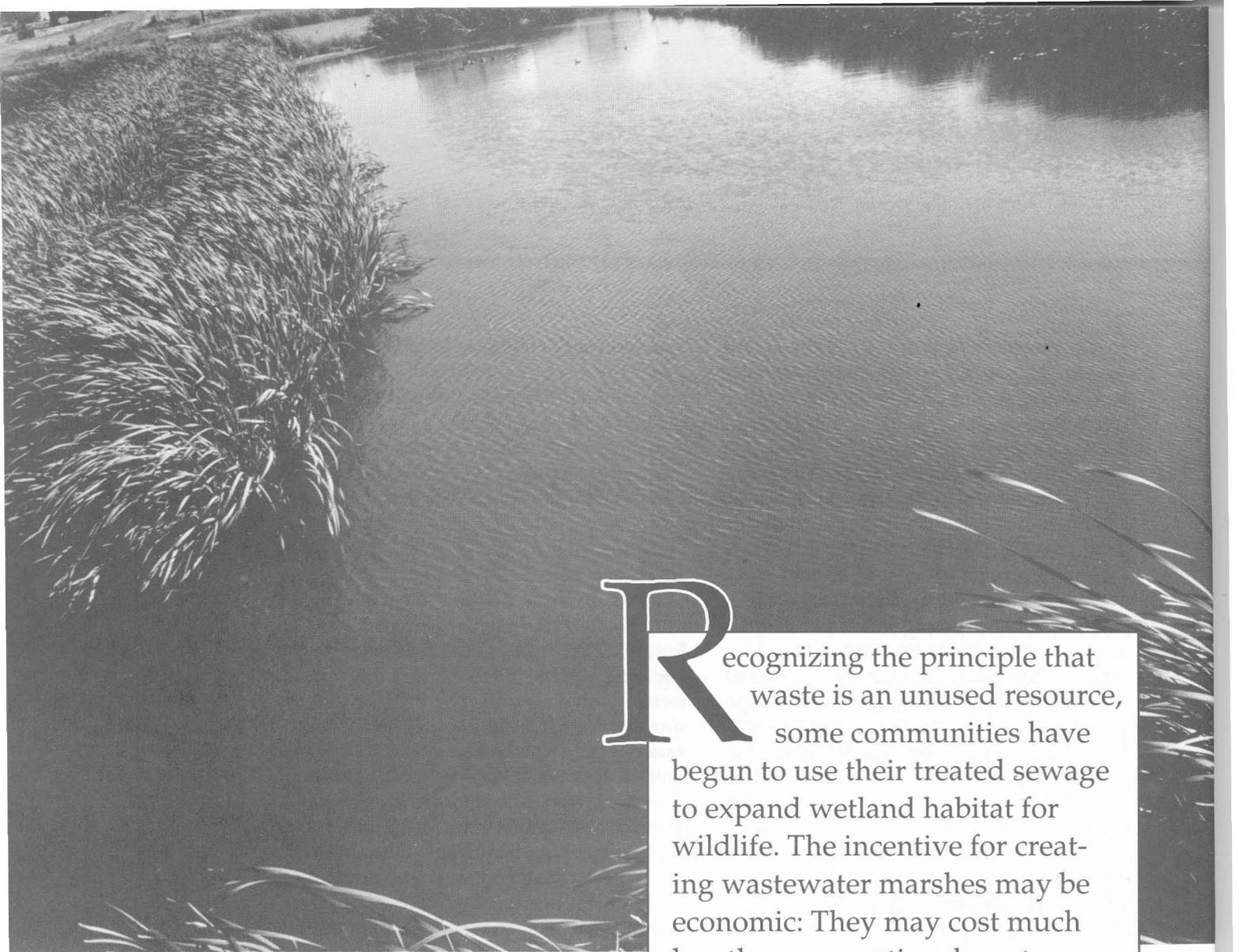
More than 200 participants considered "The Future of California's Environment: Preparing for the 1990s," at the Sixth Annual California Environmental Legislative Symposium sponsored by the Planning and Conservation League and held January 28-29 at California State University Sacramento.

Among topics addressed were urban growth, ocean pollution, coastal protection, ozone depletion, recycling, transportation, toxics, pesticides, and water. Panels were led by teams of experts who work on these issues in California. A lively debate on mountain-lion hunting, moderated by Assemblyman Richard Katz, was further evidence of growing concern and a need for immediate action regarding the protection of the large cat.

The greenhouse effect and its implications for Californians was also discussed. Six experts from all over the state joined to consider anticipated problems and measures to avert damage.

Environmentalists from throughout California got acquainted, discussed ideas, and formulated solutions at the gathering, which its sponsors considered a huge success. Preparations for next year's conference are underway. To be on the mailing list, write to PCL Symposium, 909 12th St., #203, Sacramento, CA 95814.

*Anne Hedges*



**Mt. View Marsh.**  
The pond nearest to  
Shell Oil gas  
storage tanks is  
drained seasonally  
to provide mudflats.

**R**ecognizing the principle that waste is an unused resource, some communities have begun to use their treated sewage to expand wetland habitat for wildlife. The incentive for creating wastewater marshes may be economic: They may cost much less than conventional waste management alternatives such as ocean outfall pipes. The rewards for the effort can be considerable: Francesca Demgen describes three marshes that attract both birds and admiring humans. But, as Michael Josselyn points out, we still know all too little about wetlands. Research and careful management are essential lest we damage our shrinking wetlands in our effort to enhance them.



## Successful Use of Treated Sewage for Wetland

# HABITAT

**O**F THE THREE TYPES of marshes in the San Francisco Bay ecosystem—salt, brackish, and fresh—freshwater marshes are the least common, comprising only about 3 percent of the Bay's wetlands. Here, as on other urbanized bays, these marshes all but disappeared as creeks were channelized into underground pipelines, freshwater inflow was diverted, and as the shoreline was reshaped and diminished with dredging, filling, and development. This has meant the loss of habitat for many types of organisms.

Within the past ten years, a small portion of these lost wetlands has been reclaimed in an unlikely manner: by the use of sewage effluent. Three sewage treatment districts, in Martinez, San Rafael, and Hayward, have taken the bold step of using their treated sewage to create wetland habitat for wildlife. By so doing, they have added 170 acres to a dwindling resource, saved taxpayers much money, and set a pattern that can be emulated elsewhere.

### ***Mt. View Sanitary District***

In 1974, the Mt. View Sanitary District in Contra Costa County began one of the first wastewater wetland projects in the nation. The incentives were financial and political.

The Regional Water Quality Control Board had ordered the district to cease discharging into Peyton Slough because the slough

*by Francesca Demgen*

water was insufficient to provide the required dilution. The board's Bay Basin Plan prohibits discharges into a dead-end slough or a waterway that does not provide an initial dilution of 10:1.

Mt. View, which provides sewage services to about 16,000 residents in a six-mile area, did not like the solution proposed by the Regional Board: pumping to the Central Contra Costa County Sanitary District's plant in Concord. The hookup would have cost taxpayers an estimated \$6.1 million. Moreover, Mt. View's newly built \$1 million secondary treatment facility would have had to be abandoned.

So the district asked its civil engineering consultant, Nute Engineering, to find an alternative. The late Warren Nute looked into the possibility of recycling the treated wastewater to surrounding industries or for free-way landscape irrigation, but found no one was interested. Then Beverly James, Nute's biologist, discovered that an exception to the dilution requirement might be available if the district could show that its discharge into the slough yielded environmental benefits.



When she proposed using the treated effluent to create a marsh beside the Mt. View sewage plant, the district was willing to gamble.

The plant, near Martinez, stands on a site of nearly 100 acres beside Highway I-680, adjacent to the Shell Oil refinery. A portion of the site was tideland before it was diked in

the last century to create grazing land. Across this acreage flows Peyton Slough, a narrow freshwater stream, which originates in a Martinez drinking water reservoir, and empties into the Carquinez Straits. In the dry summer months, effluent constitutes about 90 percent of the slough's flow.

Between 1974 and 1987, the Mt. View Sanitary District created an 85-acre freshwater marsh on both sides of the

slough, providing habitat for shorebirds, ducks, and other wildlife. The 10-acre pilot project was doubled in size in 1977. In 1984, doubling again, it reached its present size. The total capital costs were less than \$150,000, only 2.5 percent of the estimated cost of connecting to the Central plant. The district paid the full amount.

Construction of the wetland was quite simple. During the first phase, which cost only \$4,000, a ten-acre grassland area was divided into two sections, and each was equipped with a weir outlet. The first section was scraped, to become a pond two feet

deep. The second was merely flooded, to allow comparison. Three years later, in 1977, the project was enlarged to 21 acres consisting of six separate ponds, designed to create a mix of habitat types. In 1985, the district added 22 acres of seasonal wetland, which had been deeded by the Shell Oil Company to the Department of Fish and Game. By this time, population growth in the Mt. View District had doubled the volume of effluent flowing into the marsh, and a larger wetland was required for its disposal. The Shell marsh was annexed as it was, with the addition of water control structures to allow it to become a permanent wetland. In 1987, the district purchased 43 additional acres from Shell Oil.

Now 85 acres, the Mt. View Sanitary District wetland complex includes ponds, islands, marshes, a slough, and an area managed for waterfowl food production. The wetland extends on both sides of I-680, a neighbor to Shell Oil's giant oil and gas storage tanks, an unlikely haven for thousands of birds and many other life forms. The success of this project has attracted visitors from other parts of California and even from abroad—hikers, bird watchers, students of nature and photography, and emissaries from other communities struggling with sewage disposal problems.

**T**he District's biologist, Dick Bogaert, has recorded 67 types of plants, 31 species of animals, more than 85 species of birds, and 37 species of aquatic invertebrates. All these plants and animals have found their way here without the help of man. It appears that a stable ecosystem has been created.

Plant life includes 12 species of cattail, bulrushes, and sedges, 10 saline-tolerant species, 29 California natives, and 19 plants that have seeds that waterfowl eat. In addition, the District has planted about a dozen diverse trees along the edges of the marsh.



COURTESY FRANCISCA DEMGEN

**The author immersed in her subject.**



The vegetation provides food, shelter, and nesting sites for animals and in some cases also serves to improve water quality.

Both herbivores and carnivores live in or frequent the wetland: 11 species of mammals, 4 species of amphibians, 4 species of reptiles, 12 species of fish. Among animals that spend their entire life cycle here are mallards, coots, pied-billed grebes, turtles, fish, and thousands of aquatic invertebrates.

**D**uring migration, birds are varied and abundant, indicating that this marsh is a critical link in the San Francisco Bay estuarine system. Of more than 85 species that either live here or stop by, at least 17, including ducks and shorebirds, nest in this wetland. Bogaert and the Mount Diablo chapter of the Audubon Society have identified 15 species of ducks, 32 species of water and shorebirds, 30 songbird species, and 6 species of raptors. As many as 52 great and snowy egrets have fed on small fish in one eight-acre pond section. There are resident populations of normally migratory birds, such as cinnamon teal, pied-billed grebes, and mallard. The wetland apparently meets the needs of their life cycle.

Resident aquatic invertebrates include 8 species of bugs and beetles, 10 species of flies, 7 other insects, 8 species of zooplankton, and 4 species of snails, crayfish, and worms. The volume of invertebrates and the species diversity indicate that the ecosystem is stable. Up to 3.8 pounds per hour of zooplankton, mostly *Daphnia*, have been trapped in the outlet weir of the wetland. This is a considerable volume of food for larger invertebrates, fish, and other animals within the wetland and also downstream in Peyton Slough and the Straits.

The development of the marsh was set back considerably in April 1988 by an oil spill in the midst of the nesting season. A drain

valve left open at the Shell Oil refinery sent 440,000 gallons of crude oil oozing through the northern 65 acres of the marsh, as far as the Carquinez Straits and along 10 miles of Contra Costa and Solano counties shoreline.

Newly hatched birds, saturated with oil, died. A generation of birds was lost. The company's clean-up operations—suctioning and soaking up the oil, removing oiled vegetation, removing soil, disking and dredging the slough—took eight months.

During this time, water was not allowed out of the slough into the adjacent wetland. Monitoring by Fish and Game and consultants should show whether the cleanup efforts were effective and whether various plants and animals will return. According to Bogaert, the migratory duck count was "not much different" than before the spill. This spring, some residual oil remained, and Bogaert expected much more weedy vegetation, a consequence of the disturbances required by the cleanup. But at least on the surface, the marsh had recovered.

This has been a pioneering endeavor. The Mount Diablo Audubon Society has honored it with an award, as has the local division of the California chapter of the U.S. Soil Conservation Service. The San Francisco Bay Chapter of the Water Pollution Control Federation selected the Mt. View District for its



DEWEY SCHWARTZENBURG

**Dick Bogaert with bird-spotting scope.**



Plant of the Year award. Not surprisingly, regulatory agencies have been cautious. More than ten years of planning, construction, expansion, research, hearings, and negotiations were required before the Regional Water Quality Control Board finally granted a permit to the

district to discharge to Peyton Slough. The project was the first of its kind in the state and posed many difficult questions. For instance, Where do waters of the state begin? What water quality parameters may be regulated in the wetland? How

against building an outfall pipe. Instead it put its effluent to use in a 385-acre reclamation complex that includes a 20-acre freshwater marsh, 10 acres of saltwater marsh, 40 acres of storage ponds, 200 acres of irrigated pasture, landscaping, and 3.5 miles of public trails. This cost \$6.5 million, about half the estimated cost of the conventional outfall alternative. The district also spent \$8.5 million to improve its treatment plant. State and federal Clean Water grants paid for 85 percent of these projects.

The 20-acre freshwater wetland, behind the sewage treatment plant north of McInnis Park, is a single unit incorporating multiple habitat types. The perimeter band is shallow water less than two feet deep; the central area is about eight feet deep, with five islands. There is an emergent marsh around the periphery. Because of extensive earthwork during construction of this wetland, vegetation did not colonize all appropriate areas until four years after the project had been completed. Since then, 38 species of plants have become established, ranging from trees to submerged aquatic plants. There are several varieties of fish and small mammals, and birds are abundant.

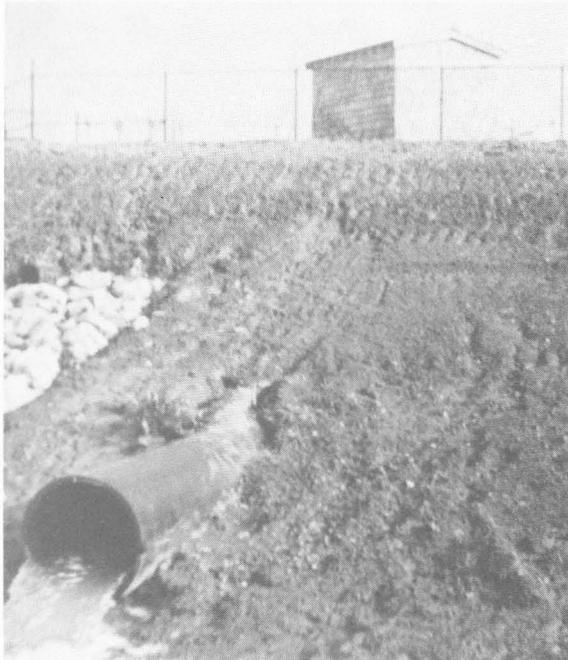
The Marin Audubon Society has recorded 147 species, including the rare Peregrine falcon. It has counted 13 species of raptors; 16 species of ducks; two species of geese; 11 species of herons, grebes, and cormorant; 21 species of shorebirds and gulls; and numerous species of upland birds and songbirds. Avocets and stilts probe in the mud for invertebrates, cormorant dive for carp, mallards eat the seeds of various marsh plants, and hawks hunt for mice and voles, which live on the levee surrounding the wetland.

Four of the five islands are being overgrown by three types of acacias, used by egrets, great blue herons, and black-crowned night herons for roosting. Bare sections of the islands contain skeletal remains of meals eaten by hawks and other predators. Ducks build nests among the tall grasses close to the

much wetland must be created per million gallons of flow? The project prompted the Board to develop a policy and guidelines concerning the creation of wetlands with treated effluent. This policy, adopted in 1979, now guides the development of other wastewater wetland projects, such as those in San Rafael and Hayward.

### **Las Gallinas Valley**

On the other side of San Francisco Bay, the Las Gallinas Valley Sanitary District of San Rafael had an incentive much like Mt. View's for creating a marsh with its effluent. It was under orders to stop discharging treated effluent into Miller Creek or shallow San Pablo Bay during the summer months. Like Mt. View, the Las Gallinas District decided



COURTESY LAS GALLINAS SANITARY DISTRICT

**First treated sewage flows into the Las Gallinas Marsh.**



shorelines of the islands.

The wetland and storage ponds provide a source of fresh drinking water for wildlife in this part of San Pablo Bay. The entire project site allows public access along trails that lead out to the northern edge of the bay. The area is popular with local residents who bike, hike, watch birds, take photographs, and enjoy the sights and sounds of this tranquil haven.

### **Hayward Marsh**

When members of the Hayward Shoreline Planning Agency heard about the process of using treated effluent to create wetlands, they thought it might fit right into their efforts to restore 1,800 acres of San Francisco Bay wetlands. The U.S. Fish and Wildlife Service and the East Bay Regional Park District first introduced the idea of using effluent as a water source for part of the Agency's restoration plan. The design concept was developed with the help of an advisory committee composed of representatives from 16 federal, state, and local agencies, universities, and public interest groups. A decision was made to construct a 145-acre wetland project, with fresh and brackish water, as an ecological complement to the newly restored adjacent 200-acre salt marsh. [See Pages 30–31, Winter 1987 issue of *Waterfront Age*.]

In 1980, the team outlined a preliminary design consisting of five basins separated by levees. More than a year passed before a potential source of funding was located: the U.S. Fish and Wildlife Service. In spring 1981, the parks district contracted with the Service to draw up final plans and to prepare permit applications. As part of that process, a park district biologist raised the possibility that the endangered salt marsh harvest mouse



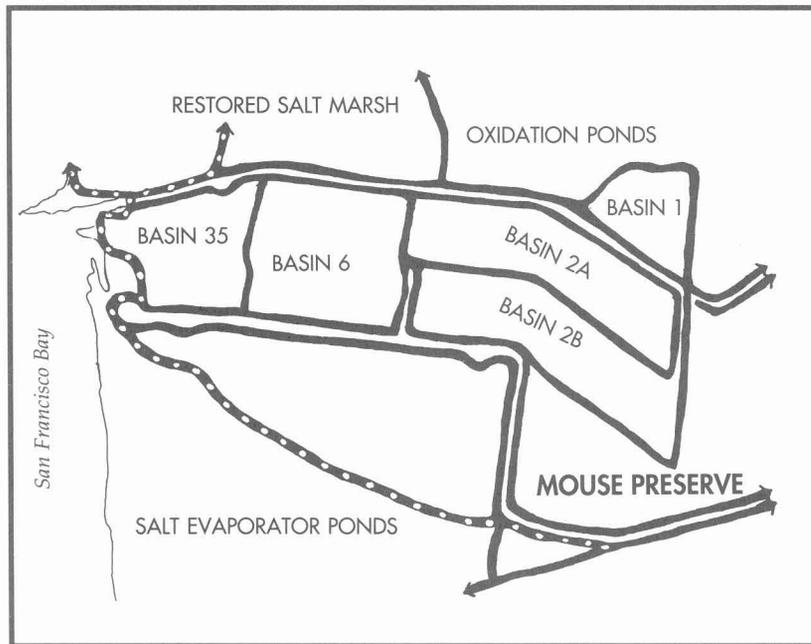
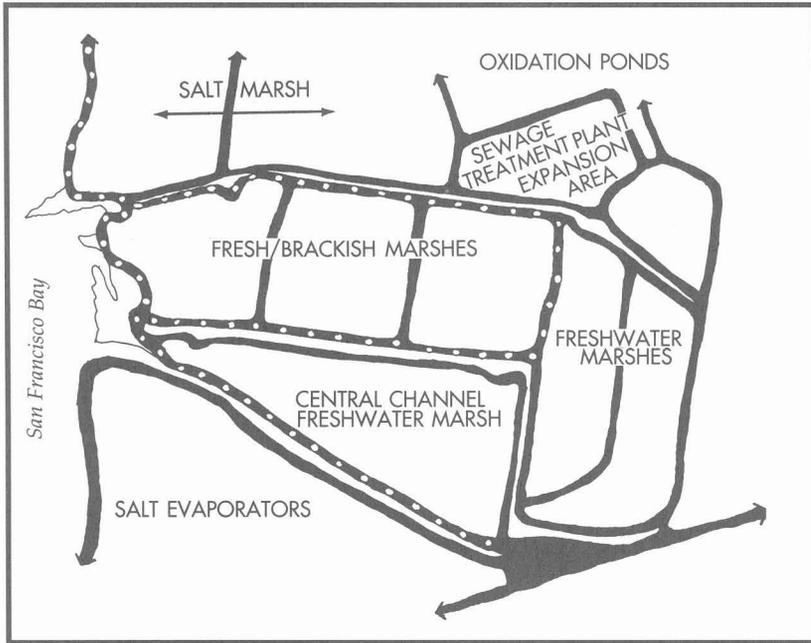
COURTESY LAS GALLINAS SANITARY DISTRICT

lived in a large pickleweed section of the site. When, indeed, a population of the mice was found in the southern portion of the site, the design of the project was restructured and a 27-acre mouse preserve was delineated. [See Page 20 for a Close-Up of the salt marsh harvest mouse.] The project area is divided into six sections: three freshwater basins, two brackish water basins, and the mouse preserve. The basins have islands, channels, and varying depths.

The restoration project was built in 1984 with \$600,000 funding from the State Coastal Conservancy. Its return to a wetland was delayed for four years, however, because the East Bay Dischargers Authority could not meet its discharge requirements consistently and was therefore forbidden to send treated wastewater to the wetland. Finally, in 1988, the water quality was found acceptable. From concept to operation, it had been nine years.

Representatives of five colleges—San Francisco State University, San Jose State, Hayward State, Chabot College, and the University of California, Berkeley—had

**Las Gallinas Marsh with trail in foreground.**



JULIE GOODNIGHT

**Original plans for the Hayward wastewater marsh (upper); the final plan (lower) includes a preserve for the Salt Marsh Harvest Mouse.**

contributed to the design of the project. They wanted a design that would allow comparative research studies and would have the built-in flexibility necessary for the study of various hydraulic regimes and the different biological consequences of those variations. With its two freshwater and two brackish water basins, the project has a built-in experimental/control framework. Research underway or planned includes measurements of productivity, nutrients, control of vegetation, effectiveness of mosquito fish as mosquito abaters, training for marsh managers, and analysis of economic variables.

On April 15, 1988, 15 million gallons a day of treated effluent began flowing into the new wetland basins. It will be a while before the new wetland is well colonized by plants and animals, and before the operators become familiar with the system's hydraulic capabilities and constraints. Two factors influence the rate at which vegetation will recolonize the wetland. The area was formerly a salt pond, thus residual soil salinities will probably retard the establishment of vegetation, as will the topsoil that was disturbed during construction. The first plants to emerge include pickleweed, brass buttons, and willows.

**T**hough vegetation is still sparse, 67 species of birds have already been noted. For some, especially for Caspian and Forsters terns, bare ground may be a positive attribute. Both tern species nested on a bare island in the new wetland. Bird counts went as high as 13,000 during the fall migration. As high tide covers the mudflats of the restored wetlands to the north, many shorebirds come down to feed here. Up to 500 pelicans at a time have been seen feeding for short periods. Unfortunately, they were probably eating fish recently stocked in the wetland.



## **Wetland Sewage Treatment**

In California, effluent used to enhance marshes must first receive secondary treatment, which removes bacteria and other pollutants but not all nitrates, phosphates, chlorinated hydrocarbons, and toxic metals. This state's water quality laws have stringent provisions on effluent discharge. It may not be discharged into wetlands unless it is already of a quality high enough to be suitable as wildlife habitat. Elsewhere in the nation, however, wetland projects are being built as sewage treatment facilities. Wetland plants and the physical and chemical processes that occur in wetlands improve certain aspects of water quality by immobilizing or eliminating some pollutants. Growing numbers of communities around the country have created wetland projects as a low-cost, energy-efficient alternative to conventional secondary treatment plants. This method is especially suitable for smaller communities with available land.

A wastewater wetland created as a treatment facility will be designed differently than one built primarily to enhance wildlife habitat. The differences may be in design depths, basin configurations, flow rates, and vegetation types. But a wetland built as a treatment facility may also yield some other benefits. It may be useful for some wildlife and may provide for recreational trails. Likewise, a wastewater wetland created for wildlife habitat may also incidentally improve the quality of water that flows through it to the sea. A wetland would lower the biochemical oxygen demand, suspended solids, and nitrates.

The wastewater wetland projects here described were designed to enhance the environment. That this goal has been accomplished can be seen in the diversity of wetland habitat types that have been created and in the numbers and variety of plants, birds, and animals that now inhabit these wastewater wetlands.

## **Visitor Information**

**Mt. View Sanitary District:** Take the Arthur Road exit off Interstate 680 in Martinez. Follow Arthur Road to the east and enter the district's driveway, indicated by a sign. About 20 acres of the wetland are open from 8 a.m. to 4:30 p.m. daily. Visitors are welcome at any time; however, people wishing specially guided tours and large groups are asked to make arrangements by calling Dick Bogaert, the district biologist at (415) 228-5635. The other 65 acres of wetland are sandwiched between Waterfront Road and Interstate 680 in Martinez and may be visited via the Waterfront Road exit on I-680.

**Las Gallinas Valley Sanitary District:** Take the Smith Ranch Road exit off Highway 101 in San Rafael. Proceed east on Smith Ranch Road, toward McInnis Park. Just before the entrance to the park, turn left and follow the road around to the end. The District has a parking lot specifically for visitors to the wetland. The area is open 8 a.m. to 4:30 p.m. daily; however, those wishing specially guided tours or large groups should make arrangements by calling Gary Reilly, plant supervisor, at (415) 472-1734.

**East Bay Regional Park District:** The wastewater wetland is only open to groups that make arrangements for a tour by calling Mark Taylor, wetlands manager, at (415) 783-1066.



*Francesca C. Demgen is a wetlands biologist operating a consulting business in Vallejo. She managed the Mt. View Sanitary District wastewater wetland from 1976 to 1979, has worked with wetlands in California, Oregon, and Nevada, and has published numerous technical reports and articles on wetlands creation for mitigation and wildlife habitat enhancement. □*



A typical pond at Mt. View Marsh, looking north toward Carquinez Straits. Mix of vegetation and open water is designed for waterfowl. Shell oil storage tanks are to the left, seen through cattails.



## ■ **Wastewater Marshes: Proceed with Caution**

by **Michael Josselyn**

Wetlands are not simple systems, as their rather uniform appearance might suggest. Their various mineral and organic cycles have broad implications. Like other natural systems in which humans have disposed of waste materials, they have limited capacity. Therefore, the use of wetlands as recipients of treated waste water should proceed cautiously and must be accompanied by continuing research.

As population growth outstrips our society's ability to pay for sewage treatment technology, interest has grown in the use of vegetated wetlands to "polish" wastewater streams. In the United States today, the greatest concentration of wetland sites receiving waste water is in the Midwest and Southeast, with over 300 projects receiving a total of 10 million gallons a day. Most of these wetlands are freshwater marshes or creek swamps and are less than 30 acres in size. The largest, in Michigan, is 700 acres.

Marshes are attractive for wastewater discharge because they are accumulators. Their existence depends on their ability to trap particulate matter, primarily sediments. The dense vegetation and shallow, quiet waters within a marsh slow down the water, and particulates settle onto the surface. Most marshes accumulate fine clays, which can absorb elements and even catalyze or stimulate chemical reactions. As the clays settle onto the marsh surface, they become incorporated into the sediments and bind numerous elements with them.

The microbial world of marsh sediments is perhaps the richest in the world. In the rain of inorganic and particulate matter onto the sediment, amid the changes in the sediment's

oxygen content, a wide variety of bacteria transforms compounds such as nitrogen, phosphorus, iron, sulfur, and manganese. Almost any compound will be transformed by the microbial population in marsh sediments. It may be liquefied, gassified, fixed, reduced, oxidized, or taken up into living tissue. Each process is mediated by temperature, salinity, and moisture in the marsh. Thus, a process that occurs in the summer months may be reversed during winter months, when salinity and temperatures drop.

The roots of marsh plants penetrate the anaerobic soils with their soup of microorganisms and chemical compounds. Some of these compounds, such as hydrogen sulfide, are toxic to marsh plants. Therefore, the root systems of marsh plants are quite different from those of land plants. They usually contain enzymes

to inhibit the effect of toxics and also to transport oxygen to the root zone through specialized air passages. Through these adaptations, the plant gains a rich supply of nutrients, mainly nitrogen and phosphorus. In spite of the extra energy necessary to live in anaerobic soils, marsh plants are among the most productive in the world. Their biomass takes up nutrients and other elements, which supply a lush growth of organic matter, which in turn provides shelter and habitat for wildlife, food for invertebrates and fish, and organic matter that is again used by bacteria as the plant dies

***"We know too little of how such marshes work. Many questions must be resolved before we can responsibly use marshes as receptacles of treated waste water."***



*Animu*

and decays in the marsh sediments.

What happens to marshes that receive treated effluent? A review of nutrient cycling [in such marshes], by Francis Heliotis and Calvin DeWitt, appearing in the *Journal of Wetlands* in 1983, concluded that:

- "Most research to date is site specific and few generalizations or extrapolations of results to other areas can be made. Treatment effects are determined through a 'black box' approach rather than on mechanisms and rates involved."

- "Studies of the impact of waste water on wetlands are scarce and inconclusive because they require long-term observations. Lack of information on the ecological consequences leads to skepticism regarding the advisability of this practice."

***"Of all the areas of wastewater wetland studies, scientists know the least about long-term implications for wildlife."***



We know too little of how such marshes work. Many questions must be resolved before we can responsibly use marshes as receptacles of treated waste water. For example, we know from numerous studies that wetlands absorb phosphorus and nitrogen from overlying water. The problem is that they do it in differing amounts, at differing times of year, and in differing ways with various water management schemes. In 1983, D.S. Nichols, in the *Journal of the Water Pollution Control Federation*, calculated that a vari-

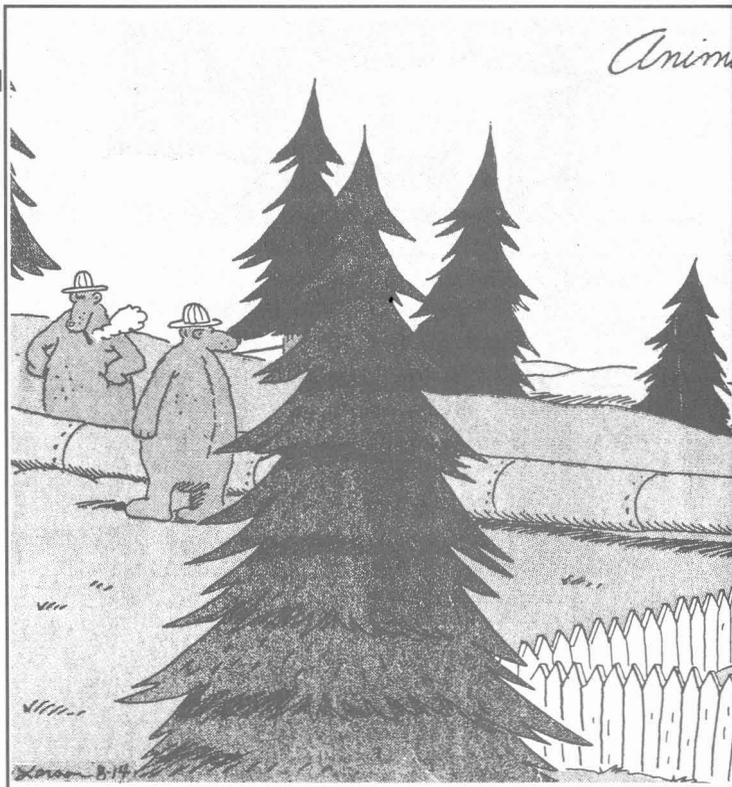
- "Few attempts have been made to integrate the existing information on the use of wetlands for wastewater treatment."

ety of wetland types removed from 20 to 95 percent of the phosphorus and from 1 to 96 percent of the nitrogen from water. The most efficient wetland type was a shrub sedge fen and forest shrub fen in Michigan, which removed more than 80 percent of nitrogen and phosphorus. In a typical freshwater cattail marsh, on the other hand, the removal rates ranged from 20 to 87 percent for phosphorus and from only 1 to 31 percent for nitrogen.

As in any treatment process, wetland removal efficiencies are also related to loading rates. Increased loading rates lead to a rapidly declining removal efficiency.

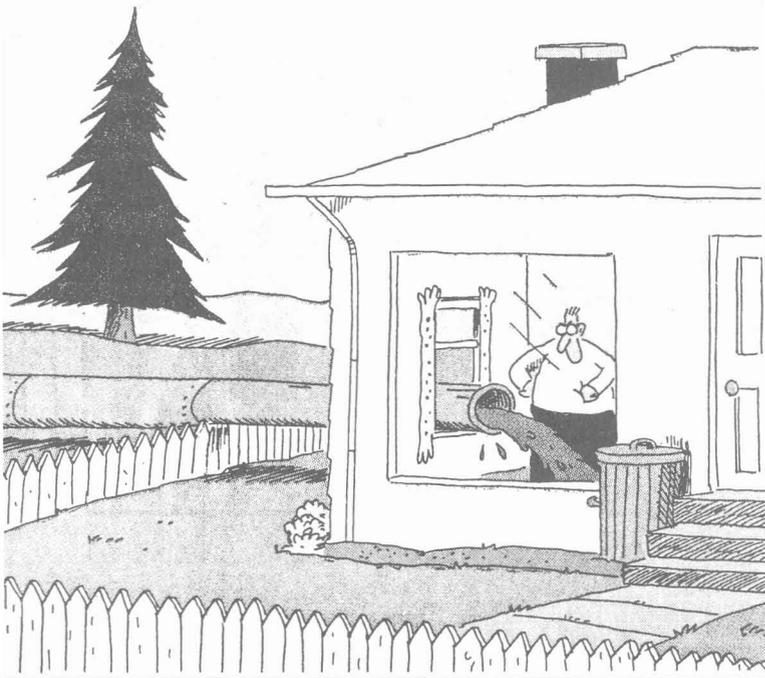
Do these wetlands reach a saturation point? Most wetlands are dominated by organic sediments that can rapidly reach maximum retention capacity as the most active absorption sites become saturated. Plant uptake can restore the absorption capacity, however, especially if the plants are harvested.

What happens to heavy metals within effluent? These elements also undergo considerable microbial and chemical reactions within wetland soils. The more acidic the soil, the less likely that metals will remain bound to the soil. Wetlands can be sinks for metals, but not traps that remove the metals



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## Waste Management



from the ecosystem entirely.

Lastly, what about the wildlife value of wetlands? Sadly, this is the area we know the least about, even while we often claim the greatest benefit in it. I say sadly because the consequences of ignorance can be severe, as witnessed in Kesterson Wildlife Refuge, where agricultural drainage water was "reused" to create wildlife habitat. Can we sequester pollutants that accumulate in a wetland from wildlife using that wetland? We do not know. In a review of wastewater and wetland animal communities, Kathleen Brennan wrote in 1985 in a book entitled *Ecological Considerations in Wetlands Treatment of Municipal Wastewaters* that the following changes were generally observed within wetlands receiving waste water:

- a decrease in species richness and diversity;
- a decline or disappearance of species with relatively narrow tolerances for changes in physical and chemical parameters;
- an increase in the number and abundance of "weedy" opportunistic species.

More specific details are unknown because of the mobility of animals, especially migratory species, the capability of species

to adapt to certain conditions, and the seasonal variations that can occur in species abundance, masking effects of specific pollutants. Of all the areas of wastewater wetland studies, scientists know the least about long-term implications for wildlife.

The use of wetlands for wastewater management is an attractive alternative to discharge to rivers and oceans. We need to be cognizant, however, that wetlands and their associated wildlife are just as sensitive to pollutants as other receiving waters and may not always be the panacea for our water treatment needs. □

Before a wetland is selected for wastewater discharge, these key questions need to be answered:

- What are the wastewater management objectives related to the wetland?
- What is the composition of the wastewater effluent?
- What is the goal for the wetland discharge?
- What type of wetland is best suited to the input concentrations and discharge expectations?
- What is the long-term capacity of the wetland to meet those objectives?
- How does the wetland application compare with other treatment options?
- Which wildlife species will be attracted and which will be displaced by the discharge of treated effluent into the wetland? What will be the effect of concentrated pollutants on the wildlife attracted to the system, and what mitigation measures must be developed for those displaced?

M.J.

*Michael Josselyn is a professor of biology at San Francisco State University and director of the Romberg Tiburon Centers.*

## Meek But Mighty Marsh Mouse

It had happened before and would happen again. Shortly after biologists trapped a Salt Marsh Harvest mouse in a South San Francisco Bay wetland—at a site a developer envisioned as excellent for tract houses—a tractor disked the habitat, dragging steel blades across pickleweed.

The biologists from WESCO, a Novato environmental consulting firm, were working for Union City, trapping to confirm harvest mouse distribution in connection with plans for this diked area of haylands intermingled with wetland, which had been proposed for development. Perhaps the wetland was disked by simple error, perhaps not.

As required by law, WESCO notified the U.S. Fish and Wildlife Service that an endangered species habitat had been disturbed. The Service responded, as did the Environmental Protection Agency (EPA), the California Department of Fish and Game, and the U.S. Army Corps of Engineers, which is responsible for protecting water quality and integrity under the Clean Water Act's Section 404. A search for mouse corpses was conducted under clumps of uprooted pickleweed, under logs and old tires.

"The [Fish and Wildlife] agents felt we needed bodies. To make a case you need to show mortality," biologist Paul Kelly of Fish and Game's Nongame Heritage Program explained. "You have to show the bodies." No dead mice were found, so this particular incident, in 1985, was not reported to the U.S. Attorney for possible prosecution. The defenders of the mouse lost one more round in the battle for its survival.

News that salt marsh harvest mice have been found on your land is news that few property owners like to hear. Usually it means that you have a protected seasonal wetland where you thought you had a building site. The presence of these mice helped to convince the Corps of Engineers to refuse a permit to the sponsors of a giant development, the Cullinan Ranch, proposed for the Napa River across from Vallejo. It persuaded the Pacific Gas and Electric Company to

abandon plans to build a coal-fired plant in Collinsville, Solano County. "Usually, where the mice have occurred, development hasn't," according to biologist Steve Foreman of WESCO, who has been trapping the mice since 1978.

Not surprisingly, therefore, some people have tried to obliterate evidence of harvest mouse habitat in hopes of putting land to what they see as its highest and best (that is, most profitable) use. They have been able to do so because of a legal loophole, which allows certain activities in wetlands for agricultural purposes. On occasion, "agricultural purposes" have served as a pretext for wetland destruction.

"The Clean Water Act does not regulate pumping or disking on a wetland, so development interests call this degradation agriculture," said Kelly. The Corps requires a permit for fill, but disking is not defined as fill. Only when it finds something actually added, such as a pad for a pump, can the Corps step in.

The above mentioned marsh in Union City had been home to the Ugly Duckling Duck Club, with waterfowl and shorebirds on a 40-acre pond. In 1982, one of the longtime members was shocked to find a bulldozer parked where the pond had been. "They scraped and leveled the pond and ran a pipe in and drained it and knocked over the levees and covered up the blinds," he later told Lance Williams of the San Francisco Examiner. "And that was that."

The wetland is drier now, but it survives, according to Vicky Reynolds, who coordinates enforcement of Section 404 for the EPA. "It is disked on a regular basis. But every year before they disk, the

wetland plants come back." So, presumably, do the mice. The depression that used to be the duck pond still fills with water in winter. The developer retains an option on the site. So far, however, it's a draw.

The salt marsh harvest mouse, which lives only on the San Francisco Bay, has turned out to be both a formidable enemy to those who would build on wetlands and a powerful ally of the forces for marsh protection. Yet much that is known about the species, *Reithrodontomys raviventris*, has only recently been learned.

"It's rarely seen. Its world is essentially invisible to humans, a network of runways under pickleweed in the middle three zones of the marsh," said Paul Kelly. "If you part the pickleweed, you may see passageways running in different directions." The mouse likes its pickleweed deep, dense, and interwoven with other species. But it must flee to higher ground during extremely high tides.

"Salt marsh harvest mice live mainly in pickleweed as long as they have non-submerged, salt-tolerant vegetation for escape during the highest tides according to Howard S. Shellhammer, biologist at San Jose State University, who has studied this mouse for more than 30 years. Since development has destroyed riparian woodlands, vernal pools, and grass-

**"The simplest way to decrease the list of endangered species is to get rid of what is left of them, so that they will no longer be endangered."—Anon.**



HOWARD SHELLHAMMER

lands as well as most of the saltwater marshes, especially in the South Bay, however, the mouse has adapted to diked non-tidal wetlands. This has only been learned within the past few years.

When the mouse is captured, it is usually docile. "Maybe because it usually doesn't encounter predators, it will just sit in the palm of your hand and look at you

with its big brown eyes," said Kelly. It's maybe three inches long, and some people find it prettier than other mice, with fur that ranges from blackish brown to cinnamon on the back, with a tawny stripe, and a cinnamon to white belly. "It's cover dependent, doesn't like being in the sun" said Shellhammer. "Once it's out of its vegetative cover, it's picked off by other animals," such as short-eared owls, egrets, herons, marsh hawks, and a newly arrived predator: the red fox, an escapee from fox farms near Sacramento.

When the highest tides cover the pickleweed, the mouse swims swiftly and competently to dry ground, exposed to danger until it finds cover amid Australian salt bushes, fat hen, and other plants. Biologists like to come out at such times to make their mouse counts.

There is much to learn about this species, which varies slightly in the North and the South Bay. It does not burrow, but builds bird-like nests of dry grasses and sedge on the surface of the marsh and sometimes roofs-over old swallows nests. Its unique physiology allows it to survive on plants with a very high salt content.

"It appears to eat pickleweed," Shellhammer said. "But because it's an endangered species, we can't monkey around enough to find out what else, if anything, it eats." To trap a mouse, you need a federal permit. The trap must not injure the mouse and you must release it quickly, which allows only a few quick observations. "It's a matter of minutes," said Shellhammer.

What is known for certain is that the mouse is an endangered species, struggling to survive in a hotly contested zone. Its predicament is most desperate in the South Bay, where man-made and natural forces have combined to destroy its habitat. More than 90 percent of the tidal salt marshes have been destroyed and those left are mostly useless as habitat, partly because of subsidence. The San Francisco Airport, Foster City, parts of Palo Alto, and the Leslie salt flats occupy former mouse habitat. Just about the only habitat left is behind dikes, according to

TUPPER ANSEL BLAKE, FROM *WILD CALIFORNIA*, 1985



Kelly. Yet of 36,000 acres of non-tidal salt marsh—much of it mouse habitat—only 3,444 acres are left, and 830 of these are proposed for development. What's more, the upland habitat the mouse also requires is highly sought-after real estate. "You don't want a housing development right up against a nontidal salt marsh," said Kelly. "You need a zone to which the mouse can retreat. This may be land that is beyond the regulated wetland area."

"It's stuck between two forces," observed Shellhammer. "On one side is the Bay, which, according to most evidence, is rising. So most of the edges of the Bay are no longer useful to the mouse. It needs a high marsh. On the other side is development. The battle will be fought on the diked wetlands between development and the Bay."

He sees hope in the creation of larger preserves, especially at the San Francisco Wildlife Refuge. "The Fish and Wildlife Service is making a big effort. An inherent problem is the checkerboard pattern of the reserves. The smaller the reserve, the less long-lived the population."

With so many species threatened, does it really matter what happens to this one mouse? Those who try to bulldoze it out of existence clearly do not think so. We

asked Shellhammer what moved him to spend 30 years studying this one little rodent. "Damned if I know," he replied. He had read another biologist's work, which impressed him. He had started studying the mouse's chromosomes. Since the mouse has been listed as endangered that is no longer possible. "I get great aesthetic satisfaction," he said, "from being in the boonies, learning about it." Clearly that was an inadequate answer, but how to put it into words? Shellhammer also studies giant sequoia ecology.

Is the mouse useful to humans? "I don't know. It's so shy, people can't see it. It's too small to shoot, and I don't even know if it would taste good. It's a beautiful little animal. There's the standard liturgy, of course. You never know if its habitat might not be important to humans. There's the aesthetic argument, the moral argument. "Any one person might put the matter differently, he said. In the end, as with all endangered species, all arguments are peripheral to a fundamental belief. Walt Whitman said it: "I believe a leaf of grass is no less than the journeywork of the stars."

And William Blake: "Everything that lives, lives not alone, nor for itself."

*Rasa Gustaitis*



PHOTOS COURTESY OF CANDLESTICK POINT PARK

# TRASHFO



**by Heather Clendenin Antilla**

**Innovative**

**Landfill**

**Parks**

**Salvage**

**the**

# TRANSFORMATION

**of the Waterfront**

**D**UMPING GARBAGE ALONG SHORELINES and in marshes is now illegal in this country and is generally regarded as uncouth. Citizens and local governments have worked to stop such shoreline abuse and are restoring and developing their waterfronts for public use and enjoyment. But what shall be done with the mounds of rubble, trash, and garbage that have already disfigured prime urban shoreline sites? These "trashformations" present a wealth of unique opportunities and challenges to local governments, scientists, planners, and citizens groups. They can be reshaped to create new scenic open space on the water's edge. But this process is fraught with hazards that need to be taken carefully into consideration.

Several innovative waterfront parks have been built recently on old sanitary landfills

and more are planned. Each is unique and each expands the definition and role of the urban park while allowing residents to rediscover and reclaim a waterfront that had been cut off by other forms of development. Taking the lead in this new, often problematic, form of reclamation are artists (especially sculptors), landscape architects, scientists, local government agencies, planners, and citizens.

In New York, Socrates Sculpture Park, built by artists with the help of neighbors on a riverfront landfill, is New York City's largest outdoor exhibition space for sculpture, showing works by contemporary artists against a backdrop of the Manhattan skyline seen across water.

In San Francisco, Candlestick Point State Regional Recreation Area, California's first



**At Socrates Park in New York, "East River Bones" by Robert Stackhouse, 1987.**

DAVID TOMANO

regional urban park, is taking shape above an old ship graveyard. The design of Candlestick, as of Palo Alto's Byxbee Park further south, acknowledges the man-made nature of the site, and its relation to its environment. On a bluff top in Palos Verdes, a former dump has been transformed into the South Coast Botanic Garden.

These and other innovative parks represent a turning away from the practice of using landfills as sites for private real estate development, especially on waterfronts. But parks built on urban household trash and garbage are experiments in progress, and they sometimes yield unwelcome surprises. Municipal dump reclamation is a practice without adequate foundation in knowledge, and learning comes through trial and error.

**Trash Space into Art Place**

Sculptors Mark di Suvero and Isamu Noguchi had studios in Queens, on the East River, where rents were far lower than in Manhattan. Di Suvero worked on a pier on the East River, constructing his large sculp-

tures in two enormous warehouses that were condemned before he bought and rehabilitated them. Next to the pier was city-owned landfill, where people dumped old cars, mattresses, and other trash. Abandoned industrial spaces and public housing projects extended behind and beyond this otherwise vacant space.

Aware that New York City had far too little exhibition space for large sculptural works, di Suvero, with the support of Noguchi, decided to create some by transforming the wasteland next door into "a space for activity and contemplation." In 1986, they persuaded the city to lease 4.5 acres of river frontage to the Athena Foundation at \$1 a year for five years. The Foundation, which di Suvero had established to support young sculptors, hired local people to haul away the old car carcasses and other junk, bring in donated topsoil, start a community garden, and create a place where sculptors could work and neighborhood people find refreshment by the river.

Four shows have been held. Sculptures were erected on the site created with skeletons of sunken ships that had been filled with

rubble from subway construction. The art is meant to be accessible and inviting to people who are not necessarily interested in art as such. Thus Linda Fleming, for instance, made two bench pieces, "Luz y Linda" and "River Rise," which invite the viewer to rest upon them. For a 1987 exhibition entitled "Sculpture: Walk on/sit down/go through," Cristos Gianakos built "Styx," a trestled, double ramp with a stage platform that invites climbing, and Robert Stackhouse's "East River Bones," evokes ships and, in his words, "not only looks to the past, but suggests journeys and new beginnings."

In 1990, however, the Athena Foundation's lease runs out. The future is uncertain. "It would be ideal for this to become a permanent part of the park system," reflected Sara Pasti, administrative director of the Athena Foundation. "Anyone who lives in New York treasures open space. But usually money interests prevail. Those of us involved would be satisfied to see a portion—a couple of acres, say—remain." This may happen. Three 14-story luxury apartment buildings with 450 units have been proposed for the site. Some space for Socrates Park is included.

As often happens, artists have inadvertently served as the vanguard for developers. Their presence attracts galleries, tourists, and restaurants and improves the neighborhood. Real estate prices rise, once more driving out the artists. Whatever happens to Socrates Park, however, "once an idea has happened, it's seen as possible, and others may try it. Prospect Park has a small sculpture park now," said Pasti.

### **A Windy Point**

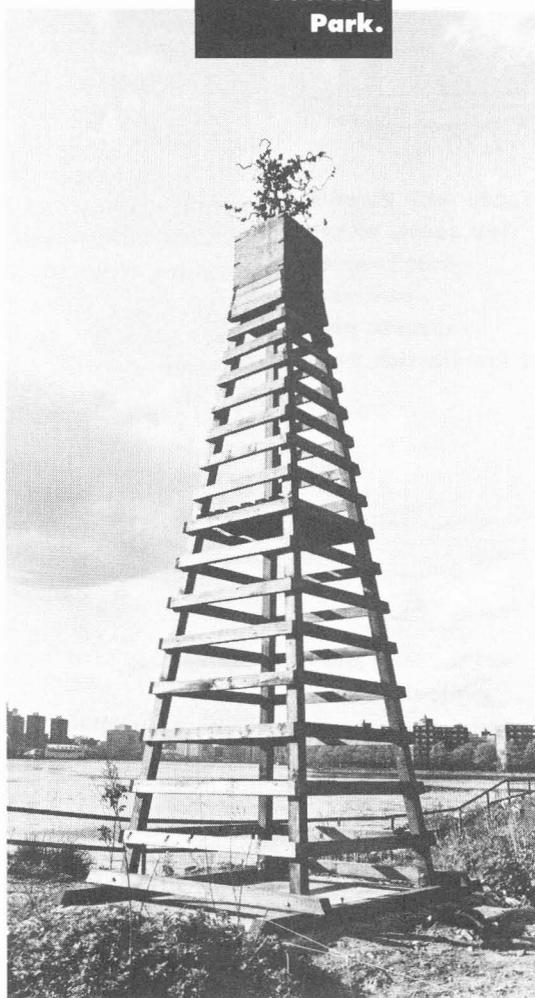
On this side of the continent, the 155-acre Candlestick Point Recreation Area is taking shape on a landfill adjacent to San Francisco's Candlestick Park, a stadium well-known nationwide for being cold and windy. The park is envisioned as a place that encourages reflection on how culture affects nature

and how nature affects culture.

All but about 30 feet of the park's shoreline is landfill and part was a city dump. In the late 1800s, decommissioned sailing ships were stripped of salvageable metals, and then burnt to their water lines and left to rot and sink just offshore. In 1955, Candlestick Park was built on fill, and uncontrolled filling continued. Speculators even bought underwater land here, expecting it to be dry soon. But in 1965, the creation of the Bay Conservation and Development Commission (BCDC) put the brakes on bay filling.

In 1975, neighborhood groups in the low-income, largely black Bayview-Hunters Point area, with the help of Assemblyman Willie Brown and then Assemblyman Art Agnos, persuaded the state to buy 155 acres along the shore for a park. Community representatives made it clear they wanted open space, picnic areas, shoreline access, fishing opportunities—but no marinas, according to George Rackelmann, senior landscape architect for the state Department of Parks and Recreation. Three years later, the Department adopted a general plan that included a landscaped park, a boat ramp, community

**Jody Pinto,  
"Watchtower  
for Hallett's  
Cove",  
1987, at  
Socrates  
Park.**



DAVID TOMANO

gardens, wetlands restoration, overnight camping, a rubble art park, and an 18-acre cultural center. Throughout the planning process, citizens participated through the nonprofit Friends of Candlestick Point, which includes representatives of the Bayview-Hunters Point area.

To design the Candlestick Point Park Cultural Center—the only such center to be owned and operated by the state parks department—the state architect chose the team of architect Mark Mack, landscape architect George Hargreaves, and artist Douglas Hollis. Their plan is meant to promote an awareness of the physical, cultural, and historical environments of the site. Because wind and water are the most prominent natural elements, both have been emphasized.

The approach to the cultural center will be a gate cut into a 130-foot-long mound and filled with wind-activated pipes. "Around 3:30 or 4 p.m. every day [the wind] will be howling," according to Hollis. "I suspect that the structure itself will create some very interesting acoustics. It's shaped as a venturi [a tube with a constricted passage that increases velocity and decreases pressure of whatever flows through] to catch the wind, but it also becomes almost a natural horn in the other direction."

Through this gate, visitors will enter a large open space with a sweeping view of the water. This space will be flanked with small dune-shaped mounds, to offer protection against the winds. Nearby, a wind harp by Bill and Mary Buchen will generate sound and visually frame the stadium.

Furnishings of the park will relate to their site: chairs, barbecues, and table legs will be made of sawn concrete pipes, table tops of 4-inch thick precast concrete, and benches of rough-cut logs. Reflecting the industrial surroundings of the site, a theater building is to be constructed of durable concrete block and corrugated metal. It will be relatively

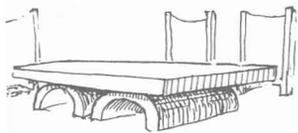
light, in keeping with requirements for building atop a landfill.

Another unique feature has come to be known as "rubble art park." It grew out of the use of the site as an outdoor sculpture space while planning was underway. Leonard Hunter, professor of art at San Francisco State University, brought sculpture students here to work on "rubble art," by using materials found on the site. He also obtained a grant from the National Endowment for the Arts to bring in artists to work with Rackelmann toward potential directions of unique park design. A predominant theme in the work of participating artists has been recycling site materials. John Roloff proposed to reanimate the form and spirit of the old sunken ships by digging a hole the size and shape of a ship and letting water flow through—water through ship instead of ship through water. Alain Gerbault used fragments of curbs, buildings, and other structural remnants in a piece meant to reflect other visible city landmarks, such as the Sutro Tower and the San Mateo and Bay bridges. Art can "enhance our experience of natural phenomena and create new metaphors by which we see and understand the world around us," Hunter observed.

It is hoped that remnants of these imaginative endeavors will be included in the new park. To Rackelmann, they represent what the filling is about—"taking bridges, curbstones, buildings, and throwing them into the Bay." Plans call for a ten-acre rubble art park next to the cultural center to remind of what's underfoot and allow further artistic transformations.

Hunter hopes the park project will stimulate "awareness and discussion of the relation between socio/cultural policies and environmental issues."

Perhaps not quite the way the planners



**Table with three to five seats, of precast concrete and sawn concrete pipe, at Candlestick Park.**



**Cantilevered table projecting from dune, shown with log-section seats.**

DRAWINGS COURTESY OF HARGREAVES ASSOCIATES



LEONARD HUNTER

**Lisa Hein's  
"Bridgeway"  
in the rubble  
art park at  
Candlestick  
Point.**

intended, this has already occurred: A site sculpture proposal by artist Patricia Johanson of Buskirk, New York, has outraged local chapters of the Audubon Society. Her proposed "Endangered Garden," part of a Clean Water Act project, is a shoreline path above a 1,700-foot-long underground sewage transport channel, suggesting the shape of the endangered San Francisco garter snake. Its head is shaped by shrubs that support the endangered Mission Blue butterfly, a native of nearby San Bruno Mountain. Its tail descends to the water as tidal steps that take the shape of butterfly wings. The snake winds into the mudflats, where 28,850 square feet of cobble and gravel are to be placed in the tidal zone, to encourage the growth of shellfish.

Rackelmann sees the piece as "marvelous—a great interpretation device." He expects it to "focus public attention on endangered species" and to add to "public appreciation of tidal and marsh environments." It would also expand public access. But Audubon Society members protested: the "Endangered Garden" must not intrude into the mudflats, they argued.

The sewage project, which includes a box

20 feet wide and 20 feet deep along the shoreline edge and also a pumping station, requires 15,000 square feet of fill, including 6,428 square feet of riprap to camouflage the walls of the sewer transport. When the entire project came before BCDC, Audubon Society members argued that it would damage one of the few mudflat roosting and feeding areas left on this part of the Bay for migratory birds. BCDC approved the water project, but sent the site sculpture back for redesign.

Had the San Francisco Arts Commission, which commissioned the work, consulted with biologists beforehand? "We had consultations with everybody—Fish and Game, the Academy of Sciences," replied Claire Isaacs, director of cultural affairs for the Arts Commission, but declined to provide names. "Everyone's attitude was: 'It's such a dead and hopeless space out there, anything will improve it.'"

Johanson wrote to BCDC that she had "worked on this design for 15 months and in the process consulted with many experts in

various fields, none of whom seemed to think that the design was either detrimental or arbitrary." The sculptor is known for her environmental art.

"There is a philosophy behind this park," said Judy Chan, president of Friends of Candlestick Point Recreation Area, "We've taken everything that was considered negative—the wind, the rubble dump, the fact that the park is on the edge of a community that is perceived as difficult—and reversed the perspective. We've tuned and used the wind, we've made wind shelters of wood that was strewn on the site. And we've built a fishing pier where all kinds of people will mix in a democratic way. The history of this park is one of overcomings."

All those interviewed expressed hope that the Johanson sculpture will become part of the park, with any conflicts concerning bird habitat resolved.

Candlestick Point has, indeed, become a laboratory for interactions between culture and nature.

### **South Coast Botanic Garden**

Meanwhile, in Los Angeles, a unique botanic garden has been developed on a former dump on the northern slope of the Palos Verdes Peninsula. A former open-pit diatomaceous earth mine, the 87-acre site was purchased by Los Angeles County in 1956 for use as a garbage dump. In 1968, the local community persuaded the County Board of Supervisors to convert the landfill into a botanic garden. Alternate layers of trash and earth were laid down, the land was contoured as it was filled, and the fill was compacted. Soon after the dump was filled in 1961, the South Coast Botanic Garden Foundation began to plant in three feet of topsoil covering 3.5 million tons of refuse, under a master plan that was being administered by the county's Department of Arboreta and Botanic Gardens.

Today, the garden boasts a thriving envi-

ronment where more than 200 species of birds have been seen and abundant plant life is enjoyed by thousands of visitors. The Foundation has played a major role in sustaining the gardens since Proposition 13 devastated local government budgets. Volunteers not only care for plants, but they also conduct many educational events and raise funds through an annual plant sale. A leaflet published by the county describes the South Coast Botanic Garden as "a continuing project in creative land recycling."

The emphasis is on "continuing," for some serious problems have developed, requiring major repairs on existing structures and revisions in the master plan. The ground has been settling unevenly on the entire 87 acres with the decomposition of varied organic materials below. As a result, irrigation lines have broken, light poles tilt, the tram no longer runs because roads have cracked and sunk, and the thresholds of some buildings are now several inches above ground. The first building erected on the site is so tilted that "you can't set an egg on it now," one staff member said.

That building "was not built on the right pilings; we'll probably knock it down in a few years," explained Tak Niiya, division chief, special services, at the Department of Arboreta. All other buildings stand on bedrock, not trash. They have been affected, however, by sinking along their edges.

"When you have a hundred feet of trash under you, you expect it to move," said Keith Palmer, of Neil, Stanton, and Palmer, a Los Angeles architectural firm that is currently redesigning all paving, lighting, and irrigation conduits to be as flexible as possible.

"One of the main things we've learned is the necessity to cap the trash with more topsoil than they did, so trees can have longer-lasting lives," said Norma Cantafio, executive director of the Foundation. Eucalyptus trees have toppled after their roots penetrated to the first layer of trash. Big trees were being removed and, after more topsoil was

laid down, were to be replaced with a shrubby variety, according to Niiya. Where the ground has settled, more soil has been brought in, he said, so that in some places topsoil is now 10 feet deep.

Many of the lessons learned here will be useful elsewhere, as much larger landfills must be redeveloped, Niiya pointed out. Cantafio finds it most satisfying that "during 27 years, the trash has been decomposing, we've been able to run a garden for the community," while learning what will grow on such a site.

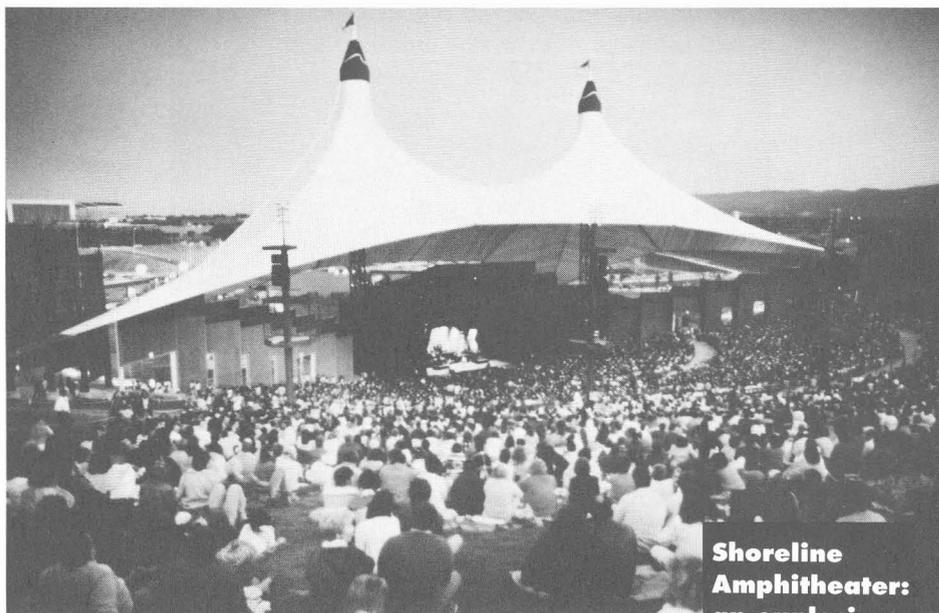
### **More Park Art**

Many, if not most, engineers would advise against building on sanitary landfills, and might bolster their case by describing a structure that stands on stilts because the ground around it has dropped by four feet. Yet in the past, office and even residential buildings have been constructed on closed dumps. This is "absolutely not" advisable, said Edgar Ugarte, senior engineer in Public Works Engineering, city of Palo Alto. Not only structural and engineering problems, but also health problems could occur.

Therefore, Palo Alto is converting a 145-acre bayfront municipal dump into Byxbee Park. So far, a 45-acre section has been closed and will be landscaped. The rest will continue to be used as a dump for some years, rising to a height of 60 feet. (It is beyond BCDC's jurisdiction, which extends 100 feet from the bayshore.) In seven years, a second portion is expected to close, and in 14 years, the remainder. Hargreaves Associates, in

collaboration with artists Michael Oppenheimer and Peter Richards, both associated with the San Francisco Exploratorium, are creating the master plan for the entire site. Oppenheimer's works interpret the natural world and various scientific phenomena. Richards designed the Wave Organ on a landfill jetty parallel to San Francisco's Marina Green.

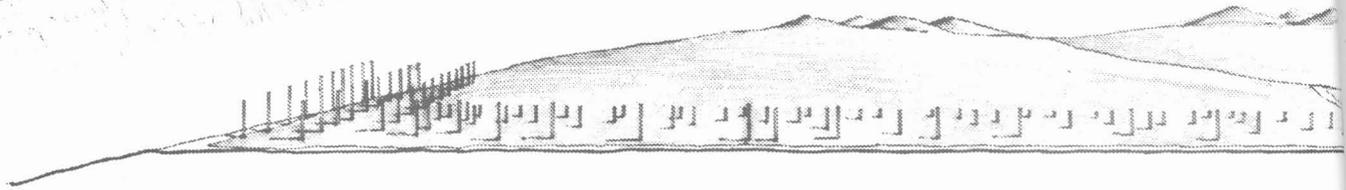
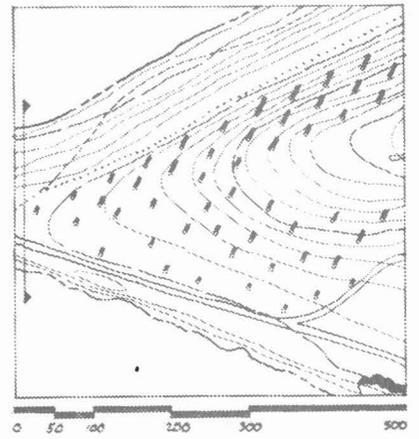
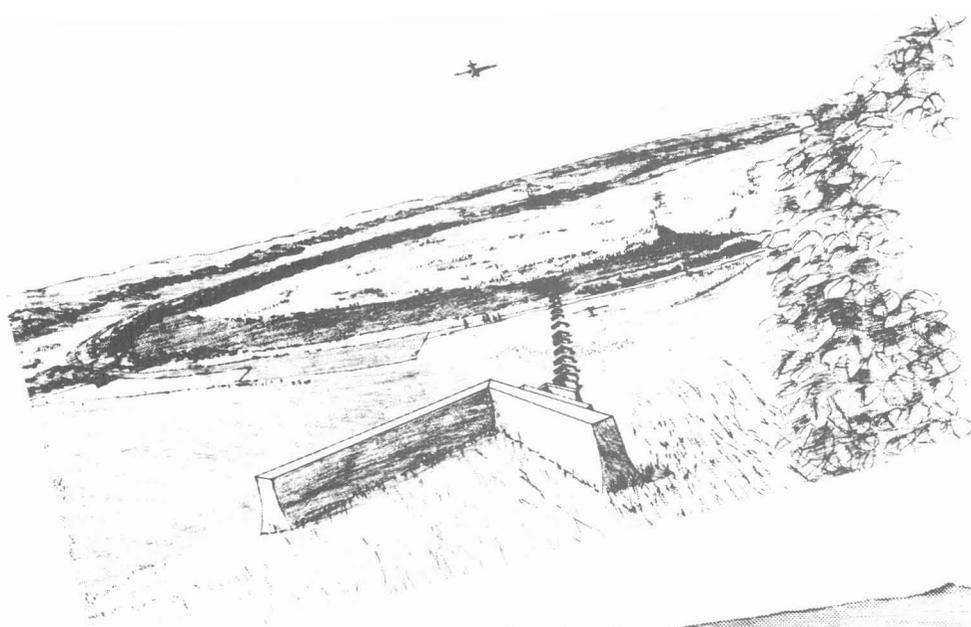
Byxbee Park will offer views and sounds of a bird refuge, old salt flats, a golf course, a sewage treatment plant, a radio relay station for ocean-going ships ("antenna farm"), an



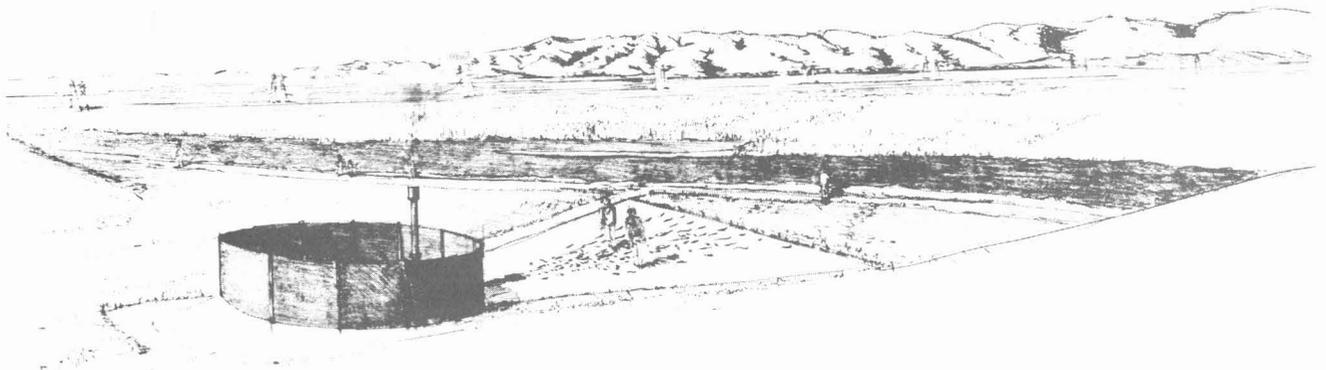
**Shoreline Amphitheater: an explosive concert site!**

COURTESY SHORELINE AMPHITHEATER

airport, a freeway, and the Bay. "We want to suggest that human activity and nature can combine in ways that are not negative," Richards said. "We wanted to create a place that would encourage people to explore and discover the site through a series of events and elements that would point to the peripheral activities surrounding the site." Plans include low viewing platforms along the adjacent Mayfield Slough. A field of poles will echo the nearby antenna farm and also provide perches for shorebirds who, in orienting themselves to the wind, would act as



**At Palo Alto's Byxbee Park, Hargreaves Associates plans include cement chevrons leading down to shore (upper left), a wind pole field, contoured so that the poles slope down to the marsh at a different angle than the land (right and upper right), and the flare and keyhole bed (lower), which permits methane gas to escape from the earth. Aerial view of site is at left.**



DRAWINGS, PHOTOGRAPH COURTESY HARGREAVES ASSOCIATES

"weather vanes," said Richards.

As in Candlestick Point, the idea in Byxbee Park is to emphasize rather than hide the past. Rather than screen off a methane burn-off flare station, the designers will celebrate it by placing a platform of white, smooth stones at its base so that the swirls and curls of the flame—which are not otherwise apparent in daylight—will be seen as shadows on the white surface. The flame will call attention to the decomposition processes

occurring underfoot.

Regulations regarding landfill sites are now far more restrictive than they were when the South Coast Botanic Garden was built. Irrigation is prohibited. Only such trees may be planted as have roots that are sure to stay above the clay cap that is intended to seal the unknown hazards below from the environment. Such restrictions have "forced us to be creative," Richards said. "What we learned from this process is that there ought to be some serious thought on the part of landfill owners for the future use of the site. Palo Alto is making a wise selection in opting for passive use," said Ugarte.

### **Avoiding the Hazards Below**

While landscape architects and artists consider design challenges on the landfill surface, scientists, engineers, and regulators must deal with the problematic materials below. Common municipal dumps are known to contain such items as dry cell batteries, insecticides, household cleaners, and used motor oils, which include hazardous substances such as mercury, lead, cadmium, ammonia, and other chemicals and compounds. PCBs, which are used in refrigerators, fluorescent lights, and television sets, are among many modern compounds that pose hazards to human and animal health and must be prevented from leaking into

surrounding soil and water. State and federal codes classify dumps and require that they be lined and sealed according to their classification. Class I or Hazardous Landfills, and Class II or Designated Landfills, contain pollutants that could cause degradation to land, air, or water and therefore require a clay liner at least 24 inches deep. Polymer liners may be added for extra protection. Class III or Nonhazardous Solid Waste Landfills require a clay liner of at least 12 inches. Dumps of all categories require a 24-inch "foundation cover" topped by no less than 12 inches of clean and compacted soil that contains no waste or leachate (the dissolved substances that result from the percolation of water through decomposing fill material), then finally with at least another 12 inches of clean soil. The cover shall be graded to a minimum slope of 3 percent and maintained so as to prevent ponding and percolation of water through the fill. Any vegetation on such cover must not root to greater depth than the top 14 inches of soil.

Capping must be done with recognition that the dump will continue to change as its various elements degrade. As organic materials in a dump decompose, they produce highly flammable gases, including methane and benzene. Such gases must be vented, monitored, and collected. Because methods for doing this are still being developed and improved, there can be some unwelcome surprises. In Mountain View, California, the open-air Shoreline Amphitheater, with a seating capacity for 20,000 on grassy slopes, was built by rock impresario Bill Graham on a city dump site. During the first season of performances, in 1986, members of the audience were twice startled by spontaneous combustions of methane beside them. Nobody was harmed, but Graham ripped out the lawn and constructed his own methane gas extraction system at a cost of \$2 million, according to Steve Macfadyen, assistant general manager of Shoreline Amphitheater. He estimated that up to \$600,000 of that was

due to having to deal with the amphitheater being already in place. Methane gas travels along paths of least resistance along a system of 55 vertical and horizontal wells. The methane gas is extracted by means of a vacuum. Since the new system was completed in the spring of 1987, no more spontaneous flare-ups have occurred. What would he advise others who contemplate building on a landfill site? "Don't," Macfadyen said.

SAN FRANCISCO ARCHIVES, SAN FRANCISCO PUBLIC LIBRARY



**May 1955. Bayshore Freeway construction southeast of Candlestick Point.**

**B**efore surface improvements on a dump site may begin, the closure plan must be accepted by the San Francisco Bay Area Water Quality Control District. Other regulatory agencies may also need to be involved, including the Air Quality Control Board, the state Department of Health and Human Services, the U.S. Army Corps of Engineers, the California Coastal Commission, and, if the site is on San Francisco Bay, the Bay Conservation and Development Commission. Subsequently, regulations require monitoring of air, water, and leachate.

Yet even with these provisions, "ulti-

mately, there is no way to know whether such a [containment] system is working," commented Paul Haxo, a laboratory technologist with Matrecon Inc., of Alameda. "Everything we do has some element of calculated risk. At present, facilities are not designed to check if a leachate collection and removal system becomes clogged [assuming the dump has one;

not all do]. As with any new engineering technology, the true safety margins are never really known until a major failure occurs. Polyethylene appears at present to be the material

of choice for lining the bottom of a landfill. It has only been used as a landfill liner for ten years." New polymers are being developed continuously," Haxo said. Regulatory requirements for landfills are based on calculated risks.

In light of these uncertainties, a different conceptual approach to the hazard containment problem has generated interest in some communities. Rather than trying to contain potential leachate forever on a dump site, this approach aims to remove heavy metals from the ecosystem with the use of soil bacteria and enzymes. The biotechnological "clean 'n' green" concept was used by landscape architect Richard Haag at Gas Works

Park on Lake Union in Seattle, on a site polluted with chemicals including xylene and benzene. The Seattle Gas Company's coal gasification plant stood for 50 years on this 20-acre promontory, relinquished to the city in 1973.

The city considered cleanup methods that ranged from covering the entire site with clay or concrete, to cleaning it with high-pressure steam jets. Then soil engineer Richard Brooks suggested to Haag, master planner for the site, that microorganisms might do a better job. He pointed out that though the surface and subsurface soil layers were contaminated with oils and tar, there was still much bacterial and fungal life in the soil. He suggested that the oil be tilled several times and that after each time soil-eating enzymes be added, together with organic materials including treated sewage sludge, grass, leaves, and sawdust. This process was carried out in 1974. "We created an active biological zone which takes care of the hydrocarbons," Haag explained. "As aromatics rise and get into the green [bioactive] zone, they get detoxified. Healthy plants grew on the site. This was a great indicator that the land was detoxified."

In 1984, concern that pollutants from deep in the soil might be migrating into the lake led to further cleanup efforts. With approval of the Washingtonstate Department of Ecology, Haag's biotechnological methods will be tested and compared with other methods.

These biotechnological techniques are also being considered for Berkeley's North Waterfront landfill park. Landscape architect John Roberts, head of the team revising the 1977 master plan for the project, said Haag's concept will be studied, along with some others. Because this method does not fit current standards of the Bay Area Water Quality Control District, special permission would be required. Haag believes it would be as effective, and much less expensive, than the methane recovery system that accompanies the traditionally required cap-

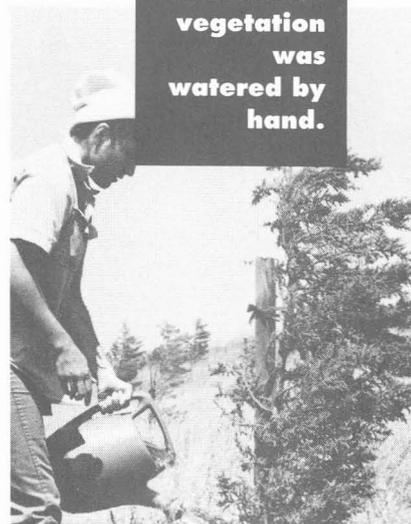
ping and sealing of landfills (estimated at \$1.6 million for this site).

**T**he artists, landscape architects, engineers, scientists, and citizens involved in the projects described lend a new meaning to the term "reclamation," which historically has referred to wetland destruction for the sake of more developable land. These projects show new directions for environmental science, for park planning, landscape architecture, and for art, particularly sculpture. Artists have worked as members of planning teams. Instead of seeking center stage for works of individual self-expression, they have sought to achieve an interaction with specific environments and to increase perception of the particular qualities of these landfill sites.

Each of the projects here described offers its own lessons. Reclamation of dump sites is an experiment in progress, requiring much more than cosmetic treatment of the surface. It is expensive—as is all repair of past abuse of our natural resources—and it requires much more research. But reclamation of abused land is becoming ever more important as natural resources continue to be diminished and destroyed. These projects chart some new and hopeful directions. □

*Heather Clendenin Antilla is a landscape architect and a visiting lecturer at the College of Environmental Design, University of California, Berkeley.*

**In 1960,  
Candlestick  
vegetation  
was  
watered by  
hand.**



COURTESY CANDLESTICK POINT PARK

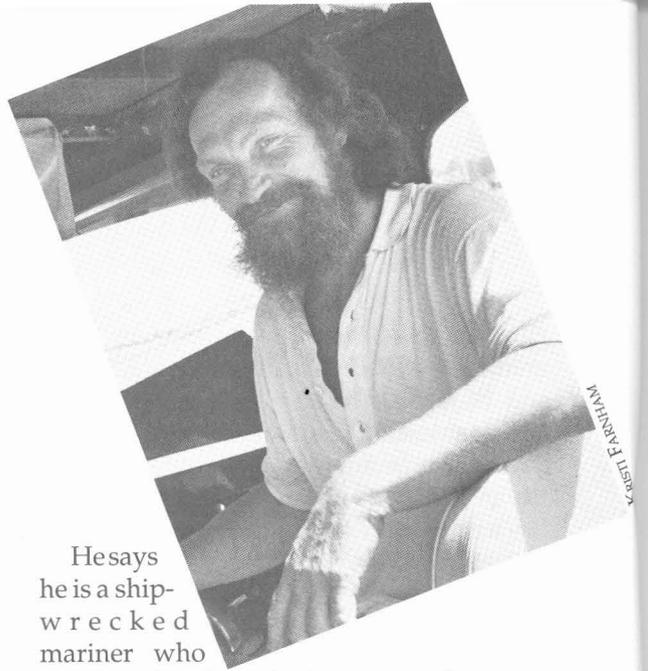
# A Very Peculiar Shipwreck

**W**HAT CAN IT BE, this conglomeration of stuff stuck together like a giant cluster of mussels here on the landward shore of Berkeley's North Waterfront Park? What is this strange aggregation of boats, barges, tanks, and pilings, laden with marine scrap and wood, with a crane towering above it all? Almost any day you'll see someone standing in front of it, trying to decipher form and function.

A weathered wooden ladder connects the accretion to the shore. Use it to board and you enter the whimsical world of Claus Von Wendel, a Berkeley waterfront fixture and sailor.

Below deck, step into a huge room with a fine hardwood floor and colored-glass portholes. Musical sculptures hang from beams, cutouts of sea animals seem to swim through the air. Beyond this room is another, and up some steps is a small nest-like bedroom.

People say there used to be big parties here before the rising bay water began to suck the eclectic palace into the mud. Now the hardwood floors are underwater at high tide, covered with a slick film at low tide. But it remains the domain of Von Wendel, 48, a tall, bushy-bearded, soft-spoken man with crinkly eyes and a gentle manner who makes his living by salvaging, repairing, and dealing old marine equipment and boats.



He says he is a shipwrecked mariner who sought refuge here during a storm five years ago and has been trying ever since to repair his vessels so he can continue his business. But to the Bay Conservation and Development Commission (BCDC), the city of Berkeley, and the Santa Fe Pacific Realty Corporation, he is an illegal squatter and his establishment is an "eyesore," "illegal fill," and "a floating junkyard."

"His boats are sinking. Most of them are resting on the mud. And he hasn't navigated anywhere in five years," says Robert Hickman of the BCDC's enforcement division, which has been trying to get Von Wendel to move for three years. "We've seen no evidence of him trying to make repairs."

"There are no laws that say how long repairs should take," Von Wendel responds. "I've been in the Bay for 15 years and on the water all my life. I'm going to insist on mariner's rights to federal anchorage."

When he arrived, he said, he "called the Coast Guard and asked about anchorage regulations. They told me there were no restrictions on the location or the time I could stay here." The Coast Guard had no comment. Neither had the city of Berkeley, which is litigating the matter.

The patch of shoreline Von Wendel occupies is owned by the Santa Fe Pacific Realty Corporation, which is concerned about a California law providing that a person who stays on private property for five years without the owner's protest can claim ownership.

"We've tried to make it easy for Mr. Von

*Continued on Page 48*

# Learning To Read Beach Litter

by Susan Davis

IT'S LOW TIDE ON A FOGGY, cold morning at San Francisco's Ocean Beach. The record-breaking high temperatures of a week ago seem but a fantasy. The few walkers on the beach are wrapped against the wind, shivering in the mist—and stepping across sand strewn with debris.

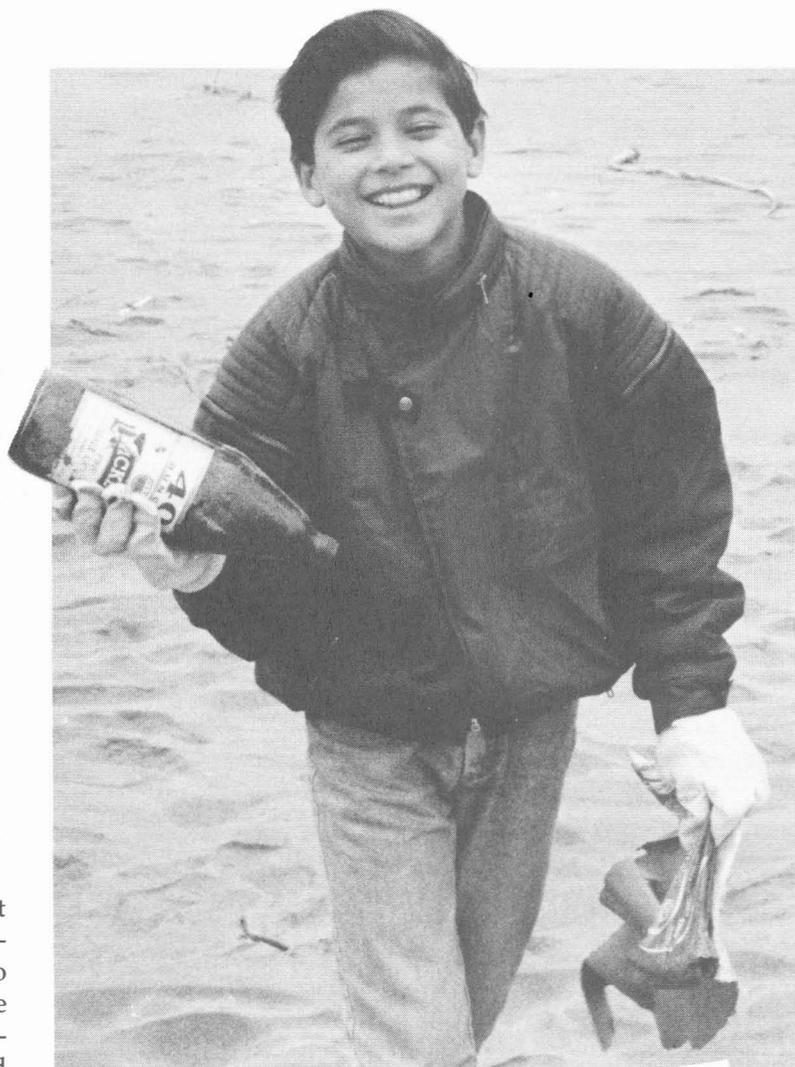
A coil of wire. A long strip of yellow plastic. A Dorritos bag. Styrofoam cups. Peanut shells. A shopping cart, used as a barbecue.

White plastic spoons. A beige sandal. Hypodermic syringes. A pair of Reebok high-tops. Beer bottles. A Pepsi cup. Soda cans. A cot frame.

Visitors enjoying last weekend's heat left much of the refuse. But some of it washed ashore from boats and lands as far away as Japan and Hong Kong.

Suddenly, from across the dunes, 30 eight-year-olds gallop toward the beach, looking for evidence of "nature's litter" and "human's litter." They spread out across the water line, scooping up seaweed, pouncing on soda cans, screaming in delight over sand dollars.

Seven of the children swarm around "the



DEWEY SCHWARTZENBURG

blob," which lies shimmering above the wave line. One boy picks it up, and runs, full-speed, to a National Park Service ranger. "Look what we found!" he screams. "What is it? What is it?"

Ranger Carol McBryant gathers the children around her. "Does anyone know what this is?" she shouts into the wind.

"A jello fish," says one girl.

"A jelly fish!" chorus her classmates.

"Is it a plant or an animal?" asks the ranger.

"An animal!"

"Does it have eyes?"

"No!"

"Does it have arms?"

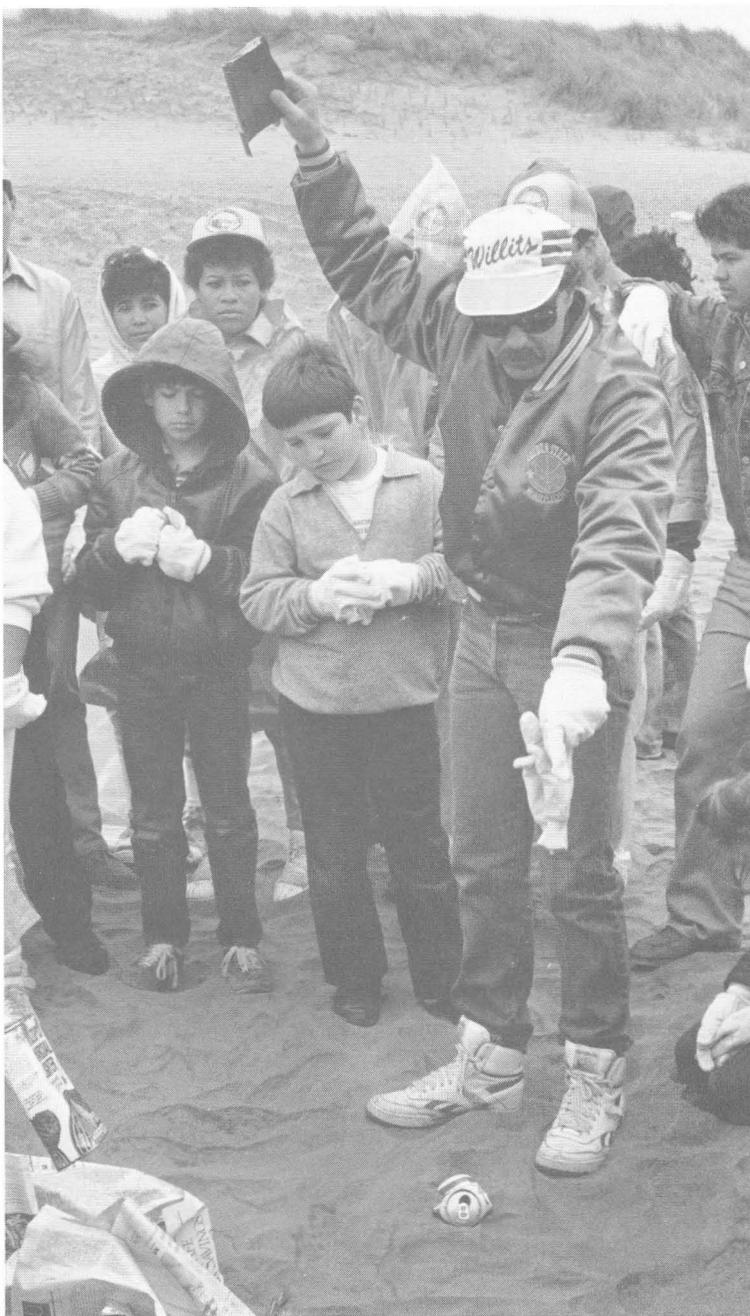
"No!"

"That's right," the ranger says. "Instead it has tentacles, which work as its fingers, arms, and eyes. Now, is this dead or alive?"

"Dead!" they all cry.

"That's right, and now it's nature's litter,

**A garbology student on a field investigation.**



DEWEY SCHWARTZENBURG

**Some scarce and expensive material found on the beach.**

which means we leave it on the beach, because nature can recycle it. Do you know what recycling is?"

"It means nature reuses it," calls one boy, and all fly off to continue their hunt.

These third graders from Treasure Island Elementary School and their teacher, Susan Clarke, are here as part of the San Francisco Bay Chapter of the Oceanic Society's Adopt-A-Beach program. The program is funded by the Division of Recycling of the State Department of Conservation, under the Beverage Recycling and Litter Reduction Act (popularly known as the Bottle Bill), and operates in conjunction with the San Francisco Con-

servation Corps, the California Coastal Commission, and several other state and local agencies.

Adopt-A-Beach teaches children in grades 2-8 about marine science, pollution, and recycling. The focal point is a field trip to Ocean Beach, where children clean up litter on one section of the beach and have a chance to learn about marine ecology. The trip is designed to heighten children's awareness of ecological issues, while teaching them the importance of recycling. The Oceanic Society pays for transportation to the beach.

When it's time for the actual cleanup, the children and teachers straggle into two double columns: the "Eagles" and the "Snowy Plovers."

"Eagles!" calls the ranger. "Are you ready to clean up trash?"

"Yes!" yells one line.

"Snowy Plovers! Are you ready to clean up trash?"

"Yes!" shouts the other line.

"Snowy Plovers and Eagles! ARE YOU READY TO CLEAN UP TRASH?"

"YES!" thunder the two lines together.

Armed with plastic bags twice their size, adult-sized white gloves, and a lot of enthusiasm, the children spread out across the beach to collect paper cups, chunks of Styrofoam, beer bottles, and soda cans. A few pieces are launched as attack missiles, but most land in bags designated as either recyclables or trash.

Adopt-A-Beach focuses on teaching children about the causes and dangers of litter. The Oceanic Society provides extensive materials for teachers, including a four-hour training workshop, in which teachers learn about beach environments, garbage and recycling, and suggestions for classroom activities—like creating an artificial oil spill in a small pan and trying to clean it up, or redesigning product packaging to cut down wastes and hazards to sea animals and birds.

The Oceanic Society also provides slide shows that teach about marine habitats and

about the dangers ocean-borne plastics pose to marine mammals and birds. When the kids arrive at the beach, each group is met by a ranger from the Golden Gate National Recreation Area, who explains various aspects of ecology and recycling.

Adopt-A-Beach is available to both public and private schools. "Over 45 percent of the children in San Franciscan schools haven't ever been to the ocean," notes Michelle Roest, the school education coordinator of the City of San Francisco's Recycling Project.

"This spring we'll have 50 classes of kids out here. Last spring we had 25. At 30 kids per class, we're giving pretty good exposure. Hopefully, when they're older, they'll have a greater sense of responsibility toward their environment," she says.

### **Lessons in Recycling**

In the United States alone, every man, woman, and child produces four to six pounds of garbage every day. California produces 20 percent of the nation's garbage. (During last fall's Ocean Week alone, 5,700 volunteers collected over 200 tons of garbage along 1,100 miles of beach in California, enough to cover 88 city blocks ankle-deep in trash.) San Francisco produced 967,000 tons of garbage in 1987, disposed of 727,000 tons, and recycled 240,000 tons, or about 25 percent, says Amy Perlmutter, coordinator of San Francisco's Recycling Program. That's twice the amount of garbage recycled in 1979. But because the total amount produced rose drastically in that eight-year period, the percentage recycled rose very little. The city hopes to recycle 32 percent of its garbage by 1992, and 40 percent by 2002. By that time, these third graders will be responsible for their own trash.

Children in the Adopt-A-Beach program learn some basic facts about recycling. For instance, a bottle made of recycled glass creates 20 percent less air pollution and 50 percent less water pollution than a bottle

made from raw materials. Every ton of recycled paper saves 380 gallons of oil and 17 trees. Recycling one bottle saves enough energy to run a 100-watt light bulb for four hours. Recycling one aluminum can saves enough energy to operate a TV for three hours.

"This is something kids can take home and teach their parents about," Perlmutter says. "I told them it was the one thing where they could know more than their parents and not get in trouble."

Teacher Susan Clarke used the Adopt-A-Beach program as part of her unit on Saving The Earth. "The idea for that unit came when *Time* magazine gave the annual award to Planet Earth," she says. "I decided to start by talking about how humans get colds. Then I drew an analogy by saying 'How is our planet sick?' and, 'What can we do about it?'"

Clarke used the Adopt-A-Beach program in conjunction with the Oceanic Society's Ocean Project, which primarily takes place in the classroom and is available to grades K-8. In that sequential program, each grade level in a school learns about a different marine habitat. After several years, says Joan Patton, conservation director of the Oceanic Society's San Francisco Chapter, children have "an incredible marine sciences background."

### **Following Up in the Classroom**

After the three-hour Adopt-A-Beach field trip, children return to the classroom for follow-up lessons and activities, which can include further study of things found on scavenger hunts, identifying different kinds



**Humans' litter goes here; nature's litter stays on the sand.**

of sand, and talking about what was seen and learned at the beach.

Meanwhile, the San Francisco Conservation Corps takes the recyclable garbage back to its center for further processing. The Corps works with the City's Recycling Project to identify how much beach trash comes from

on the beach, his enthusiasm is evident. "Don't miss this piece," he calls, digging out some buried plastic wrap with his toe. "And don't forget the orange peels—they're signs of human impact." He peers intently into a bag of beer bottles: "What kind of beer are they drinking here? Looks like 'Bud' is king of the beach."

"Most people think of archaeologists as just studying prehistoric sites," he says. "Archaeologists really examine the relation between behavior and material remains. When you study ancient pots, you're studying the garbage of ancient cultures to understand what those societies were like. I happen to study contemporary culture."

By analyzing garbage, Hughes comments, you can understand that solid waste is not just an issue of technology, but one of behavior. "Garbology involves examining people's perceptions of waste and yields clues as to how to change them," he says. "Hopefully, these children will learn where waste comes from, and feel impelled to clean it up if they see it on their beach again."

After the children leave, the beach is clean. A few sea gulls hop across the sand, but find no food. The only trace left by the children are hundreds of small footprints. □

**Jaime Perkins from the Oceanic Society discusses driftwood as an illustration of nature's litter.**

the water and how much is dropped on land. Corps members are also being trained to act as field trip leaders for the Adopt-A-Beach outings to allow the children to learn more about the sources of litter. "We didn't just want the kids to be beach janitors and not know what's being picked up," Perlmutter says.

As the children swarm across the beach today, Corps members tag along amusedly, lifting bags that get too heavy, teaching the children to identify nature's litter and human's litter, sorting what can be recycled and what has to be disposed of.

Also along today is Wilson Hughes, a research archaeologist at the University of Arizona, who calls himself a "garbologist." He studies trash to understand the cultures that produce it. After a 15-year study of land-based garbage, he has become interested in sea-borne trash. Hughes has trained Corps members to work with the Recycling Project. Now, as he walks along with the Corps group

DEWEY SCHWARTZENBURG

Adopt-A-Beach is available to public and private schools in the San Francisco Bay area. The Oceanic Society plans to have its curriculum available statewide by summer. The Society is also preparing a handbook to distribute to groups like Boy Scouts, Girl Scouts, and 4-H'ers who want to clean beach fronts. For more information, call Joan Patton or Catherine Halverson at the San Francisco Chapter of the Oceanic Society, Building 8, Fort Mason, San Francisco, CA 94123. (415) 441-5970.

*Susan Davis is a free-lance writer specializing in environmental issues.*

## **Waiting for Oil Prices To Rise**

**I**t was 1969 and the voice of Dan O'Neill's *Odd Bodkins* was strong in the land: "Hear the sound of my feet walking, drown the sound of my voice talking." None heeded the call with more vigor than Don Engdahl, a reporter for the *Santa Rosa Press-Democrat*, who walked the length of the 1,100-mile California coast, often stopping to write down observations.

Wondering where so many footsteps had taken him, we tracked him down and found him in an entirely new occupation, far from shore in body, but close in mind. He was working for the Department of Water Resources in Los Baños, developing solar ponds as a technique for disposing of selenium-laden drainage water in a benign, even beneficial, way. Solar ponds can alleviate salinization problems caused by irrigation while also reclaiming fresh water and salts and producing some energy. Such ponds could be a site-specific solution to an enormous problem, which came to public attention when selenium buildup at nearby Kesterson Wildlife Refuge poisoned massive numbers of birds. If widely used, solar ponds could even head off disposal alternatives that would damage San Francisco Bay, Engdahl believes. *Waterfront Age* editor Rasa Gustaitis spoke with Don Engdahl next to the pond he had designed and was managing.

**Waterfront Age:** *So here we are standing above your solar pond. It's square, about half an acre in size, and it's lined with a special plasticized fabric. How does it work?*

**Don Engdahl:** The scheme is this: We take drainage water that has a fair amount of salt in it, perhaps a quarter of what's in sea water. We extract the fresh water, using a desalter, and with the residual salts we make salt gradient ponds, which make power to run the desalter. Such ponds could be used throughout the valley. In this case only part of the brine was obtained from drainage

water; the rest was a mix we bought to simulate it. Our source was drainage to the Kesterson reservoir, which was shut off after the selenium contamination problem was discovered.

**WA:** *What's the gradient?*

**DE:** On the bottom of the pond is extremely dense brine—four, six times saltier than sea water. Each gallon of water has about three pounds of salt in it. From there on up, the salt gets progressively less dense. The specific gravity of the water lessens as you move up toward the surface. It's a stable system that resists mixing. There is also a thermal gradient. The pond is transparent to ultraviolet light. It is opaque to infrared. So heat can't radiate. The bottom gets very hot. The top is cool. The gradient provides an insulating system, equivalent to about a third of an inch of Styrofoam. On the very top there is a layer of fresh water.

**"THIS IS THE  
FIRST POND TO  
USE  
AGRICULTURAL  
RUNOFF. . . .  
IT WORKS  
BEAUTIFULLY."**

**WA:** *Heat only gets out if you take it out from the bottom with a pipe?*

**DE:** Some heat is conducted through the gradient, and some goes into the earth. But when the pond is really cooking, about 30 percent of the solar energy is trapped. So we pump out the hot brine, put it through a heat exchanger, and pour it back, slightly cooled. It's really hot down there, watch. It's about 175 degrees Fahrenheit. Just to convince you . . . (Engdahl reached into a box and activated a pump, which pulled up some water from the bottom through a pipe. The water was steaming.)

**WA:** *Amazing. What potential do you see here?*

**DE:** I think it's pretty great. One scenario: Take all drainage water, make fresh water. Take what's left and make solar ponds. I've done some salt harvesting on an experimental scale, and I think you can make fresh water, electricity, and salts in a combined system. If we can solve this problem, turning waste into products and energy, that will be the first time a civilization has done it with irrigated agriculture. And as soon as the crisis gets hot enough, I think it will happen.

**WA:** *How good is the fresh water you make?*

**DE:** You can make it as good as you want, depending on the system you use. We make it through reverse osmosis, a high-tech system that runs on electricity. Or you can use boilers. We're installing a little desalter that we'll run from heat from the pond under low pressure. That's a more elegant use of the heat. If you use the heat directly, you may someday want to have a hundred acres of these ponds next to a food processing plant to provide hot water. There's a solar pond in Miamisburg, Ohio, that heats a municipal swimming pool.

**WA:** *What do you do once you have enough salt and the salty drainage water keeps coming?*

**DE:** People's first thought on what to do with the drainage water was to dump it. It was going to be piped out into San Francisco Bay. But the environmental, political, and economic considerations make that impossible, I think, so we have to start looking at it now as a resource. You can start extracting the salt and reusing it. The main component in this is sodium sulfate, which is used in detergents, making paper, and is a major international commodity. You'd do that first. And then eventually you'd get down to extracting the silver and gold.

**WA:** *Really?*

**DE:** Sure, eventually. You have so much water. And if it contains even a little silver and gold, eventually it accumulates.

**WA:** *Is this the system developed in Israel, which Jerry Brown went to see when he was governor?*

**DE:** In Israel they have it to commercial scale, using Dead Sea brine. This is the first pond to use agricultural runoff. There are other ponds in the U.S., too, experimental ones. They all differ from ours in that they use sodium chloride. This is the first pond to use a mixture of salts. It works beautifully. It is now three years old, and it has never gone unstable.

**WA:** *So what's next?*

**DE:** At this point I'm the only person working on this project, and at this point I've done about what I think I can do with this pond. Maybe one more year would be useful. After that we need a big pond, with a desalter or evaporation ponds to feed it. The state now spends about \$200,000 a year on this project, including my salary. The state's plan is to go to a five-acre module. That would cost a lot more, of course.

**WA:** *This is the kind of thing we got excited about in the 1970s. Are people interested now?*

**DE:** Oil is too cheap. I can compete with \$20 to \$23 [per barrel] oil. But it's now \$14 to \$18 [it rose after the Exxon spill]. The Australians have an even better driving economy in the outback. It's a land that's unbelievably empty, and here and there you have a need for electric power. So they run diesel engines and truck oil in. But they've just got one little research pond, and this is its last year. They



RASA GUSTATIS

seem not to be putting the money in.

**Don Engdahl**

**WA:** *And in Israel, where you said it was commercially viable?*

**DE:** They're making a significant amount of electricity. Their plan was, at one time, to have one-fifth of their national energy through solar ponds. But oil's gotten cheaper there, too, so as I understand it, they're not really developing it.

There's a proposal for some evaporation ponds and some solar ponds on the Salton Sea. The Israelis and the Imperial Irrigation District together put in \$100,000 for pilot studies. But what we need is millions. And there's no money going into nonmilitary innovative energy now.

**WA:** *So this is where your long coast walk brought you? It has turned you from a writer into a problem-solver?*

**DE:** It was a turning point. I'd done my 15 years as a reporter. The walk gave me a lot of time for introspection. It's very hard to express what you get from such a long exposure. And I don't know how long it would have to be for it to work. You need days to get to know the rhythms—not just tidal rhythms, though that of course is the big governing rhythm on the coast. By the time I got to Bodega, which was after about a month of walking, I had the sense I could walk across

the world. I had gone to a kind of appreciation and real concern for the creatures I could see at low tides, I had walked through some of the most beautiful shoreline the state has left. And then I began to feel like an intruder—though you would think that by now I would feel part of it all. And then I talked with Cadet Hand, the director of the Bodega Marine Lab, and he said: “Nothing is unnatural, even the people.” That helped, and I have thought about it since. So I think you need time. And of course the better equipped you are to understand what you see, the better off you are. I was glad I had done considerable reading.

As a reporter, I had been bothered that I was the observer and everyone else was doing stuff. Though it wasn't as though I had never done anything. I built the first hot-air balloon to be licensed on the West Coast, and I had invented a diesel-powered pogo stick and some other harmless oddities. But after that walk, I did not return to the paper.

**I**t was clear during the conversation that Engdahl was once again growing restless. The price of oil remained low. The next step was not happening on the solar pond scene. A few weeks ago, he sent word that he had once again pulled up stakes to embark on a new adventure, this time at 7,000 feet above sea level in New Mexico. He planned to write on some aspects of the Los Baños pond and do some “minor consulting,” but would be “delighted to correspond or talk with anyone interested” in the research.

Back at the Department of Water Resources, Brian E. Smith, chief of special investigations branch, San Joaquin District, said pond studies would continue at Los Baños through 1989 while the next step is considered. That step will probably mean building a pond of three or more acres at another location, where agricultural drainage water is available. “We would probably want to bring in a group of people to replace Don Engdahl’s skill and knowledge,” Smith said. “It’s unlikely we’ll find another Don.”

Solar ponds make sense in the Valley, where small evaporation ponds are now being built to replace Kesterson as dumps for drainage water. Research is showing that they collect boron and selenium much the way Kesterson did. They could also become hazardous to wildlife. The Los Baños solar pond did not attract birds, Smith said, perhaps because it was nearly sterile. Construction costs are about the same for a solar pond as for an evaporation pond, he said, and you get better value for your money with the solar alternative. The heat it generates could be used directly for evaporators, greenhouses, or canneries, or converted to electricity. The gains in energy would make drainage water disposal less expensive.

“I foresee a solar pond at the end of the evaporation pond process,” Smith said. □

*For more information: Brian E. Smith, chief of special investigations branch, San Joaquin District, Department of Water Resources, 3374 E. Shields Ave., Fresno, CA 93726. Don Engdahl: P.O. Box 687, Las Vegas, NM 87702. (505) 425-9540.*

## Book Reviews

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### **Weathering Coastal Storms**

**Catastrophic Coastal Storms: Hazard Mitigation and Development Management**, by David R. Godschalk, David J. Brower, and Timothy Beatley. Duke University Press, Durham: 1989. \$47.50, 275 pp

The subtitle reads "Hazard Mitigation and Development Management." Planners and policymakers are encouraged to shift from structural controls—seawalls and coastal armoring—to non-structural measures—building setbacks and land use controls. The authors are well qualified; they are professors in planning at the University of North Carolina at Chapel Hill and the University of Virginia who have collaborated on mitigation research for the National Science Foundation. Unfortunately, the book is not without its own hazards, particularly for local planners anxious to mitigate damage in the event of a repeat of California's devastating 1983 coastal storms. In this book, the Pacific coast does not exist.

On Page 11, the authors acknowledge: "The major focus of this book is on mitigating hurricane damage because it is potentially the greatest due to the threat of shoreline wind and water surge atop rising floods." The authors go on to state: "Because the mitigation actions taken for hurricanes also reduce damage from other coastal storms, our analysis applies to the full range of coastal storms threats." However, overlaying the land use controls designed for hurricane-prone, low-lying barrier islands onto a cliff-shore prone to wave undercutting, slope instability, and landslides is easier said than done. Do we want a planner in Orange County, California, to downgrade seawalls and celebrate setbacks to an SRO audience of real estate agents, developers, and million-dollar beachfront owners, based on what's

happening in Green Swamp, Florida, and St. Bernard Parish, Louisiana? Moreover, as the last issue of *Waterfront Age* indicates, shoreline controls, either on the beach below or the bluff above, can be undermined by inland dams that impound the coast's river-borne sand supply. Such sand loss does not rate mention as a coastal storm threat in this volume.

Even on the book's chosen coastline, the Gulf and the Atlantic, significant omissions crop up. Coastal Louisiana lost 50 square miles a year, an erosion rate that can quickly outmode hurricane setbacks and building elevations. Erosion stems from subsidence induced by oil pumping, from flood control levees that reduce freshwater and sediment flows to wetlands, and from oil company canals that permit salt water to intrude into the shrinking coastal delta. Such wide-ranging impacts, which can occur in other coastal areas, too, make coastal Louisiana especially vulnerable to coastal storms, catastrophic or not. Yet the book is silent on how to mitigate such critical impacts. Like the Western rim of North America, today's drowning delta region does not exist in the book.

*Catastrophic Coastal Storms* is not without redeeming values. Within their confined focus, the authors describe how government at the federal, state, and local levels can interact or conflict in developing mitigation programs. They would integrate hazard mitigation directly into development management so corollary goals—open space, public access, habitat protection—can be achieved and the constituency for mitigation thereby expanded. Oregon today enjoys a relatively safe coastline compared with New Jersey or Southern California because of its early and continuing interest (one that predated the buzzword "mitigation") in acquiring extensive coastal parks and safeguarding public access.

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One chapter is devoted to mitigation or its lack after three recent hurricanes—Camille, Frederic, and Alicia. The Federal Emergency Management Agency (FEMA) issues inter-agency hazard mitigation reports so disaster-struck communities can reduce their exposure to the next one. However, state and local governments can ignore these well-researched reports while soliciting another FEMA service—federal grants to rebuild. The authors would link future FEMA grants to a community's demonstrated urge to mitigate.

California offers a worthy candidate for such treatment. Since 1980, the flood-prone islands in the San Joaquin Delta region have received over \$100 million in federal and state disaster grants while failing to plan for adequate levees or subsidence control. Currently, FEMA wants to recover \$10 million in grant funds from delta reclamation districts because of alleged overcharges. The authors also suggest that FEMA audit high-hazard areas before the next disaster.

The authors recommend the development of coastal storm hazard mitigation performance standards that could become national policy. The operative word is "performance": achieving a certain level of reduced hazard exposure through whatever mix of measures is suitable for a particular coastal area. This type of policy advance should delight the Bush administration, with its rhetorical allegiance to cost-effective environmental approaches.

Who will find this book helpful? Certainly, planners, teachers, decision-makers, environmental groups, and coastal developers along the Atlantic and Gulf coasts; their counterparts on the sundown coast, less so. And that brings us to another publishing hazard. The book is modest in length (some 250 pages of text). The price: \$47.50.

Wesley Marx

Wesley Marx, whose books include *The Frail*

*Ocean and Acts of God, Acts of Man*, recently wrote the introduction to *Pacific Coast: A Rugged Harmony*, a photographic essay by Tim Thompson, published by Thomasson-Grant, Charlottesville, Virginia.

### **Greenprint for Urban Change**

**A Green City Program for San Francisco Bay Area Cities and Towns**, written and edited by Peter Berg, Beryl Magilavy, and Seth Zuckerman. Planet Drum Books, San Francisco: 1989. \$ 7.00, 92 pp

This is a useful collection of ideas and guidelines for a more humane attitude toward urban change than presently characterizes most of our cities, San Francisco included. The reader looking for ways and means to become active in the community and take responsibility for its environment can benefit from these observations, which are categorized into Urban Planting (planting, mind you, not planning), "Smart" (mainly pedestrian oriented) Transportation, Sustainable Planning (planning that predicts and understands consequences), Recycling and Reuse, the Urban Wild Habitat, Creating Socially Responsible Small Businesses and Cooperatives, and Celebrating Life-Place Vitality.

Each section begins with a brief overview of the current situation, what potentials exist, and what cities can do to achieve these potentials. These are the useful parts of each section. Unfortunately, things get a bit cute thereafter, with a "fable" wrapping up the chapter, telling of how "typical" San Franciscans were born again into urban awareness and activism. The characters in the fables are caricatures of Bay area urban types: Mrs. Wong in Urban Planting, Jedidiah Washington in Renewable Energy, Cuong Nguy in Recycling and Reuse, and so forth. The tone can be cliched or patronizing, as when Jack

Marshall and his lover, Tom, decide that the way for "Celebrating Life-Place Vitality" is to have a costume party to greet spring on Twin Peaks.

"Life-Place Vitality" simply means "the unique natural features—native plants and animals, climate, seasonal variations, and many others—that mark the places where we live." "Many others," I hope, includes social and cultural differences, ethnic variability, and the non-physical qualities that enrich the Bay area. This tendency to substitute New Age-speak for forthright language occurs several times in the little book. It should be guarded against.

That aside, however, *A Green City Program* contains ideas that deserve serious development and implementation. They include

- Establishment of local composting centers, the compost to be made available to parks and gardens in the city.
- "Proximity policies" to guide planning, so that uses are mixed, not segregated, with "tax incentives to encourage them to mix—residential and commercial along with light industry, workshops and services."
- Production of a guide or workbook of all the projects of situations where "planning for livability has succeeded." St. Francis Square in San Francisco is the project noted despite its residential single-use nature.
- The creation of viable markets for recycled materials.

"For example, city governments could purchase recycled paper for all its [*sic*] duplicating and word processing to help establish that industry."

• Creation of a city Department of Natural Life "to coordinate [all city agencies'] efforts on behalf of urban wildness." (That's natural wildness as represented by foxes, hawks, and the like, not the kind that appears South of Market after dark.)

- "Create 'small business incubators'—

places where new businesses can set up shop, pay low rent, and share services and office equipment such as computers and photocopiers with other start-ups." Having achieved a measure of success, they would move into the mainstream, making room for other businesses. This is the book's best idea.

This little book is a good first try at establishing a scope of responsibilities and activities that can help people become more in charge of their neighborhoods and their environment. Much of the material emerged from a series of "Green City" meetings held at Fort Mason Center in 1986, attended by a wide variety of individuals and interest groups. *A Green City Program* is in reality a preamble, not a program. It needs to be followed with a much more detailed and extensive exploration of processes, projects, and legislative approaches that have worked in other communities, plus proposals for new activities that are more site-specific to particular places in the Bay area.

And the next time, without the "fables" and the New Age jargon, please.

Jim Burns

*Jim Burns is an urban design and planning consultant who specializes in community involvement and participation.*



## Letters to the Editor

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### More Opinions on Sand

Editor:

I am an avid reader of *California Waterfront Age*. However, some balance and comment are needed on two articles in the Winter 1989 edition.

"The Impact of Dam Building on the California Coastal Zone," by Scott A. Jenkins, Douglas L. Inman, and David W. Skelly, seems to me to be quite one-sided in its view of dams and quite incomplete in its understanding of the impact of dams. For perspective, let me begin by saying that I am not an advocate of dams, but nevertheless feel compelled to comment on the shortcomings of the article. It seem to be premised on the logic that rivers and creeks deliver sediment to the beach, all dams trap sediment, and therefore all dams have a significant adverse impact on the beach. While this rather simple premise has appealing logic, it falls far short of explaining the causes of beach erosion.

The majority of sediment trapped behind dams is not suitable, because of its size, for beach replenishment. Also, nearly all dams in Southern California are located at some significant distance from the beach, and the water released by the dams, having been relieved of its sediment by the dam entrapment, will attempt to pick up sediment by eroding the watercourse bed and banks downstream from the dam. Thus, the entrapment behind the dam need not mean a loss of sand for the beach in that much or all of the sediment deposited by the dam is replaced by downstream erosion. Of course, the sand pickup downstream will be less than the sand entrapped because impounded water is released at a slower rate and thus has less sediment-carrying capability.

Also, the situation in the Oceanside littoral cell, while common, is not necessarily typical. For example, the Los Angeles, San

Gabriel, and Santa Ana rivers (the largest watershed in Southern California) and the San Joaquin and the Sacramento rivers in Northern and Central California in their natural condition did not deliver significant quantities of sediment to the beach.

The Santa Ana River, for example, did not discharge directly to the ocean, but instead crossed a large area of tectonic subsidence (the coastal plain basin) that lies between the Santa Ana mountains/Chino Hills/Coyote Hills/Repetto Hills and the coastal uplift attributed to the Newport Inglewood fault.

This geosyncline has subsided contemporaneously with deposition from the aforementioned rivers and contains in excess of 20,000 feet of sediment. In its natural condition, the Santa Ana River traverses its canyon, where it flows in a relatively narrow and deep configuration, and exits onto the coastal plain, where it spread out as a wide and shallow sheet, lost most of its sediment-carrying capacity, and deposited the sediment on the subsiding coastal plain. It is unlikely that significant quantities of sediment reached the ocean except in very great storms. In the 1938 flood, the Santa Ana River inundated 90,000 acres of the coastal plain and moved across this plain slowly in a relatively shallow sheet that could carry only the fine-grained type of sediment that would not remain in a beach deposit. The advent of flood control systems confined and channelized the Santa Ana River and vastly increased its sediment-carrying capacity so that the sediment was transported through the flood control channels and was delivered to the beach instead of being deposited on the coastal plain. The Santa Ana River channel is a soft-bottom channel designed to be in equilibrium with its sand bed: that is, the sand that enters the system is carried through the system with no net deposition or erosion.

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Dams can hardly be blamed for all the problems in the Oceanside littoral cell. None of the major watersheds in the northern portion of the cell depicted in the map on Page 14 are dammed. These include Trabuco, San Juan, San Mateo, and Christianitos creeks. Nevertheless, there is an extensive history of beach erosion in the Capistrano Beach area of Orange County, and in 1965 the state placed 650,000 cubic yards on Doheny Beach State Park. One of the reasons for the wax and wane of beaches is the poor match between sediment delivery of the natural (that is, untamed) rivers, creeks, and streams and the sand transport rate of coastal processes. In dry and average years, there is almost no sand input from the rivers and creeks. The sand input occurs only very infrequently during great storms and then deposits a large delta at the mouth of the rivers and creeks. In the following years the material will be transported downcoast, and as the time increases subsequent to the most recent sand input, beach erosion may occur. The wide, sandy beaches described in 1916 (Page 13) occurred after the greatest storm of record in the San Diego County area. On Page 12, it is stated that a shoreline can only remain stable if a steady state exists. In reality, a steady state seldom exists because of the infrequent input from natural (that is, undammed) rivers and creeks.

The statement is made on Page 13 that Oceanside harbor contributes to the net loss of sand only to a minor degree. Others (reference "Study of the Oceanside, California Littoral Cell," U.S. Army Waterways Experiment Station, August 19, 1978, Page 8) have described the impact as significant and the figures on Page 13 (140,000 cubic yards out of 250,000 cubic yards) seem to suggest its significance.

The attribution (Page 14) of the settlement in the parts of the Warner Valley to Lake

Henshaw is not documented and in the absence of documentation seems implausible.

The section on "Remedial Measures" on Page 15 seems to imply that sediment entrapment by dams is the reason for the remedial measures being undertaken along the coastline. At best, the dam contribution can be described as only one of the reasons. The statement is made on Page 15 that "stream bed reinforcement around bridges and overpasses merely results in increased current scour immediately downstream." While this happens on occasion, it is a matter of design, and is not inevitable.

Page 15 states that "at the heads of reservoirs behind dams . . . lies the sand supply missing from the beaches." There is no direct relationship. Furthermore, much of the material deposited behind the dams is unsuitable for beach replenishment. Very significant costs would be required to excavate this material, classify and sort it to make it suitable for beach use, haul it from the upper reaches of the watershed, and place it on the beach.

I would also like to offer a brief comment on "A Legal System to Protect the Shores of the Sea," by Katherine E. Stone and Benjamin Kaufman. The authors seem to suggest measures applicable to the entire watershed for the purpose of protecting the sand supply for the beach. While that may seem to be an admirable goal, it also seems to suggest that the inland watershed must be eroded for the benefit of the beach and seems contrary to the public interest in preventing or controlling soil erosion and in the rights of property owners to protect their property.

*J.W. Williams  
Manager, Public Works Design  
Orange County Environmental  
Management Agency*

## Letters

*Continued from Page 47*

*Katherine E. Stone replies:*

The concept of "Sand Rights" does not require that the inland watershed be eroded for the benefit of beaches. Application of the sand rights theory would require decision makers to consider and weigh the benefits of and mitigate the impacts of inland projects on the transport of sand to beaches.

The costs of ignoring such impacts have required expensive remedial action in the form of protective coastal structures and sand replenishment as well as the loss of public and private coastal properties. The rights of property owners are subject to the public trust and reasonable exercise of police power.

Sand rights is a form of regional resource management, tied to geographical and geological rather than political boundaries. □

## Executive Office

*Continued from Page 2*

Must we have people living off our dumps, as in Bombay, Mexico City, and elsewhere, to solve our waste disposal problems? Do we have to give up our ideal of an opportunity for the good life for every American? We do not. Our approach to development, once viewed as the embodiment of democratic free economic choice and opportunity, has led to continuing destruction of the resources on which a good life depends, especially arable land, clean water, forests, natural habitats. What we must accept is not unequal distribution of our shared wealth as a nation, but the simple fact that not everyone can live in the most scenic or convenient places because there is either not enough room, or because overdevelopment will destroy the "paradise" that first attracted us. We must learn that "quality of life" is something other than the freedom to sprawl across the landscape so we can all be gridlocked together en route to the places we can no longer enjoy because we have destroyed them.

Clearly, then, we must look back at what we have done and *restore* our surroundings. We must consider our present and *conserve* what we have. Finally, we must look ahead, overcome our inertia, and *prepare* the groundwork for future generations, building upon our successes and our knowledge of what is necessary now.

What goes around comes around. As we understand the whole cycle, we will no doubt also realize that we have found a new version of the good life, one that we actually can pass on to our children. □

## A Very Peculiar Shipwreck

*Continued from Page 34*

Wendel," said Santa Fe's attorney, Claude Stern. "We've invited him to leave, we've urged him to leave, now we've initiated suit to get him to leave the property. Santa Fe has been a saint in the matter."

Von Wendel says he has no intention of claiming land rights; he's waterborne.

Berkeley citizens tend to favor people who challenge authority, and many people find delight in Von Wendel and his amazing structure. "He ought to be made a historical monument," said Jim Elliot, a boat owner at the Berkeley Marina. "He's a symbol of everything Berkeley stands for. He's sort of an outlaw, a radical, an artist."

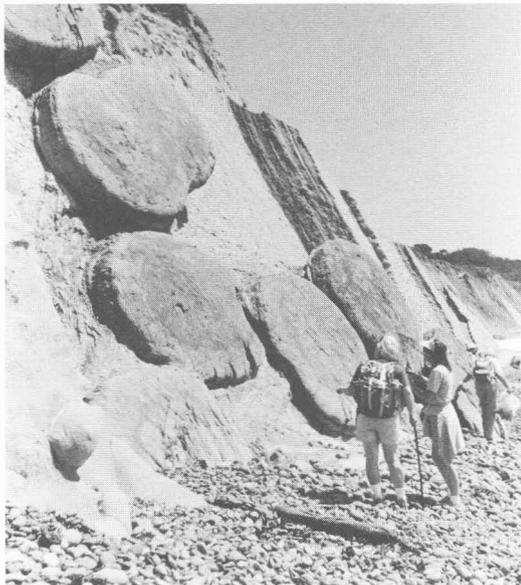
To boat owner John Lemmon, Von Wendel is a community asset. "I've seen him rescue boats washed ashore, help people out, and clear away sunken boats to make the area more navigable," he said.

Others are less enthusiastic. "I wish him well, but he's been shipwrecked there a long time," said Nick Cook of the Richardson Bay Community Association, which is seeking mariner's rights to anchor up to six months for repairs and to wait out bad weather in Sausalito. "That argument gets weaker as you go along."

Is this man a mariner or is he just marinating? Tide may tell.

*Kristi Farnham*

SIMONE WILSON



## **Mystery Photo**

Animal, mineral, or vegetable? Art or nature? Identify the site and the phenomenon (let's have a nice, scientific explanation, please—no flowery prose!) and win a free year's subscription to your favorite magazine, **Waterfront Age**.

Last issue's mystery solved: To BCDC, the city of Berkeley, and the Santa Fe Pacific Realty Corporation, this conglomeration in the Berkeley Marina is everything from an "eyesore" to "illegal fill" to "a floating junkyard." But to Claus Von Wendel, it's home. See article on Page 34 for all the facts.

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