

CALIFORNIA
Waterfront Age

SPRING 1988

VOL. 4 NO. 2



Guidelines for Contributors

California Waterfront Age is glad to consider contributions of articles and shorter items related to the state's waterfronts. We aim to provide a forum for the description and discussion of public programs and private initiatives relating to waterfront restoration and development in California. Resource management and economic development are our major themes.

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. Tourism, waterfront parks, public access.
3. Maritime industries.
4. Water quality, resource restoration, enhancement.
5. Cultural and historical issues.

We will also consider the following shorter features:

Conferences: We publish summaries of waterfront-related conferences.

Book reviews: We seek relevant reviews, about 500 words in length, 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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CALIFORNIA WATERFRONT AGE

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Cover: Brown pelican on Monterey Fisherman's Wharf. The pelicans, an endangered species, can be found in the area year-round. Photo by Mark Wheatley.



**Watershed Restoration:
Theory and Practice
pages 13, 22, 24, 28**

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URBAN WETLANDS are increasingly being recognized as a significant natural and economic resource. While proximity to human settlement places continuing development pressures on wetlands, that same proximity also enhances their value as wetlands. They offer great recreational and educational opportunities to a population that is increasingly distant from, and ignorant of, the natural ecological context that ultimately supports us all. They also function as flood control buffers, water quality filters, receivers and processors of treated wastewater, and visual amenities for adjacent development.

More and more communities faced with the challenge of maintaining their quality of life are beginning to notice and appreciate their wetlands, and to resist pressures to use

land Managers, to be held June 26-29 in Oakland, California, has as its theme "Urban Wetlands and Riparian Habitat."

Simultaneously, the recognition is spreading that no single water-related issue can be addressed adequately unless it is considered in the context of the entire watershed. In heavily urbanized San Diego County, for example, efforts are underway to preserve several coastal river valleys, as residents realize that their search for the good life may be imperiled by loss of natural stream flows and riparian habitats—and wetland losses may diminish property values. Some residents, with broader outlooks, are also moved by the importance of urban watersheds as breeding grounds and flyway stopovers for many avian species. In rural areas, ranchers and farmers are slowly realizing that their interests will be better served by protecting their own and adjacent wetlands through comprehensive watershed planning and management. Laurel Marcus' article in this issue of *Waterfront Age* addresses these situations and the Coastal Conservancy's role in watershed management.

Yet efforts to protect these areas face formidable financial, political, and educational obstacles. The danger is that we will end up with no more than a few scattered urban wetland remnants, interpreted as museum pieces of what once existed. But there are signs of a rising public consciousness of a need for action.

The challenge of wetland conservation has several facets. Arguments rage about what is more important: preservation, restoration, enhancement, creation. Many preservationists contend that remaining wetlands must be acquired by public agencies before they, too, vanish completely. This, of course, takes money, and a lot more than is available, or likely to be, in the near future. Restoration advocates focus on the need to "clean up the existing mess" we have made of things by eliminating pollution and sedimentation and restoring tidal flows, spawning beds, and breeding areas. Others charge that restora-

them as sites for buildings and parking lots. Resource conservation districts, land trusts, and local governments are increasingly involved in protecting wetlands. The annual conference of the Association of State Wet-

RON KUKULKA



tion efforts have not been proven effective and could do further damage. Enhancement projects may improve the wetlands' functioning for some purposes, such as waterfowl habitat, but may perhaps be detrimental for other functions, critics contend. Lastly, some wetland advocates argue for creation of new wetlands to redress at least partially the tremendous loss of historic wetlands. Here, too, as with restoration, it is too soon to tell whether wetland creation really works.

Clearly, if wetlands are indeed as important to our survival and enrichment as they appear to be, we need all these efforts. Much of the disagreement about the appropriate approach to wetland protection stems from our inadequate knowledge of how wetlands work and the effects of our interventions (notwithstanding significant expansion of understanding in the past few years). Disagreement also stems from the total lack of money to fully address environmental concerns, leading to disputes over the most cost-effective use of minimal funding.

Recently, conflicts over wetlands have been increasingly addressed by requiring mitigation for losses caused by what is deemed essential development. This approach favors those who consider that regulatory policies requiring "no net in-kind loss" of wetland values are too severe. Others, who vehemently oppose less stringent controls, contend that no net loss itself represents a substantial concession to those willing to destroy wetlands, because what is sacrificed to development can never be duplicated or substituted by mitigation projects. Some criteria to give greater assurance that restoration projects, including those occasioned by mitigation, have the best possible chance of success are proposed by David Shonman's article in this issue.

All wetland projects, whatever their genesis, should include rigorous monitoring and evaluation from the outset, so as to increase our knowledge on the broadest scale possible. For as wetlands continue to shrink, despite current laws to protect them, we will

need all the knowledge we can now acquire. We will also clearly need more funds, if the public sector is to have a major part to play in wetland conservation. The public sector must also cooperate with, and help to educate, the private sector—developers, farmers, other landowners—to promote further conservation activity.

Our recent collective experience with wetland conservation suggests, on the one hand, that existing regulatory measures could be made clearer and less cumbersome in some respects, strengthened in others, and expanded to cover situations that require public protection. On the other hand, non-regulatory methods for solving wetland problems now offer promising new avenues. These involve innovative funding approaches, land use conflict resolution, cooperative land use planning and management, and collaboration between nonprofit organizations, government agencies, and private landowners. The Coastal Conservancy's wetlands program is a notable state government effort in this direction.

The time is right for articulation of clearer public policy on wetland conservation. The issue is eclipsed, this election year, in the face of massive budgetary deficits, growing numbers of the poor and homeless, the spread of AIDS, deteriorating public infrastructure, the continued flight of manufacturing employment overseas, growing crises in education and health care, and global saber-rattling. But despite all that, much progress has been made in recent years in learning why we need wetlands, and how their loss leaves us not only poorer, but also with an economic burden that will have to be paid by our children in other ways. The loss of wetlands has profound implications for us all, for we cut ourselves off from our environmental roots at our own peril. □

The danger is that we will end up with no more than a few scattered urban wetland remnants, interpreted as museum pieces of what once existed.

Santa Monica Westside Hostel

Low-cost overnight accommodations that are otherwise unavailable in the Los Angeles coastal zone will be provided through the development of the Santa Monica Westside Hostel. Last December, the Coastal Conservancy authorized a reimbursable grant of up to \$300,000 to the Los Angeles Council of American Youth Hostels for the project, which includes renovation and rehabilitation of the historic Rapp Saloon, a designated City Landmark, as a community room. Hostel guests will help the city by picking up litter in nearby Palisades Park.

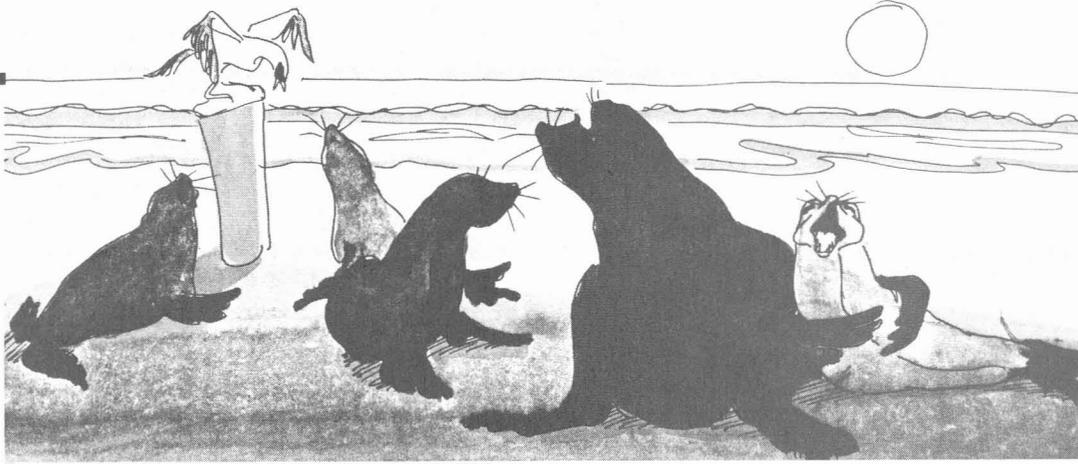
Stairway in Isla Vista

A Conservancy grant of up to \$41,000 to the Santa Barbara County Parks Department, also authorized in December, will fund reconstruction of a beach stairway to the Camino Pescadero street-end location in the community of Isla Vista.

San Francisco Bay Access Grants

Grants totaling just over \$1.5 million were approved by the Coastal Conservancy in January for 15 public access projects throughout the San Francisco Bay area. These projects will open up or make accessible to more people areas of great scenic and recreational value.

- The Golden Gate National Park Association will construct new trails and link existing trails at East Fort Baker, in Marin County. It will connect the Vista Point Overlook at the north end of the Golden Gate Bridge with the paths at the bottom of the adjacent steep slope. It will also link existing paths with a branch of the Coastal Trail. This will open up the entire west side of the Golden Gate National Recreation Area to bicyclists and hikers crossing through on the Fort Baker trail system. The association's request for \$100,000 was approved in full by the Conservancy.
- The city of Benicia will construct an all-weather pathway linking an existing fishing access area to Benicia State Park. Pedestrians and bicyclists now use the road shoulder and walk very near to oncoming traffic. This project adds a safer, barrier-free segment to the shoreline trail. Full funding of \$40,260 was approved.
- The city of East Palo Alto will build access improvements at Martin Luther King Jr. Park, providing a rest area/staging facility for bicyclists and pedestrians using the nearby Baylands Shoreline Trail, which runs for several miles. An already funded Conservancy project to extend the pathway north toward the Dumbarton Bridge will open the East Palo Alto area up to even more regional visitors. Funding of \$160,500 of the \$175,225 requested was approved.
- The San Mateo County Harbor District will raise and resurface the parking area and construct an all-weather, barrier-free promenade pathway along the West Basin of the Oyster Point Marina in South San Francisco. The project will link an existing pathway to the north with the fishing pier and shoreline path to the south. Funding of \$56,500 of the \$158,750 requested was approved.
- The city of Oakland will construct a number of barrier-free amenities at Estuary Park. The work includes surfacing a path and constructing overlook areas, and retrofitting an observation platform, a restroom, a floating dock, and picnic facilities. The project will significantly increase park use by people with disabilities, especially through boating access via the city's water sports program for the disabled. Funding of \$105,000 of the \$146,000 requested was approved.
- The county of San Mateo will rehabilitate and expand existing facilities at the county-owned fishing pier adjacent to the west end of the Hayward/San Mateo bridge. A staging area with parking, restrooms, picnic facilities, landscaping, and fencing will create a trailhead connection to a re-



cently completed shoreline bike trail north of the site, and to the existing Foster City/San Mateo trails networks heading south to Coyote Point. Funding of \$154,800 of the \$191,000 requested was approved.

- The Hayward Area Recreation District will raise the level of the existing levee-top road through the Hayward Shoreline Marsh and resurface it so it will be accessible year-round. The road extends from the visitor center to an area near the shoreline, where it connects to an existing all-weather pathway. Full funding of \$26,000 was approved.
- The East Bay Regional Park District will build a bridge across the San Leandro Channel as a better link between the Bay Park Refuge and the San Leandro Bay Regional Shoreline bike/pedestrian trail. To get to the park and continue along the shoreline trail now, joggers, walkers, and bicyclists must go several blocks south to Hegenberger Road, then cross a bridge with no sidewalk, and backtrack. Full funding of \$160,000 was approved.
- The city of San Rafael will develop a section of the shoreline trail near Point San Quentin. It will connect to an existing trail immediately south of the project area, and eventually to Pickleweed Park to the north. Funding of \$65,395 of the \$241,725 requested was approved.
- The city of Alameda will construct a bicycle staging area to serve existing and future bike trail links in Alameda and San Leandro Bay. Project elements include parking, picnic areas, drinking fountains, and paths connecting existing paths over and under the Otis Street Bridge with city surface street and off-road bike routes. Funding of \$139,596 of the \$153,500 requested was approved.
- The city of San Mateo will construct a bridge to connect its surface street bike-lanes with the shoreline pathway along the bayside of Foster City. The bridge will eliminate the need for extensive backtracking and provide continuous north-south progress away from crowded surface streets. Funding of \$190,000 of the \$200,000 requested was approved.
- The East Bay Regional Parks District will acquire a 1-acre parcel for development as a recreation staging area for the shoreline trail from Point Pinole to Martinez. Full funding of the \$58,588 requested was approved.
- The city of San Francisco will construct major retrofittings of several parts of the Marina Green area to render them accessible to people with disabilities. The work includes: resurfacing paths and sidewalks, making curb cuts, re-striping some of the parking lot to provide more handicapped parking spaces, retrofitting restrooms, connecting the project area with the existing shoreline path to Fort Point, and constructing a ramp to the Wave Organ at the end of the Yacht Harbor breakwater. Funding of \$171,095 of the \$271,626 requested was approved.
- The city of Burlingame will build a 400-foot-long bike/pedestrian pathway linking an existing bridge to another bike/pedestrian pathway now under construction. The project site runs along an existing wetland/shoreline bird sanctuary and will help to complete the shoreline trail through this area of Burlingame. Full funding of the \$40,000 requested was approved.

Santa Cruz Beachfront Plan

A grant of up to \$50,000 to the city of Santa Cruz was authorized in January for preparation of a Beach Area Urban Waterfront Restoration Plan for the beachfront from the municipal wharf south along Beach Street to the San Lorenzo River. The plan will be developed in consultation with a task force of interested parties and will consist primarily of detailed schematic designs for street improvements intended to address the traffic congestion, confusing and dangerous street design, and visual blight along the world-famous beachfront.

Restoring Manhattan Beach Pier

In February, the Coastal Conservancy authorized a grant of up to \$50,000 to prepare an engineering feasibility analysis for restoration of the Manhattan Beach Pier in Los Angeles County, the oldest concrete pier on the West Coast. The pier is owned by the California Department of Parks and Recreation (DPR) and until recently was operated by Los Angeles County. In recent years its structural condition has deteriorated. Assembly Bill 1675 appropriated \$600,000 in local assistance grant funds to the Conservancy from the Special Account for Capital Outlay (SAFCO) for restoration, to augment existing local funds available to restore the pier. However, no current estimates of restoration costs have been completed. To determine if the SAFCO money, combined with local resources, will suffice for restoration, updated engineering and cost information is essential. Since December, Conservancy staff have been coordinating discussions between DPR and the city with the goal of negotiating either a long-term operating agreement between the two parties or the transfer of pier ownership from DPR to the city. The engineering update is essential to continue current negotiations and structure a successful local assistance grant of the SAFCO funds to the city of Manhattan Beach.

Carmel River Wetlands Plan

Also in February, the Coastal Conservancy authorized a grant of up to \$35,000 to the Carmel River Steelhead Association to prepare an enhancement plan for the Carmel River wetlands within the Carmel River State Preserve in Monterey County. The Carmel River is the southernmost major steelhead stream in the state. The wetlands at the river mouth play an essential role in maintaining steelhead populations, as well as providing valuable habitat for other aquatic species, shorebirds, and waterfowl. The Steelhead Association, alarmed by diminished steelhead populations, will seek alternatives for enhancing and expanding the Carmel River wetlands. The plan will also address current flood control practices and upstream water diversions that affect the wetlands. The county of Monterey and the Monterey Peninsula Water Management District will each contribute \$25,000 to the cost of the project and will serve on a project management committee jointly with the Conservancy, the Steelhead Association, and State Parks.

Cascade Ranch Award

The coalition of individuals, public agencies, and private organizations that joined to protect the 4,000-acre Cascade Ranch on the San Mateo County coast has received the American Farmland Trust's Agricultural Achievement Award for 1987. The Coastal Conservancy played a leading role in shaping the multiuse agreement that protects and enhances farmland, improves access, provides for new camping and lodging facilities along a heavily traveled stretch of coast, and links segments of parkland. In presenting the prestigious award to the Cascade Ranch team, the Farmlands Trust stated: "This cooperative conservation effort drew together public and private interests rarely allied in a common purpose. It serves as an excellent model for other joint protection projects around the country." □

Urban Wetlands Conference

"Urban Wetlands and Riparian Habitat" is the theme of a conference sponsored by the Association of State Wetland Managers to be held June 26-29 in Oakland, California.

The national symposium will address problems and issues, provide practical information, and define further research needs associated with urban wetlands and riparian habitat. The conference will provide an unprecedented systematic examination of the special characteristics of and severe development pressures facing urban wetlands.

Presentations will include scientific, policy, and legal papers describing success stories and addressing special problems. The workshops and plenary sessions will cover areas such as the economics of wetland and riparian habitat protection, federal 404 permitting, the role of developers, solid waste disposal, and hydrology, design, management, planning, acquisition, urban wildlife values, and water quality. An extensive poster and display area is also planned.

For more information, contact the Association of State Wetland Managers, Box 2463, Berne, NY 12023. (518) 872-1804.

Statewide Trail Conference

The California Recreational Trails Committee's (CRTC) fifth annual Statewide Trail Information Conference, held at the Asilomar Conference Center March 6-8, drew participants from groups as diverse as equestrians and ORVers, hikers and mountain bikers. In fact, a major topic of discussion (often frank and funny, sometimes long-winded, always impassioned) was the burgeoning numbers of mountain bikers, and the few who give the many fits. The conference was organized by the state Department of Parks and Recreation and CRTC.

Much printed information was made available by several participating groups. Simultaneous workshops covered four main

topics: trail closure litigation, liability and insurance issues relating to trails, how to write a grant, and trail building and maintenance.

In terms of number of people attending, the workshop on trail building and maintenance was the clear leader. Discussions ranged from how to keep volunteer trail-builders organized, happy, and working, to ways to engineer for very steep slopes being traversed, to the different mechanical aids available to those who would build trails. A portable, pneumatic limb-lopper elicited great interest and much oohing and aahing during a demonstration at the end of the session.

The workshop on liability and insurance covered the various liability issues likely to be faced by different groups, e.g., government entity, nonprofit organization, or private individual or company, usually involved in trail building or operation and maintenance.

The next conference will convene one week before a major conference, to be held in Sacramento, on "Californians Outdoors" in early March 1989. Attenders of the Trail Conference felt that a representative from CRTC should make an official presentation at the later conference on the work of the committee and the information compiled by Trail Conference participants.

Further information on the conference is available from Ross Henry, executive secretary of the California Recreational Trails Committee, P.O. Box 942896, Sacramento, CA 94296-0001.

—Karen Rust

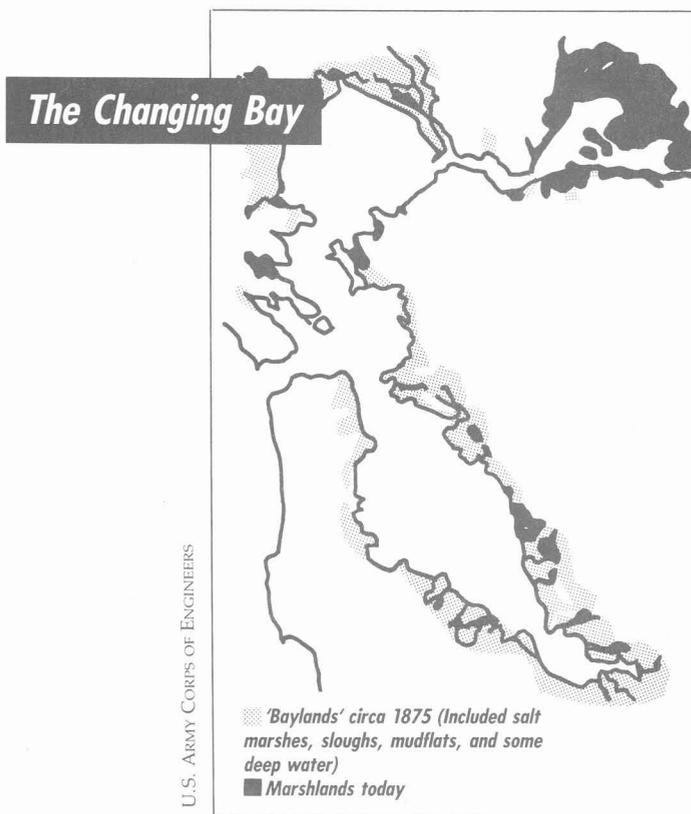
Restoring the Earth

A diverse crowd of 900 gathered at the University of California, Berkeley, January 13-16 for a conference on Restoring the Earth. More than 150 presented talks and papers on the repair of ecosystems, and other creative environmental restoration programs underway

Continued on Page 48

How Much Fresh Water Does San Francisco Bay Need?

by Michael Josselyn
and Philip Williams

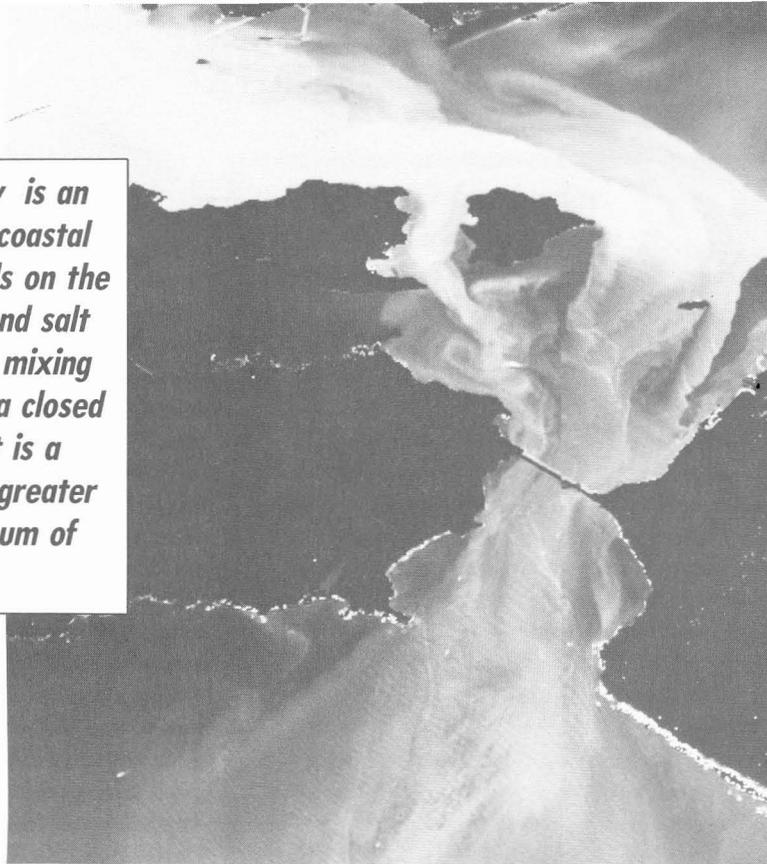


IMAGINE SAN FRANCISCO BAY without its rivers. It would be a different place, a marine embayment. Salt water would reach all the way to Sacramento. The oceanic water might be clearer than the Bay water is now, sandy beaches might be more common, kelp beds and lush intertidal algae might grow by the shore, and saltwater animals such as seastars, rockfish, and dolphins could be present.

But the diversity of life associated with tidal marshes and mudflats would not exist, nor would habitat for migratory waterfowl. There would be no striped bass, salmon, or other estuarine and anadromous fish (ones that go up rivers to spawn). Without freshwater inflow, urban runoff and wastes discharged into the basin would be flushed out far more slowly than they are now. Farming would be impossible in the Delta as salts built up in the soil. Water supplies for the Bay area, the San Joaquin Valley, and Southern California would have to be drawn from elsewhere, rather than being pumped through the Delta.

Nobody is proposing to cut the freshwater flow into the Bay entirely. However, over the past 30 years, more and more of the river

San Francisco Bay is an estuary, a unique coastal feature that depends on the mixture of fresh and salt water. When that mixing takes place within a closed basin, the result is a circulation system greater than the simple sum of its parts.



NASA

Image of San Francisco Bay, acquired by NASA-Ames Research Center aboard U-2 aircraft at 65,000 feet, using an airborne coastal zone color scanner, which simulates digital scanner aboard the orbiting Nimbus-7 weather satellite.

water flowing into the Bay has been tapped for export to central and Southern California. In some years, as much as 55 percent of the historic predevelopment inflow has been diverted. The current flow volume is below what many scientists accept as necessary to sustain fish and wildlife populations. Since the 1976 drought, striped bass populations have plummeted, according to the state Department of Fish and Game, and many of the surviving fish are harmed by hydrocarbon pollution. Salmon have also suffered, as spring flows have been insufficient to allow young fish to migrate to the ocean. Salinity intrusion into Suisun Marsh poses a threat to one of California's most important habitats for migrating waterfowl.

How much was taken from rivers before they reach the Bay, for distribution to municipalities, industry, and agriculture, has in the past been decided in the Legislature by means of a political tug-of-war. Southern and central state interests proposed water projects, on the ground that the North had "surplus water," which was wasted by being allowed to flow out into the ocean unused. The period from the 1950s through the late '70s saw a rapid development of federal and state-funded reservoirs, canals, and pumps

to divert water from the Bay to the San Joaquin Valley and south. However, since voters defeated the Peripheral Canal in 1982, the Legislature has been unable to reach any agreement on new water projects.

Although the Legislature must appropriate funds to construct new water facilities, it is up to the State Water Resources Control Board to decide just how much water is actually conveyed. Beginning last year, and continuing for two more years, the Board must determine the number of acre-feet that can be diverted from the Delta to serve water demands in central and Southern California. In 1989, the Board will set water quality standards for the Delta and Bay to protect natural resources.

The Board has the authority to require already diverted water to be released to the Delta. Eleven years ago, it briefly considered adopting water quality standards for the Bay, but instead ruled that more research was needed. In 1986, a First District Court of Appeal decision opened the door to a more substantive review of the Bay's functioning as an estuary. Presiding Justice John T. Racanelli ordered that the Board balance the needs of the Bay and Delta equally with those of agriculture and municipalities.

Tough Questions

How much fresh water does San Francisco Bay need? The answer hinges on an understanding of what San Francisco Bay is. Unlike Monterey Bay, it is not a bay in the sense of being an indentation of the coast. Rather, it is an estuary, a unique coastal feature that depends on the mixture of fresh and salt water. When that mixing takes place within an enclosed basin, the result is a circulation system greater than the simple sum of its parts. The outgoing fresh water and incoming saltwater combine to substantially increase the flow of water through the mouth of the estuary. At the same time, a gradient of fresh to salty water develops from both head to mouth and top to bottom. The adaptation of organisms to these gradients creates a unique diversity of life within the estuary; organisms live there that could not survive in either the ocean or in rivers.

Rivers and ocean add more than just their water volume. Rivers and streams bring nutrients, which fuel the growth of phytoplankton, and also sediments, which build up the marshes along the estuary's edge. The ocean is the source of most of the animals that invade the estuary, either for a short time or to spend their entire life cycle. The high quantities of nutrients; relatively shallow, warm waters; and the diversity of plant and animal life combine to create one of the most productive environments on Earth. Humans have lived on estuaries since the birth of civilization. Today, more do so than in any other environment in the world.

Ignorance of the Bay's nature has spawned grandiose schemes for improving it. The grandest of these was that of John Reber, a retired actor and theatrical director, who in the 1950s proposed that the Bay be converted into two freshwater lakes by building two large dams, one across San Pablo Bay between Richmond and San Quentin, the other between San Francisco and Oakland. The lakes he envisioned would provide drinking water for the region, allow shipping unham-

pered by tidal fluctuations, and create a national recreational resource. Reber's dramatic descriptions and exciting drawings gained much attention. The idea died, however, after the U.S. Corps of Engineers completed tests in a hydraulic model especially constructed in an old warehouse in Sausalito and found that siltation would be enormous, water quality appalling, and the anticipated economic benefits unlikely. Today, the Bay model is used as a teaching tool, demonstrating to the public how the Bay functions as an estuary.

In working to determine inflow standards, the Water Quality Board will have to sift through information provided by governmental, academic, and environmental interests. It will confront contradictory conclusions, because statistical comparisons, correlations, and biological variability provide fertile ground for conflicting interests to dispute.

What Is At Stake

What is at issue in these hearings is not restoration to some pristine baseline condition. Human settlement has drastically changed the Bay's geography and biology. The Board's task is to develop inflow standards based on an understanding of how the estuary functions today and what flows are necessary to protect its existing resources. These standards may be based on rates of inflow, salinity levels at certain points, or biological indices that measure growth or population levels of certain organisms.

This by no means implies that the status quo is an adequate baseline for standards. Additional water will be needed to sustain some species populations that have declined below viable levels. Striped bass, for example, have declined to one quarter of their adult population of 25 years ago.

What standards are needed to protect the Bay? The question is as complex as the estuary itself. It requires consideration of many separate issues: What flows are required to

maintain circulation patterns that maximize algal growth rates? What salinity levels are necessary to maintain the growth and diversity of tidal marshes around the bay edge? What flows are needed to support the spawning and migration of salmon and other anadromous fish, and to maximize the flushing ability of the estuary so that pollutant loading is reduced? Answers to each of these questions can be generated, but none can be considered in isolation. The Bay is a system, as complex as our own body, and it requires all components to work in unison to support the whole. Just as medical researchers dissect the human body to learn how its parts function, so the Water Quality Board, before setting inflow standards, must understand individual components as parts of the whole estuarine system.

Standards Proposed

To help the Board in its task, the authors prepared a report for the San Francisco Bay Conservation and Development Commission (BCDC) in 1987, presenting an overall strategy for setting standards. The commission adopted the report's recommendations and presented them to the Water Resources Control Board in September 1987.

In our report, we recommended that water quality standards be set for three major estuarine components: plankton, marshes, and recreational fisheries. All three provide major economic and recreational benefits. Plankton are the base of the food chain that supports the estuary's rich biological resources. Marshes support waterfowl and provide habitat for rare and endangered species. Fisheries are both economic and recreational benefits of a healthy estuary.

Our report to BCDC named six areas in which sufficient information is available to establish standards of freshwater inflow to the estuary. We recommended that the Board adopt:

1. A set of seasonal flow and salinity standards to maximize the growth of phytoplank-

**More water for the Bay
generally means less water
for irrigated agriculture.**



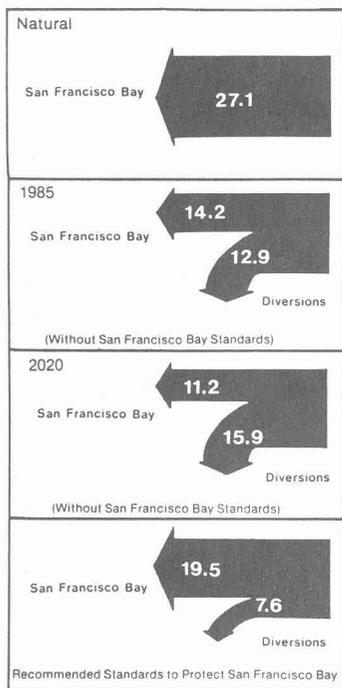
BOB WALKER

Folsom Dam



DEPT. OF WATER RESOURCES

San Joaquin County

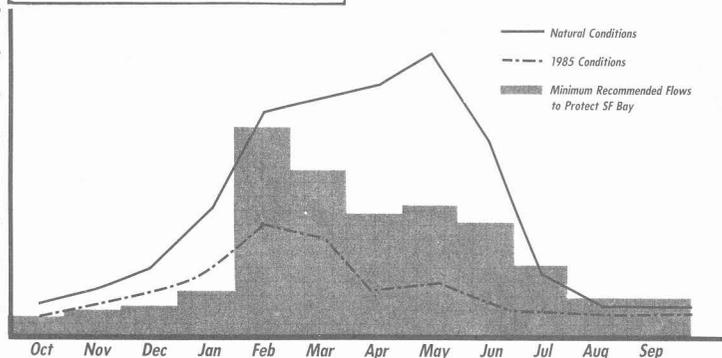


Delta Outflow

For Different Water Management Scenarios (millions of acre-feet)

Freshwater Inflows to SF Bay

(Monthly delta outflows in median year)



ton in Suisun, San Pablo, and San Francisco bays at critical times of the year necessary to support other estuarine organisms such as clams or juvenile fish;

2. A standard to require sufficient winter and spring freshwater flows to Suisun Marsh to protect over 10,000 acres of valuable tidal brackish water wetlands as well as the 44,000 acres of brackish managed wetlands;

3. A standard to require greater spring flows of the Sacramento and San Joaquin rivers to allow outmigration of salmon smolt;

4. A standard to protect the spawning and juvenile survival rates of striped bass by providing sufficient spring flows;

5. A standard to reduce the summer flow reversals in the Delta that are responsible for the loss of juvenile fish to the pumps that export water to Southern California;

6. A standard to minimize residence times of pollutants in the south portion of San Francisco Bay, especially during winter and spring, when pollutants from urban runoff can be a serious problem.

Subsequent analysis and testimony by the Environmental Defense Fund, BCDC, the Contra Costa Water Agency, and Citizens for a Better Environment identified specific water requirements for each of these components. While each was developed separately, when combined they provide the best estimate of optimal flows required in the estuary to maintain natural resources (see figure). These combined flows typically cover a seasonal range of flows from 5,000 cubic feet per second (cfs) in October to 50,000 cfs in February. The total annual flow calculated for these standards amounts to 19.5 million acre-feet of freshwater inflow in an average year, an increase of 5.5 million acre-feet over the current average Delta outflow, which the Department of Water Resources estimates as 14 million acre-feet. Projected development could drop that flow to about 11 million acre-feet annually. The total average unimpaired flow is about 27 million acre-feet. To meet the recommended standards, therefore, current diversions would have to be reduced by about 40 percent.

Similar outflow magnitudes have been suggested by others, using independent analysis. Michael Rozengurt and Michael Herz of the Paul F. Romberg Tiburon Center for Environmental Studies have suggested that average monthly spring flows of 40,000 to 67,000 cfs, with yearly flows at 17.5 million acre-feet are necessary to support salmon and striped bass recreational fisheries.

Restoring the needed inflow would require major adjustments in the way water resources are managed in California. More water for the Bay generally means less water for irrigated agriculture and municipalities.

It is clear that the Board is listening to the evidence presented on the Bay's water quality needs, and it is probable that the final decision will contain provisions for better management of freshwater inflows. The decision will, hopefully, mark a turning point in how California views San Francisco Bay—as one of the nation's most valuable estuaries. □

Michael Josselyn is a professor of biology at San Francisco State University and director of the Romberg Tiburon Center for Environmental Studies. Philip Williams heads a San Francisco firm that specializes in hydrologic and hydraulic engineering as related to natural resource management.

An Idea Whose Time Has Come—Again



LAUREL MARCUS

by Laurel Marcus

BY 1850, CALIFORNIA had been wrested from Mexico to join the United States, and its Sierra Nevada was rampant with gold seekers. Most gold miners were not lone prospectors with donkey and gold pan, but large companies employing hundreds of men. They stripped soil from hillsides and river canyons and processed thousands of tons of dirt to remove flecks of the precious metal. By using powerful pumps and hoses pointed at the slopes, they brought down huge quantities of gold-bearing soil which, after the gold had been extracted, washed downriver.

Sending refuse down the river was convenient, but, of course, it was not the end of the story.

Sierran streams flow west into the Sacramento and San Joaquin rivers in most of the watershed, or drainage basin, of San Francisco Bay. As greater and greater quantities of silt washed through the rivers in the 1860s and 1870s, the Sacramento River bed began to rise. During floods the old channel was now too shallow to contain the rushing water, and the river jumped its banks, sweeping away many farms. Northern San Francisco Bay and the Carquinez Straits shoaled in, and over 79 square miles of mudflats formed. The miners had unwittingly created a flood problem for valley farmers and navigational hazards for Bay sailors. By 1884, the Legislature was forced to outlaw

hydraulic mining and finance the dredging of the Sacramento River. San Francisco Bay never recovered its former depths.

Human disturbance to a watershed can cause dramatic problems. A dynamic balance exists between land and water in all watersheds, large or small. With each land disturbance,

"Stream and surrounding terrain always belong together, and the vegetation unites both in a living totality. In comparison, a river that has been artificially straightened out looks lifeless and dreary. It indicates the inner landscape in the souls of men, who no longer know how to move with the rhythms of living nature."

—Theodor Schwenk in *Sensitive Chaos*

be it natural or man-induced, the stream system compensates. Floods, fills, landslides, land grading, road building, dam construction, flood control projects, logging, and agriculture all disrupt watershed lands, stream systems, and water flows. Throughout California there are stream systems in which developments in one portion of the watershed have created massive problems elsewhere, typically in downstream lowlands.

The watershed is a natural division of the landscape, rarely recognized by human activities. Ownership lines are often drawn to the center of a stream, separating control of the two banks. Governmental boundaries typically follow straight lines. A single creek drainage may include three or four local governments; a large river system may encompass a hundred. Though hydrologists have for years taught the importance of watershed analysis and management, offering ideas that could have aided local flood control districts and water supply agencies, the natural processes of water and land movement have largely been ignored. In the wake of the Dust Bowl disaster, the Soil Conservation Service (SCS) and the Civilian Conservation Corps (CCC) were created to build erosion control, stream restoration, and land revegetation projects. But later the CCC was dissolved,

be it natural or man-induced, the stream system compensates. Floods, fills, landslides, land grading, road building, dam construction, flood control projects, logging, and agriculture all disrupt watershed lands, stream systems, and water flows. Throughout California there are stream systems in which developments in one portion of the watershed have created massive problems elsewhere, typically in downstream lowlands.

and funds for the SCS were severely reduced—despite the fact that the United States is now losing more soil on farms than it was losing in the years of the Dust Bowl.

Interest Reborn

With the rise of the environmental movement in the 1960s and '70s, a national outcry against water pollution prompted Congress to pass the Clean Water Act. It required that water quality standards be met throughout a drainage basin by reduction of sewage and industrial wastes at their discharge point. But though it also applies to the more difficult-to-control wastes, such as agricultural pesticides and sediment flowing in rainwater, debris from logging sites, and runoff from urban graded lands, the Act has had little impact on these pollutants. The environmental movement's vision of clean healthy streams, filled with fish and bordered by riparian forest, would take more than regulation to achieve.

Damage inflicted on the landscape continuously for 150 years had to be undone, and destructive land uses had to be changed. A small group of environmentalists, scientists, and members of the "counter culture" began to write and talk about restoring watersheds, replanting, and clearing streams.

The 1978 expansion of Redwood National Park in Northern California created a laboratory for practicing land restoration techniques. The federal purchase included land on steep slopes that had been severely damaged by clear-cutting, poor road construction, and extremely high erosion rates. In addition, a logging company, attempting to maximize profits just prior to federal purchase, had employed erosion-causing tractor-yarding: dragging logs uphill by tractor, thereby plowing the hillside and inviting mudslides and erosion.

After many years of such practices and some large floods, Redwood Creek was badly silted in and its drainage basin scarred.



To protect some of the largest trees in the world, the National Park Service experimented with techniques to stabilize the treeless hillsides, borrowing from SCS designs and creating new ones. The Park Service revegetated roads and landings, replanted landslides and streambanks, and tried to clear the creek of accumulated debris and silt to re-create salmon and steelhead habitat. Many of these techniques were successful, and a slow healing is taking place. But the effort made clear that damage wrought by a few years of human activity can take decades to repair.

From Redwood Park, the idea of watershed management and restoration has spread and found its way into the bureaucratic thinking of the U.S. Forest Service, the California Department of Fish and Game, California Department of Water Resources, and the State Coastal Conservancy, as well as many local land management agencies.

There are watershed restoration projects now throughout California, as well as elsewhere in the nation, and they are no longer simply the work of a few environmental zealots. Some are being carried out by fishermen's groups; others by coalitions of ranchers, farmers, government, and environmental groups; some are sponsored and paid for by industry; and some are the civic vision of local government. The following examples demonstrate both the physical complexity and the governmental and economic difficulties of restoring watersheds to health.

Urban Areas

The Los Angeles River—a triumph of modern engineering, or a symbol of a society sorely out of touch with the earth and its cycles? After this massive concrete ditch replaced the river's meandering channel in the 1940s, buildings could fill the floodplain once watered by occasional floods. Los Angelenos had embraced the man-made, and set an example for cities throughout the West. Flood control became synonymous with concrete streams, and both came to be thought necessary for orderly urban development. Lost were the river's other values — groundwater recharge, wildlife and fish habitat, riparian forest, and natural beauty.

The concrete river became a fixture of the mushrooming subdivision throughout the state. Planning and design were done piecemeal, by subdivision or, at most, citywide, without consideration of the overall effect on drainage in the watershed. Usually, development of coastal areas and shorelines preceded building on the hills. No thought was given to the cumulative effects of development in the watershed. Consequently, in time the concrete channels in the lower watershed became inadequate for the volume of flood waters.

On a natural hillside, stormwater percolates downward into the soil and releases slowly into the nearest stream. The tree-lined stream with rocks and reeds is a rough-bottomed channel obstructed by roots and

Gully formed along Walker Creek due to inadequate drainage along a dirt road (see arrow). Steep banks along the creek are symptomatic of severe arroyo formation.

branches. Stormwater flows slowly and may percolate into groundwater. But when impervious cement and asphalt cover this same hillside and a smooth concrete channel is installed, the stormwater's flow speeds up greatly. Where the lower watershed is first developed, the hills often remain natural at first, and stormwater flow is manageable. But as the drainage basin is paved, and development continues uphill, flows accelerate. Eventually, lowland homeowners may find their land underwater during a storm. There is usually no room to expand the channel, and the area becomes a flood hazard zone.

Buena Vista Creek watershed in northern San Diego County offers a case in point. At the base of this creek is a 300-acre lagoon surrounded by the cities of Oceanside and Carlsbad. The 20-square-mile watershed is contained in these two cities and the city of Vista, which occupies the upper half of the watershed. Homeowners on the lagoon wanted a consistent water level for a scenic view. The original tidal lagoon did not provide this, so they installed a weir at its mouth,

impounded the creek inflow, and created a freshwater lagoon. Water circulation was further restricted by the building of three bridges across the lagoon. Thus, the basic hydrology of the lagoon was radically altered. The result was self-defeating: the shoreline landowners had inadvertently created a perfect sediment catchment basin, dooming the lagoon they wanted to perfect.

Meanwhile, the watershed lands were developed. Portions of the creek in each city were confined to a narrow flood control channel lined with concrete or riprap. Small tributaries were channeled into underground pipes and stormdrains, though some sections of natural creek channel remained, interspersed between "improved" areas.

In the upper watershed, grading for housing and commercial building sites was often massive, with recontouring of entire hillsides. Little erosion control was practiced, and highly vulnerable soil was left to wash down storm drains in winter rains. Sediment settled in the natural floodplain of the lower creek, caught by riparian trees and marsh plants. Some of it reached the lagoon and some settled in the concrete channel, requiring costly clean-up.

As urbanization spread and more of the watershed was paved, it fell farther and farther out of equilibrium and changed dramatically in form. With the increase of impervious surfaces throughout the drainage, stormwater runoff accelerated. Large volumes of relatively sediment-free water began to erode the remaining areas of natural creek channel in the middle section of the creek. A 20-foot-deep gully formed. After a large marsh just upstream of the lagoon was filled for a shopping center, the lagoon received the sediment directly. In one very wet season, tons of sediment filled the eastern section of Buena Vista Lagoon, alarming residents, politicians, and the lagoon's owner—the Department of Fish and Game. Subsequently, the state spent \$1 million to dredge the lagoon and partially remove the silt.

The catastrophe prompted the study of the

The Los Angeles River. A politician once campaigned on the pledge he would turn it blue by painting the cement.



RON KUKULKA

Anatomy of a Watershed

lagoon and its watershed as one interactive system. The Coastal Conservancy, using its own funds and a grant from the Water Resource Control Board, hired several engineering firms to complete computer models of the watershed and to formulate ideas on how to control the sediment reaching the lagoon. Simultaneously, the Conservancy helped to organize the three cities—Carlsbad, Oceanside, and Vista—into a Joint Powers Committee to cooperate in solving the lagoon's problems.

The studies found that the most practical way to control sedimentation was to decrease the volume of stormwater flows. They recommended two improvements: construction of stormwater detention basins, to consist of small dams on a creek that would temporarily impound stormwater, releasing it at a slower rate; and restoration of sections of natural creek to an enhanced flood control channel, which would be completely planted with riparian trees and contain small drop structures to slow water velocities significantly.

These two measures would help to restore an equilibrium in the watershed between the volume (and thus erosive force) of stormwater and the transport of sediment. The only alternative to retrofitting the watershed in this way was continued and costly dredging of Buena Vista Lagoon. Without changes in the watershed or dredging, the lagoon would fill in completely in 15 to 20 years.

Most of the needed improvements would have to be situated in Vista, which had no lagoon frontage and was therefore at first uninterested in participating. However, several of the restoration program components helped to turn the city into a strong supporter. Foremost, downtown Vista had inadequate flood control channels and could find itself several feet underwater in a major storm. The proposed stormwater detention basins would alleviate this problem. Second, the Army Corps of Engineers, using regulatory powers under the Clean Water Act, had blocked installation of a concrete channel

WE ALL KNOW water runs downhill, but what it carries with it is not always so obvious. A watershed or drainage basin is the land area that drains water, sediment, and dissolved materials to a common outlet. It is usually named by this outlet: San Francisco Bay, Lake Tahoe, Buena Vista Lagoon. Within a large watershed such as Lake Tahoe, there are many subwatersheds, unconnected creek systems that individually drain into the lake and contribute to the overall lake inflow.

For each watershed there is a drainage system that conveys rainfall to the outlet. This system contains the familiar stream and river network, but may also have a subsurface drainage element. Stream systems are many-branched or simple. The particular geology of the land largely determines these patterns. Geology also defines the soil types found in the watershed and, combined with topography, the overall erodibility of the land.

Vegetation plays a role in erosion. For instance, native perennial grasses have thick root systems and produce a dense mulch, which blankets and protects the soil. Introduced annual grasses have shallow root systems and create a lighter mulch, and a thinner protective covering. In forest and brushland, the level of soil protection varies with the density of plant cover and the composition of plant species.

Coupled with the basic characters of soil, topography, and vegetative cover in the function of the watershed is the level and duration of rainfall. In Northern California, intense storms often bring a large volume of rainfall in a short time. High-intensity bursts of rainfall also occur in Southern California.

The combination of climatic conditions, soil types, topography, vegetative cover, and drainage system define the particular character of each watershed. In its natural state, the soil covering the watershed remains in a state of equilibrium with water flows over long periods. Water will erode some soil particles, but slowly, except during floods or after fires. Human activities greatly increase rates of erosion by changing the state of equilibrium. Agriculture is an example. The natural vegetative cover is removed and the soil plowed. As raindrops strike the field, they set soil particles in motion with water flowing downhill. Storm water may flow in sheets across the field, carrying away a layer of soil, or water flows may be concentrated into a swale and erode a gully. Most crops do little to protect the soil. The spaces between plants are too large, and farmers typically remove all stubble and unwanted ground cover. The eroding topsoil flowing down the watershed is often a witches' brew of pesticide and herbicide residues.

Even greater rates of erosion are often produced on graded construction sites. Topsoil is scraped off and subsoil piled into steep-sided building pads. Few cities and counties have adequate erosion control ordinances. Erosion control can be lacking even in massive developments. Simple measures can reduce the damage: restricting grading

during winter months; installing sediment catchment basins, sediment fences, or rows of straw bales to intercept flowing soil; and stabilizing graded slopes with vegetation prior to the rainy season.

Road building on logged, farmed, and developing land can be a major land disturbance and source of sediment. On logged land, for example, there are numerous roads constructed to reach timber harvest sites. These roads are cut into a hillside with bulldozers; surplus soil is side cast. The road cut is usually left to revegetate by itself, and once logging is completed, the road is usually abandoned. Little restoration or maintenance work is performed.

Drainage underneath and along dirt roads is also a concern in watersheds. If culverts are inadequate at stream crossings, the road may wash out, sending sediment into the stream system. In steep country the road may act as a conduit for water flow. The runoff must be directed off the road at frequent intervals through the use of waterbars: otherwise, the road will concentrate the volume of runoff to one or two release points. At these points the increased volume of runoff will cut a gully in the hillside. Culverts, another flow concentration point, must be protected at their outlet with rocks, or a gully will form. Once sediment is eroded, the stormwater carries it until water velocities slow and the heavier sediments, such as sand, settle out. Sediment may move just downslope or into a creek where riparian vegetation and wetland plants slow water flows. The creek bottom slowly builds up or aggrades. The greater the level of aggradation, the more width the channel will need to accommodate flood flows and the greater the flood risk for adjoining lands. A great deal of sediment may be deposited when the storm flows reach tidal water in a lagoon or bay or the calm water of a lake. In very large floods the aggraded sediment may be flushed out of creeks all the way to the ocean, becoming the primary source of sand for coastal beaches.

In addition to disturbing soil, human activities frequently affect the volume of water in a watershed. Water impoundments and diversions reduce peak flood flows and built-up sediment may not be flushed from streams.

An increase in peak storm flows commonly accompanies urban development. These larger volume flows have a greater capacity to carry sediment, and they can erode natural creek channels into deep gullies. In the extreme case, the creek channel will erode downward and outward, toppling riparian trees and taking on the wide steep-banked braided channel form of an arroyo. The stream will continue to erode until the increased water volume and the size of the channel reach an equilibrium. Arroyo formation can also occur in rural watersheds where soils are overgrazed or severely trampled and compacted, diminishing water infiltration into soils and increasing peak flow volume.

In all cases, the watershed will respond to the change in the system until an equilibrium is once again reached. □

in a riparian floodplain along the creek in Vista. The Corps supported the creek enhancement scheme. Development on adjacent land could not proceed without a Corps permit.

Finally, the plan would restructure and revegetate the creek through the center of Vista, creating a wet green corridor through the center of an expanding city in an arid region. Businesses could front on the creek. The City would gain a major natural amenity. Enthusiastic support came from the Vista City Council and Chamber of Commerce. What a far cry from the logic that created the Los Angeles River channel!

In 1987, the Coastal Conservancy granted \$500,000 for construction of one 7-acre detention basin and \$250,000 for preparation of detailed studies and final design drawings for the enhanced creek channel. The city of Vista would bear the annual maintenance costs.

A Model for Others

The Buena Vista Creek project sets a precedent for urban watersheds. The solutions to the lagoon's problems are comprehensive, long-term improvements formulated after studying the entire watershed system. The improvements themselves make use of the natural processes of the watershed.

Throughout the state, appreciation of green urban creeks is growing. As more successful vegetated flood control channels are built, engineers, city officials, and developers look more fondly on this type of design. In addition, as the construction and maintenance costs of concrete channels skyrocket, the vegetated low-maintenance option is more attractive. In many areas, government regulation does not allow the destruction of riparian and wetland habitats, and vegetated channels are the only option.

Roseville, near Sacramento, has preserved a natural creek that flows through the city. The creek corridor is a park and remains

Natural Floodplain; Urban Problems

completely vegetated. San Jose plans to reconstruct the Guadalupe River, creating a linear park. San Luis Obispo has an attractive restored creek downtown. Berkeley has taken urban creek improvement a step further by restoring Strawberry Creek from an underground pipe to a vegetated channel below the University of California campus.

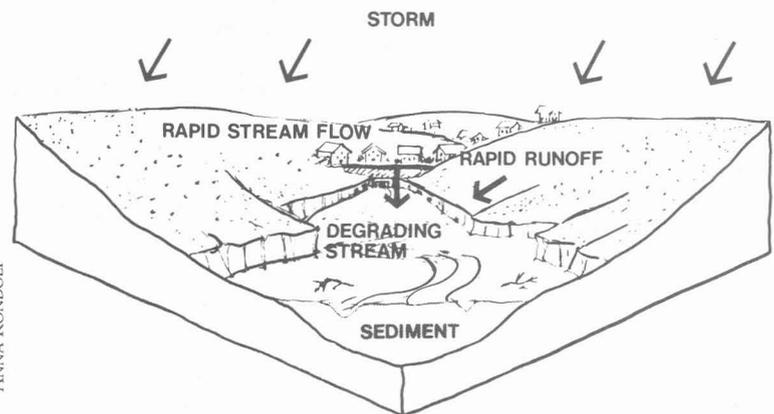
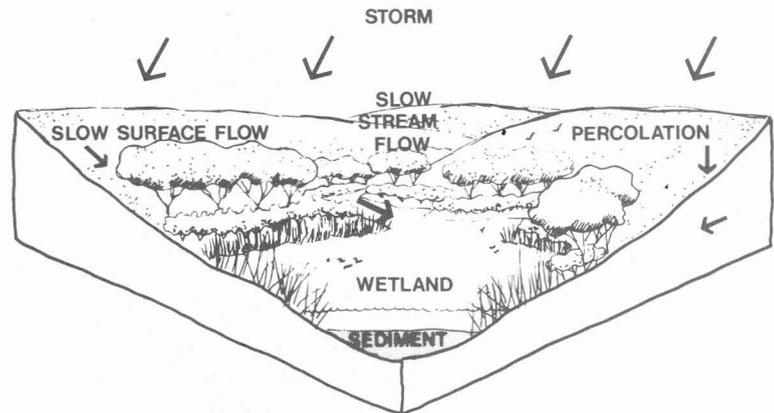
Rural Watersheds

The problems on Tomales Bay, in Marin County, go back several generations, to the early settlers. The Bay is a natural harbor, a long intertidal finger of the San Andreas Fault. When the first Europeans arrived, its 223-square-mile watershed was largely native grassland with some tracts of redwood forest, oak woodland, and many streams lined by riparian forest. The thick-rooted native perennial bunchgrasses stayed green year-round. But these grasses were not adapted to cattle and died out after grazing began, replaced by annual grasses introduced from Europe. These annuals died back in summer and provided less stability to soil layers. The change in vegetation, combined with grazing and trampling by livestock, widespread logging, and road building increased erosion.

When potato farming began in the 1890s, a still greater change occurred on the watershed. The steep slopes and fragile soils were plowed, planted, and left to weather in the rainy months. Tons of soil washed from the land, filling streams, creeks, and inlets.

Today, Walker Creek, on which large potato-filled barges once floated out to market, is barely navigable by kayak. Sediment has created a large delta, which extends another 35 feet each year into Tomales Bay. In the southern arm of the Bay, the delta of Lagunitas Creek grows by an annual average of 50 feet.

After the crash of the potato market, Marin farmers took up dairy ranching, and then cattle ranching. Many current ranch



ANNA KONDOLF

families are the third generation to work the land. Erosion of topsoil in the watershed damaged not only Tomales Bay, but also the farmers' livelihood. More erosion means lower soil productivity, leading to a need to import more feed and driving up the costs of ranching. Over the years, a downward spiral evolved. Reduced productivity led to increased grazing to make an adequate income, and to further erosion. The need for outside assistance in restoring the watershed was obvious.

The disastrous flood of 1983 brought Tomales Bay's erosion problems into focus. Sedimentation into the Bay was enormous, and three entire creeks in Inverness were buried in mud, along with most adjacent houses. The Coastal Conservancy held a series of workshops with ranchers, environmentalists, various government agencies, local politicians, and residents to discuss the watershed's problems. Afterward, the Con-

Comparison of a natural watershed where water flows and sediment are in balance and an urban area where impervious surfaces (that is, cement, asphalt) cause increases in water flow, upsetting the balance and resulting in sedimentation of the wetland.

servancy hired a hydrologist to study the general character of the watershed and, in conjunction with several local nonprofit groups, to identify the primary sources of sediment and the measures to control erosion.

For a watershed as large as Tomales Bay, identifying erosion sites can be a herculean task. Study of aerial photographs can locate large gullies, but most lands and streams must be examined on foot. In one of the first subwatersheds to be studied in detail, Lagunitas Creek, poorly built roads were a major cause of gullies and a source of sediment from washouts at stream crossings. Cattle roaming freely over the hills had trampled banks and denuded the stream of riparian vegetation, its natural armor.

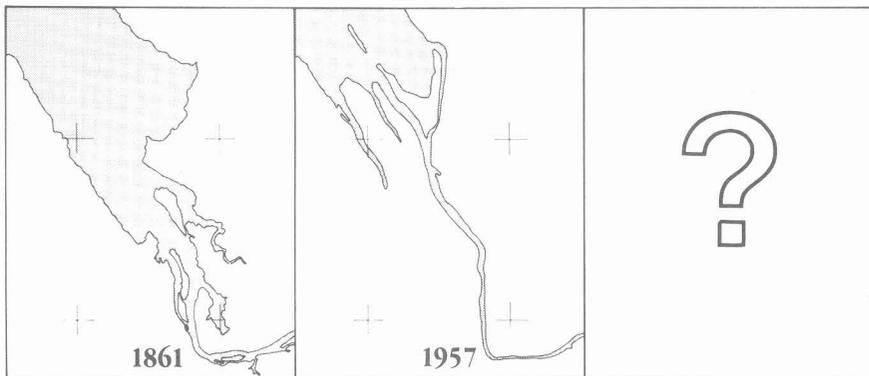
and Game, Trout Unlimited, and the San Francisco Foundation provided high levels of funding. More than \$500,000 in funds and matching services were expended to repair the Lagunitas Creek watershed.

Checkdams were built in gullies; roads were regraded with installation of waterbars, concrete stream crossings, and new culverts; streambanks were revegetated; rocks and slides stabilized; and exclusionary livestock fencing was installed. To restore trout and salmon habitat, large boulders were placed in the stream to increase water velocities and scour pools, and native riparian trees were planted on streambanks to create shade.

The other major tributary, Walker Creek, presented a more difficult challenge. Here the main problem was extreme arroyo formation, caused by very high peak storm flows. The Marin County RCD is carrying out a restoration project under a \$1 million grant from the Coastal Conservancy. Its main goals are to stabilize the creek from further downcutting, and to reduce peak storm flow through changes in land use practices and repair of erosion sites. The primary land use change needed is to increase vegetative cover in the watershed by revising grazing practices. This can be accomplished through the creation of more small pastures within a large ranch and rotating cattle through them, so they do not crop all vegetation in any single area. Vegetative growth can also be improved by intensive fertilization.

The RCD uses novel methods for instituting changes in agricultural practices. It has an advisory board to review project proposals and recommend projects for funding. Its staff work out detailed management programs with ranchers, locating new fencing and water supply, and developing schemes for cattle rotation, fertilization, and planting. The rancher and his peers essentially formulate and test their own land use changes with some financial aid and expert advice from University of California Agricultural Extension and the Soil Conservation Service. In this way, ideas and changes come from

CONSERVANCY STAFF



The Lagunitas Creek delta progressively stretches into Tomales Bay at the rate of 50 feet a year.

In 1983, the Conservancy granted \$150,000 for repairs to the Marin County Resource Conservation District (RCD), a local government agency created to conserve soil and provide leadership to the farming community. It works with the Soil Conservation Service. The RCD helped to convince many private landowners to allow work to be done on their property. Because there is almost no government regulation of farming practices, the cooperation and sponsorship of the RCD was essential. On most projects, Conservancy funds were used for design, materials, and installation. Landowners contributed labor and use of heavy equipment. They are also required to maintain structures on their property. The California Department of Fish

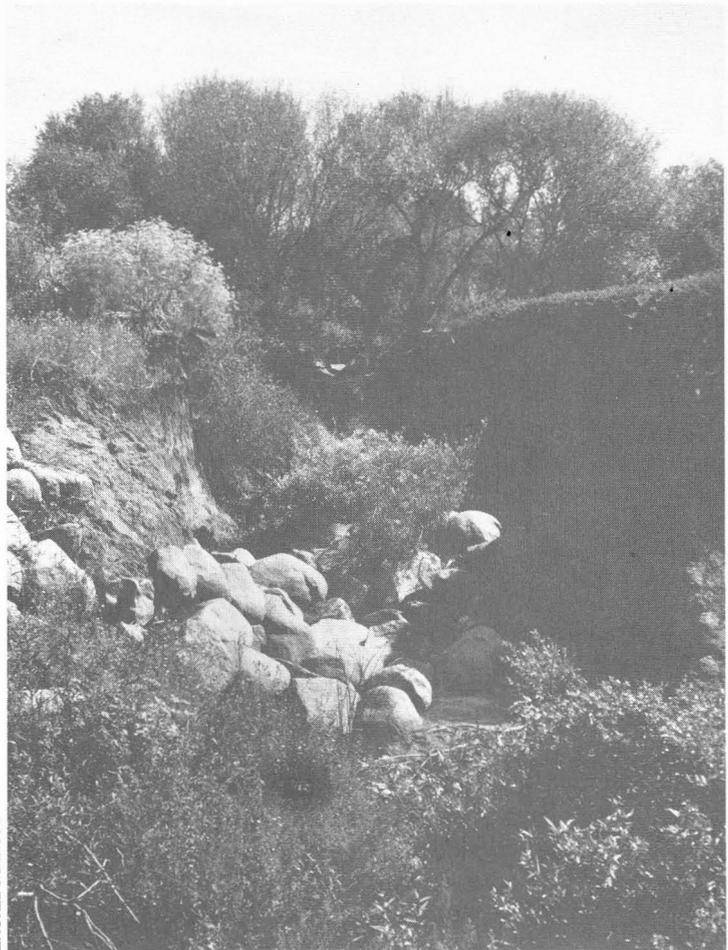
those most familiar with ranch management rather than from outsiders, and the program has a much higher chance of success.

The long-term effects of these repairs on Tomales Bay will not be known for years. However, in Lagunitas Creek it is already clear that soil erosion has decreased.

The Tomales Bay Watershed Restoration Program affords a model for similar rural watersheds where both erosion repairs and land use changes are needed to restore balance to a watershed. Last year, the Coastal Conservancy granted \$1.2 million for a similar program just north, in Sonoma County. (See "A Step in Time Saves.") There it was found that dredging sediment from baylands would cost 40 times more than controlling and repairing sediment in the watershed. The loss of shellfish and wetland habitat in the bay, and the destruction of salmon and steelhead stream habitat, were not included in this cost comparison. With the ever increasing need to dredge harbors, ports, and navigational channels, watershed restoration projects may become a necessity.

In Conclusion

Lack of public funding and of local regulation limit the continuation and expansion of watershed restoration projects in California. As little as \$50,000 a year in federal funds is available in most counties through the Soil Conservation Service and its associated agency, the Agricultural Stabilization and Conservation Service. Most other federal programs apply to federally owned lands only. The U.S. Forest Service, the National Park Service, and a few other agencies have completed some stream and watershed restoration projects. However, such activities are not widespread on federal lands. State agencies, particularly the Coastal Conservancy and the Department of Fish and Game, have initiated larger and more comprehensive restoration activities with funding from voter-approved bonds. Local governments and private landowners rarely



LAUREL MARCUS

have resources to complete such projects.

Another impediment is the patchwork of jurisdictions that may have authority in a single watershed. Inconsistency in erosion control practices and flood control improvements among jurisdictions can have disastrous consequences in a watershed. One approach to this problem may be to form a joint powers committee, a nonregulatory body that can act as a forum for interaction and cooperation. Local nonprofit groups, particularly those interested in protecting lagoons, lakes, and bays, must insist on good land management practices and encourage formation of regional coordinating agencies. Public pressure can alert local governments to problems in a watershed and initiate the necessary response. □

Laurel Marcus is project manager for wetland enhancement and watershed restoration projects at the State Coastal Conservancy. She has been involved in wetland enhancement, mitigation, regulation, and biology for the past nine years.

A typical erosion problem along Buena Vista Creek.

A Step in Time Saves

THE EUCALYPTUS-SHADED two-lane road runs along the bottom of a cow pasture, separated from it by a gully vast enough to sink several semi-trailers or railroad cars. Lee Erickson stops and his passengers climb out of the van for a look.

"It's a classic case," he says. "Absentee landlord, fairly high stocking rate, no tenant on the place. This is sandstone-derived material and once a gully starts. . . ." He shrugs. "Ten years ago I could jump across here. Now it's more than 20 feet across, and it goes at least 1,000 feet before it tapers. And this landlord has the exact same problem on the other side of the hill, five times worse."

The Ericksons' fourth-generation family farm is across the road and downhill, so some of the eroded topsoil has washed into his meadow. He and his father have tried to stop it there, so that nothing like this disaster happens on their land. But they too have gullies, which started almost a century ago when potatoes were grown here in the Estero Americano watershed. Though Lee and his father have worked hard to repair the old damage, they have merely managed to arrest it.

Lee is also district engineer for the Gold Ridge Resource Conservation District (RCD), which works to help farmers and landowners with soil conservation. Today he is leading a gully tour for the State Coastal Conservancy board of directors to persuade the agency to approve a grant request of up to \$1.2 million for erosion control here in Sonoma County. The Conservancy is interested because these gullies are not only the farmers' problem, they are also a coastal problem. The soil loosened from these pastures clogs coastal wetlands, turning them into uplands, and interferes with navigation, requiring dredging of estuaries. The cost of such dredging, per cubic foot of soil, is at least four times the esti-

mated cost of upstream erosion control that will stop the damage where it starts.

"Something like this, we can't fix it," Lee says. "But we can keep it from getting worse. We had three 100-year floods in the past ten years—worst-case conditions. The heaviest flow may be only a few hours a year, but that's what does the damage. After the big 1986 storm, CalTrans put in this riprap." He points down to a spot where the gully would have eaten into the roadway had not tons of rock and cement been poured in. "I estimate you're looking at \$15,000 to \$20,000 worth here. That would not have been spent if the gully had been stabilized years ago."

Proposed for this site is a step system of small dams that would lower the water's energy and allow sediment to settle. The cost of eight to ten steps would about equal the cost of the riprap here. Animals would be fenced out of the gully, willows planted on the sides. (The existing eucalyptus trees have shallow root systems and may wash out.) Gradually—given no worst-case sequels—the gully should stabilize and begin to fill in.

The group continues to the Ericksons' 350-acre farm, where Lee's father, Roy Erickson, meets us at the house built in 1906 by Lee's great-grandparents. Its porch faces south, to take advantage of natural air conditioning, and is shaded by a climbing grapevine.

Together, Roy and Lee escort the group to the lower pasture, where silt from the giant gully across the road is piling up along stream banks. To slow the water and prevent continuing erosion, the Ericksons have piled rocks in the stream at several points. These form checkdams that slow the water. They have also put in some bridges to encourage animals to cross without entering the stream. Each



PETER GRENNEL

checkdam represents a cost of \$200 to \$400—a third of that for the rock, a third for hauling, a third for time. "Double the cost if you don't do it yourself," says Roy.

The Ericksons know and love this land. In spring, they graze about 1,000 animals on 340 acres: lambs and ewes, calves and cows. The grazing habits of the two complement each other, reducing the impact on the meadow. They also fertilize with turkey manure to keep the clover going. "Maintenance of a quality pasture also reduces potential erosion," Lee points out.

They welcome other creatures as well, putting out bluebird boxes and allowing bucks to seek refuge during hunting season. Roy points out a hillside fox den. He saw a big male and four cubs near the entrance last spring.

Still, the Ericksons' knowledge of the land is recent. Along the stream further east, there is evidence that a homestead stood here perhaps 150 years ago. A spring box and some old apple trees remain, but the house site can no longer be precisely determined. Things fall apart fast in this dry, summer-hot climate.

Just past the old apple trees is the worst gully on the Ericksons' land. Its progress has been stopped by means of fencing the head of the gully and planting its sides with willow, and by installing a \$7,000 checkdam further downstream to slow down water enough to allow any eroding sedi-

ment to settle. A side benefit of the dam is the pond that has formed. It serves for watering stock, breeding smallmouth bass, and harboring ducks and an occasional egret.

Another water impoundment is nearby, in the old railroad cutbank. Multiple watering places mean animals need to walk shorter distances and cause less damage to pastures.

Many farmers decline to fence off eroded land because by doing so they may have to forego 10 percent of their income. "Most people just look at the front-end cost," says Lee. "But if you let it go and you get a gully like the one across the street, what have you got?"

The visitors pause for lunch on a hilltop, where a haywagon has been placed for the occasion. They settle on bales of hay to munch on sandwiches and a delicious apple pie baked by Agnes Erickson, Lee's mother, while they gaze out over the rolling golden brown grassland, here and there patched in green with high-silicate rushes, which are unpalatable to animals.

Surveying the family domain, Roy muses: "You could just cut it into four parcels and have a couple of million dollars, easily." But he is not about to cash in. "I want the grandchildren to have some of this," he says. "And the coming generations."

The tour continues through the Estero Americano and Salmon Creek watersheds to another, even more horrendous gully, caused by a badly placed and poorly maintained old road, and proceeds to a silted-in stream that is to be revegetated if the proposed project is approved by the Conservancy board the next day.

The Gold Ridge RCD is to be the primary contractor for the project, with Lee Erickson as project manager. The principal subcontractor will be a local nonprofit organization, Circuit Rider Productions, which conducted the studies on which the

PETER GRENNELL



Roy Erickson has built checkdams.

PETER GRENNELL



Upstream gullies send silt into the Estero Americano.

project proposal was based, and which persuaded farmers and ranchers to cooperate.

Gradually, the visitors have been approaching the coast. Toward day's end, they arrive at the fjord-like Estero Americano, four miles from its mouth. This is what the whole expedition has been about. Here the tidal water winds inland, meeting freshwater flowing toward the sea, creating a rich brew that nurtures a wide diversity of species. The California Department of Fish and Game has declared it one of the 19 most important coastal wetlands in the state.

The next day, at a meeting in Valley Ford, the Coastal Conservancy approves the restoration proposal. The work will be done in the next five years. The benefits will accrue far more slowly than it took the water to carve out the gullies. —Rasa Gustaitis

PETER GRENNELL



Eucalyptus helped to hold back erosion, but deep-rooted willows hold better.

Restoration Standards:

HOW TO GUARANTEE ENVIRONMENTAL PROTECTION

by David Shonman

WHILE RESTORATION OF DISTURBED HABITAT may be a laudable goal to most people, it is a subject of great controversy for others. This is especially true when restoration projects are undertaken to mitigate the effects of a proposed development. To a developer, restoration may be just another expensive, time-consuming obstacle to deal with in order to complete a project. To an environmental activist, restoration that is a condition for approval of a development permit may represent a short-sighted deal between a developer and a government agency.

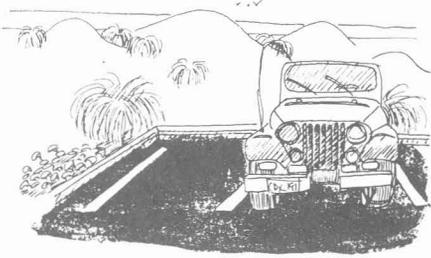
The arguments surrounding development-linked projects are usually charged with emotion. Opposition may stem from dislike of the development itself, for which the restoration element is seen as a sugar-coating tossed in to help gain public acceptance. Or the opposition may be to the use of restoration as a bargaining chip, a mitigation that permits destruction of undisturbed habitat in return for promised restoration of damaged land—a promise that often goes unfulfilled.

The concept of mitigation may be seen as a form of plea bargaining in which a developer who causes environmental damage receives a "lighter sentence" by promising to perform environmental penance. Some mitigations are reasonably straightforward. Dedications of access or conservation easements, for instance, are clear cut, easy to verify, and their benefits are felt almost immediately. Restoration, however, is a special kind of mitigation. It is a long-term, experimental, sometimes expensive undertaking which often lacks clearly definable goals and whose success can never be fully guaranteed. This absence of certainty is often at the root of controversy surrounding restoration projects.

Some biologists involved in development-linked restoration projects have been surprised by the intensity of opposition they have encountered: they fail to understand that restoration is much more than a biological activity. It is also a political, legal, economic, and in some respects a philosophical enterprise. A successful restoration project must address all these aspects.

The following recommendations address problems that have been encountered when coastal dune restoration has been set as a condition of development approval. They can be applied to a wide variety of restoration projects, including those that are not linked to a development. If included in restoration/development agreements, the recommended elements should contribute to long-term success.

Drawings by Ken Downing



1. Restoration of disturbed habitat should not be equated with protection of undisturbed habitat.

Restoration techniques are still experimental. Restoration projects can increase the ecological value of already disturbed land, but should not be used in trade for development of undisturbed land.

2. Restoration must be sensitive to the local biogeographic area and must include appropriate biota.

In the Monterey Bay coastal dunes, for example, some restoration projects have introduced exotic species along with native plants. Some exotics, such as static, introduced by the California Department of Transportation in the dunes along Highway 1 in the city of Marina, are a minor but unnecessary nuisance. Others, like Hottentot-fig ice plant and European dune grass, are extremely invasive and can outcompete, and eventually replace, native dune plants, including those serving as habitat for native animals. These exotics have been introduced into coastal dunes in Moss Landing, Sand City, and Monterey.

Even the use of native California plants may be inappropriate if the species selected are not a natural part of the community at the restoration site. The landscaping of Highway 1 through the Marina Dunes included native California poppies. However, landscapers used the common bright orange inland variety rather than the coastal variety, which is predominantly yellow. While these orange poppies probably do not represent a threat to the Marina Dunes ecosystem, their introduction does represent an unfortunate oversight.

A restoration sensitive to the local biota must be based on a complete biotic survey, one which characterizes the area with enough accuracy and detail to allow re-creation of the native habitat, if possible. Mere use of a species list is not enough. For example, a botanical study of dunes formed at the end of the last ice age in the Marina area ("Flandrian dunes") was recently conducted. The results indicated that the plants found in these dunes represent a unique assemblage. All the native species recorded in the Flandrian dunes are also found in other parts of the Monterey Bay coastal dune system, but the proportional species composition and patterns of distribution at this site are not duplicated anywhere in California. The restoration of these dunes clearly requires a comprehensive understanding of the biota.

3. Restoration should set short- and long-term goals that are specific and easily verifiable.

When goals are vague, success cannot be measured. A mitigation requiring that a developer simply "restore the habitat" is too general to be enforced. Restoration/development projects should set specific goals to be achieved during a specified time period. These may include projected species composition and densities of native plants, allowable densities of exotic invasives (as low as possible), and methods for protecting the restored area from damage by trampling and off-road vehicles. These goals will serve as criteria against which the project's success will be measured.



4. Restoration must include provisions for monitoring.

This is a critical aspect of any mitigation-implementation agreement, because it is the only way to verify if the developer is meeting the agreed-upon terms. While monitoring might seem intrusive, remember that a property owner will usually derive great benefit, financial and otherwise, from development, especially along the coast. Most often, the only benefit the environment receives will come from promised mitigations. Since these promises are basic to approval of the development permit, there must be assurance that they will be kept. As Ronald Reagan said to Mikhail Gorbachev last December, "*Dover-yai no proveryai*" ("Trust but verify").

The success of monitoring will be based, in part, on the clarity and specificity of the restoration goals and criteria. These will be used to give direction to the monitor, describing what must be observed and measured. It will be easy to verify the existence of an intact fence line, or the lack of invasion by aggressive exotics. However, if the agreement requires that the owner maintain a viable population of Menzies' wallflowers, the monitor may have more difficulty. What constitutes a viable population? Has the agreement established a minimum threshold number of plants to be maintained, or has it only described an area that must be set aside and protected? How should the monitor deal with natural problems such as adverse weather and deer predation? These may constitute threats to the restoration project, but are beyond the control of the owner/developer/restorer. Clear restoration criteria are essential. They benefit the property owner, the monitor, and the habitat.

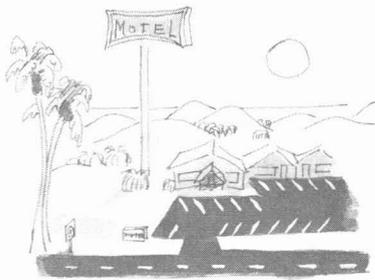
5. Restoration must include an established mechanism for correcting problems reported by the monitor.

Problem correction responsibilities might range from repairing a fence to eradicating regrowth of invasive exotics to replanting native species in a restoration area that failed to meet the established criteria. Such procedures must conform to the original agreement. If, for example, methods for removal of invasive exotics and planting appropriate native species were described in the original restoration/development agreement, these same methods should be used to correct any problems reported by the monitor.

For example, if the needed repairs involve replanting Menzies' wallflower, then the revegetation methods might include collecting seeds only from local dunes, then planting seedlings during late fall to early winter, without use of artificial irrigation. If ice plant must be stopped before it can encroach on a newly restored area, it might be necessary to remove the ice plant by hand, wherever it is found growing within five feet of the restoration area, rather than spraying it with an herbicide.

This portion of the restoration/development agreement should clearly assign responsibility for correcting problems. If the property owner is to be responsible, then the terms of the restoration/development agreement should be recorded as a deed restriction, which will automatically pass to the new owner whenever the property changes hands. This will clearly establish legal responsibility and will be helpful if a cooperative owner sells to someone with less environmental sensitivity.





6. Restoration must include a long-range funding mechanism.

The establishment of a long-term funding mechanism is one of the most important factors in the long-range success of a restoration program. It will guarantee that the critical program elements can be carried out. Long-term funding can sometimes be secured by assessing an "impact fee" on those who benefit from the development. For example, owners of a motel to be built in the Marina Dunes will pay an \$18,000 lump sum, plus 35 cents per occupied room per day into a dune protection fund. This fund resulted from negotiations between the developer and a local conservation group. The city of Marina has since agreed that any new development built in the Marina Dunes will pay into the dune protection fund.

If many properties in the same geographic area are involved in similar restoration/development projects, a Resource Protection District might be formed to levy taxes and, in return, provide services that include monitoring, expert consultations, and greenhouse support. Such a district could be modeled after the dune preservation district concept described by Karl F. Nordstrom and Norbert P. Psuty in "Dune district management: A framework for shorefront protection and land use control," in the *Coastal Zone Management Journal* (Vol. 7, No. 1, 1980). Or, funds can be sought from government resource protection agencies and private foundations and land trusts which, during the past several years, have become increasingly aware that long-term habitat maintenance is as important as habitat acquisition.

7. Restoration/development agreements must be enforceable.

The terms of restoration/development agreements, like those of any mitigation agreement, are sometimes violated. Whether the violations occur accidentally or purposely, they must be redressed in a competent and timely manner to reduce environmental damage to an absolute minimum. If the responsible party is unwilling to pay the cost of corrections promptly, mechanisms for relief are needed. Available relief mechanisms include:

Performance bonds—Commonly used to assure that contractors' work meets specific quality standards. Often, a specified sum is held in an interest-bearing account until the finished project has been inspected and given final approval. If made a part of a restoration/development agreement, these bonds can be applied to situations in which the responsible party fails to perform an agreed-upon task necessary to the long-term success of the restoration project. In such a case, the performance bond is similar to a renter's security ("cleaning") deposit.

Penalties/fines—Sometimes, a restoration/development agreement can provide for specific fines. For example, the developer of a desert resort near Tucson, Arizona, agreed to protect saguaro cacti in the development area. During construction, price tags were hung on each cactus, warning construction crews how much would be charged for damage to the vegetation ("Fitting in: A desert resort respects its environment," by Patrick Phillips, *Urban Land* [Vol. 45, No. 6, June 1986]). The most effective way to use fines is to impose them in addition to the cost of correction.

Liens—Government agencies can impose liens against the responsible party's property to pay for necessary actions.

Given the impacts of development on the environment, any enterprises that seek to restore damaged habitat must be held in the highest regard. Those involved in restoration have the responsibility to use the best available techniques, backed with sufficient financial resources, in making a good-faith effort to meet all promised goals. Anything less diminishes the quality of the environment and violates the public trust. □

David Shonman
is a coastal biologist and
is chairman of the Marina Coastal Zone
Planning Task Force, Marina, California.

Stream Restoration: The Healing Touch

by Nancy Reichard and Bob Wunner

Now Wohpekumeu rubbed his hands together and threw into Stone Lagoon the black epidermis that came off. It became trout.

—paraphrase from *Yurok Myths*,
by A.L. Kroeber

And so it is, according to Yurok mythology, that trout came into being in Stone Lagoon, one of a chain of brackish lagoons on the Humboldt County coast. McDonald Creek, the lagoon's major tributary, runs toward the coast about six miles south of the town of Orick.

The headwaters of the six-square-mile watershed arise in commercial forest lands. The lower stream flows through pastures grazed by cattle and horses and browsed by elk and deer. About one mile from the coast, McDonald Creek enters Humboldt Lagoons State Park, flowing through an alder woodland and tule marsh and then into Stone Lagoon.

The lagoon provides habitat for a diverse

assemblage of fish and wildlife. It is also a scenic coastal area, popular for boating, fishing, camping, and beachcombing.

Upstream, on McDonald Creek, the watershed has been logged and is crossed by logging roads and skid trails. In the lower watershed, unrestricted grazing had demolished the riparian (streamside) forest and destabilized stream banks. Consequently, McDonald Creek carries large loads of sediment, which degrade fish habitat in the stream and accumulate in the lagoon, making life hard for the coastal cutthroat and steelhead trout of Wohpekumeu, the mythic folk hero, as well as for coho and chinook salmon. Old fence lines buried in silt where the stream enters the lagoon indicate a rapid deposition rate.

In 1982, the Natural Resources Division of Redwood Community Action Agency (RCAA), the Coastal Conservancy, and the state Department of Fish and Game embarked on a series of projects to slow erosion in the watershed and to improve instream and riparian habitat. As all their projects occurred on private prop-

What a difference a fence makes: Since it went up in 1983, a diverse vegetation has developed, protecting the stream.

JEFF PATTY



erty, landowner cooperation has been essential. In the lower watershed, 100-foot-wide, fenced corridors were constructed along the stream channels to exclude livestock. Within the corridors, vegetation can flourish, and wildlife can find an abundance of food and shelter. After five years, a canopy of willows, alders, and spruce trees is developing. Eroding stream banks are healing, some with the help of rock riprap as well as vegetation.

Numerous log and rock structures have been installed along the lower section of the year-round creek to help restore pools and shelter for salmonid.

Work in the upper watershed has included removal of road fill from failing stream crossings, installation of numerous waterbars on old roads and skid trails, and careful modification of instream debris to reduce stream-bank erosion.

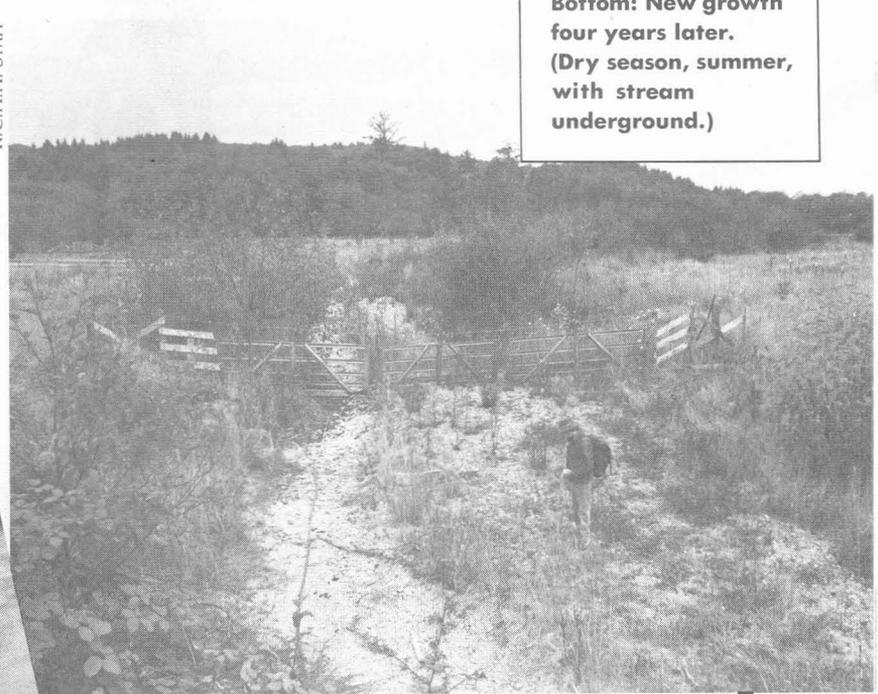
The restoration work accomplished to date has produced significant improvements in in-stream and riparian habitat. However, several sediment sources in the upper watershed still await treatment. The RCAA will continue to monitor conditions in the watershed and to seek further opportunities to improve the condition of the McDonald Creek/Stone Lagoon system. □

Project specifications or other details are available from the Natural Resources Division of RCAA at 904 G St., Eureka, CA 95501. (707) 445-0881.

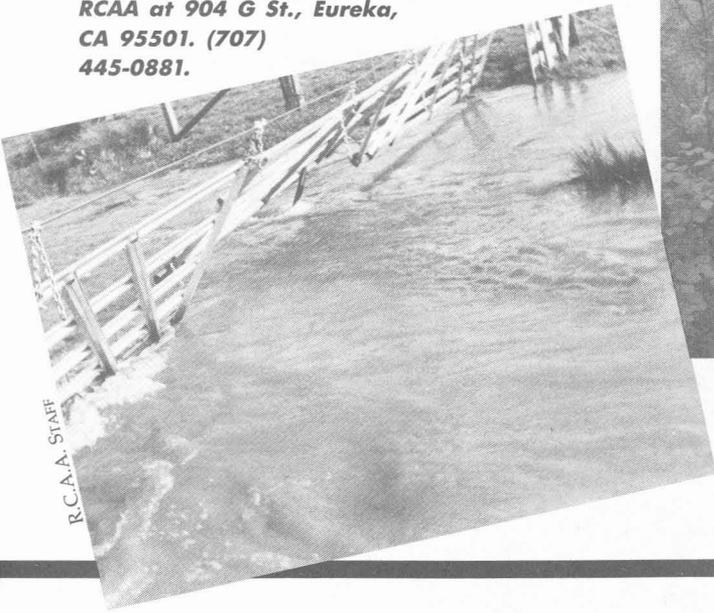


JEFF PATTY

Top: Grazing had denuded stream banks before the fence (background). Bottom: New growth four years later. (Dry season, summer, with stream underground.)



R.C.A.A. STAFF



R.C.A.A. STAFF

Stock gates keep cattle out of the protected area. The gates are designed to lift, allowing stormflows and debris to pass.



Stamboul as a whaling bark, San Francisco, circa 1890.

An Innovative Future for a Waterfront of the Past

by James P. Delgado

THE HISTORIC COMMUNITY of Benicia lies on the shores of the Straits of Carquinez, the waterway linking San Pablo Bay and the Sacramento and San Joaquin rivers. Established just prior to the Gold Rush as an ostensible rival to San Francisco, Benicia was California's capital for a year, from 1853 to 1854.

The departure of the capital, and the rapid rise of San Francisco 27 miles to the south as an urban, industrial, and shipping center, left Benicia with the reputation of a city of dashed expectations. But the failure to develop into a metropolis looks, in retrospect, like a boon: today Benicia is a thriving small city with 19th century ambience and unique charm.

Much of Benicia's past is represented in historic homes, churches, and other structures such as the 1853 California State Capitol building, the 1851 industrial complex of the Pacific Mail Steamship Company, and the clock tower, guardhouse, and other military buildings of the Benicia Arsenal, including one known as the camel barn because some camels the Army bought and then decided to sell were once corralled there.

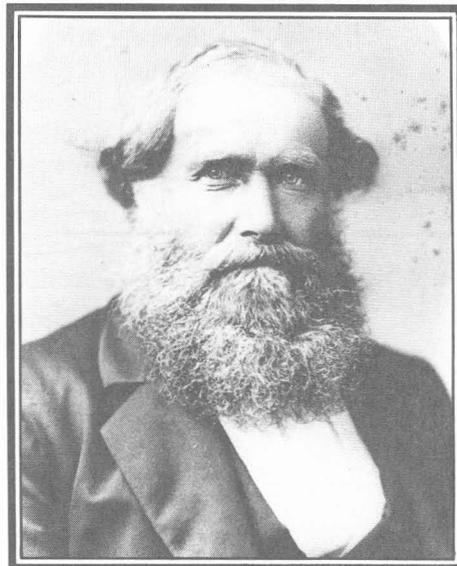
Yet there is another, far less obvious, aspect of Benicia's heritage. Just off the waterfront at the foot of West 12th Street, and visible only at low tide, are the remains of the Matthew Turner/James Robertson Shipyard, which launched 165 vessels between 1883 and 1903. It was the center of Pacific coast

wooden shipbuilding and one of the most significant shipyards in the United States in the late 19th and early 20th centuries. Now it is a city waterfront park, one of California's newest state historical landmarks, and a candidate for listing on the prestigious National Register of Historic Places. The city is working with the National Park Service, the State Coastal Conservancy, the Benicia Historical Society, and with private citizens and volunteers to create a unique historical park, archaeological preserve, and recreational facility.

The Turner/Robertson Shipyard

Twenty-five-year-old Matthew Turner, a native of Ohio, emigrated to California in 1850, during the Gold Rush. After a short stint in the mines, he turned to the sea. For over 15 years he was variously engaged in the general carrying trade between the Eastern seaboard and California and in the Pacific coast lumber trade, fishing, and trade with the South Pacific. Then, in 1868,

NAT'L MARITIME MUSEUM



he commenced shipbuilding. He worked out of H.H. Cousin's shipyard in Eureka until 1875 and then relocated to San Francisco, where he built a number of vessels and established a reputation for craftsmanship and for innovative adaptation to Pacific coast sailing conditions.

San Francisco was growing rapidly, and the need for more room forced Turner to relocate to the north. He purchased lots in Benicia in 1882, in partnership with John L. Eckley of Contra Costa County, and, by early 1884, had completed the construction of the new yard. The hectic pace of the work was described in a January 1884 *San Francisco Call* story.

We noticed some thirty men employed around the yard. The principle work done by Messrs. Turner and Eckley is the building of the 140-ton brig *Coventry Ford* [sic—actually *Courtney Ford*] for San Francisco owners, which was launched on Wednesday last. The work in hand when we visited, besides the finishing up of the brig, was a steam launch, for the use of the builders, 35 feet long, with 8 feet beam. In the carpenter's shop, a cutter for the Mexican government, 21 feet long, is being fitted up very handsomely . . . The people of Benicia are highly pleased with the coming of Messrs. Turner and Eckley among them, and on all hands we heard earnest wishes for the success of their old enterprise in a new place.

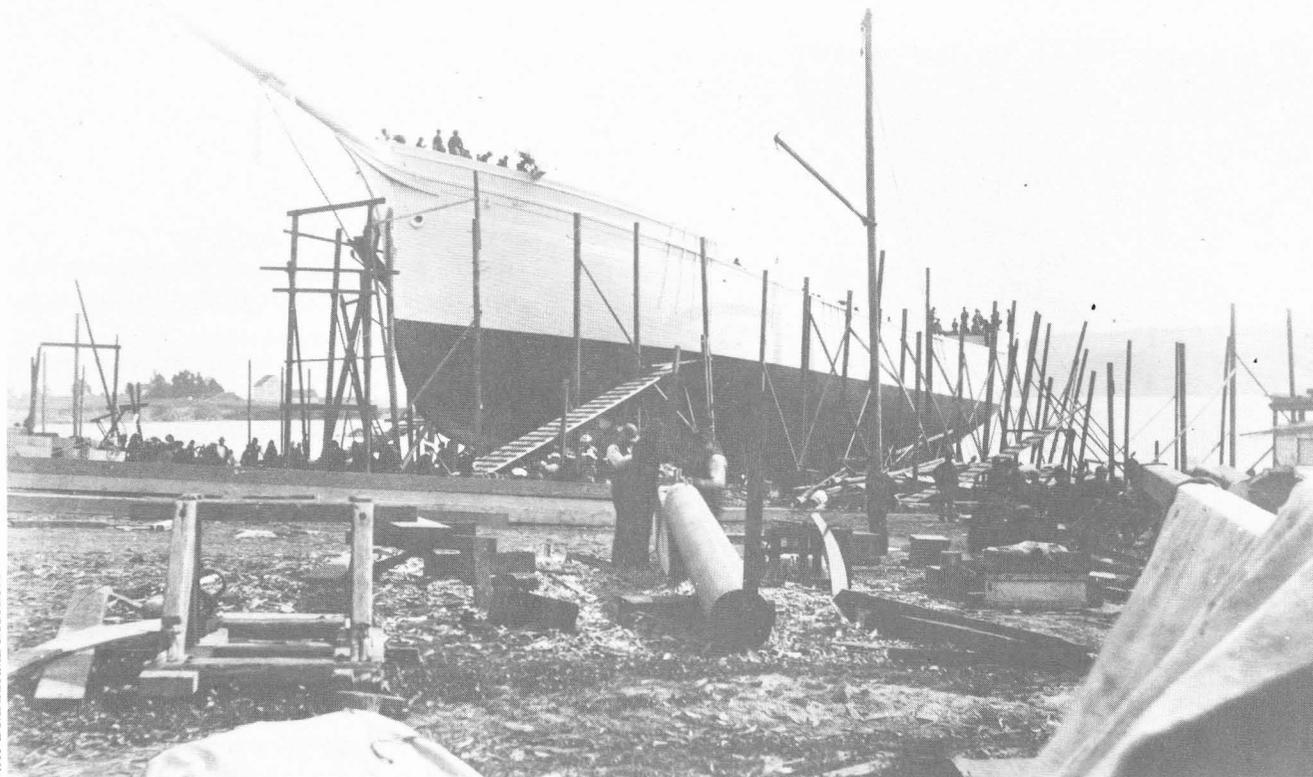
In all, Turner built 228 vessels—more than any other individual shipbuilder in North America. According to maritime historian John Lyman, “although many [of Turner's ships] were rather small . . . [H]e probably built more vessels for foreign account than any other American since the Revolution.” He built South Seas trading vessels, pilot boats, yachts, Pacific coast trading vessels, floating dry-docks, most of the United States' Bering Sea pelagic sealing schooners, steam whalers, tugboats, steam schooners, scows,

gas auxiliary schooners, barges, barkentines, and barks.

When Turner retired in 1903, he left the yard in the charge of his stepson-in-law, Andrian Chapman, who supervised it after the death of the previous superintendent, Horatio Turner, Matthew's brother. The yard closed soon thereafter. Turner died in Berkeley, on February 10, 1909, at age 83, having left a profound impact on American maritime trade and commerce. Vessels he had built ranged far and wide, from the Gulf, South America, the Pacific Basin, and the Arctic. His barkentines were considered by noted maritime historian Howard I. Chappelle to be exemplary of the shipbuilder's art.

In 1912, marine engineer James Robertson of San Francisco bought the shipyard from the Matthew Turner Company for \$20,000. Robertson had started to learn the shipwright's trade in 1886, at age 13, as an apprentice at the Union Iron Works of San Francisco. Later, he apprenticed for three years at the Hall Brothers Shipyard at Port Blakeley, Washington, learning to build wooden ships. In 1894, he returned to San Francisco and Union Iron Works, studying nights to become a naval architect. In 1903, the firm sent him to the Imperial Russian Naval Yard at Vladivostock to superintend the construction of caissons for dry docks. In 1906, Robertson returned to San Francisco and entered a partnership to form the South San Francisco shipyard of Schultz, Robertson, and Schultz. There he designed and supervised the construction of a number of ferries and riverboats. It was after the partnership dissolved six years later that he purchased Turner's shipyard.

At Benicia, Robertson added to the yard and built a number of impressive vessels, including *Charles Van Damme*, believed to be the first ferry designed in the United States to carry both automobiles and passengers; the sternwheel ferry *Petaluma*; and several barges. The yard was not an economic success, but the outbreak of World War I and the boom in wooden shipbuilding it inspired



Four-masted schooner *Solano* nearing completion, 1901.

aided Robertson's fortunes. During the war years he built two 4-masted schooners, *LaMerced* and *Orinite*, for the Standard Oil Company; a 5-masted schooner, *Rose Mahoney*; and the barkentine *Monitor*.

Toward the end of the war, Robertson sold his interest in the yard for \$100,000 to the Benicia Shipbuilding Company and remained to superintend the construction of three wooden-hulled steamers. He left Benicia in 1918, when the yard closed for good. The buildings were torn down; high tide covered the wharf pilings and shipyard ways (the timber frames on which ships were built and along which they slid into the water). In time, the precise location of the shipyard was lost by mismapping. Numerous maps repeated the error.

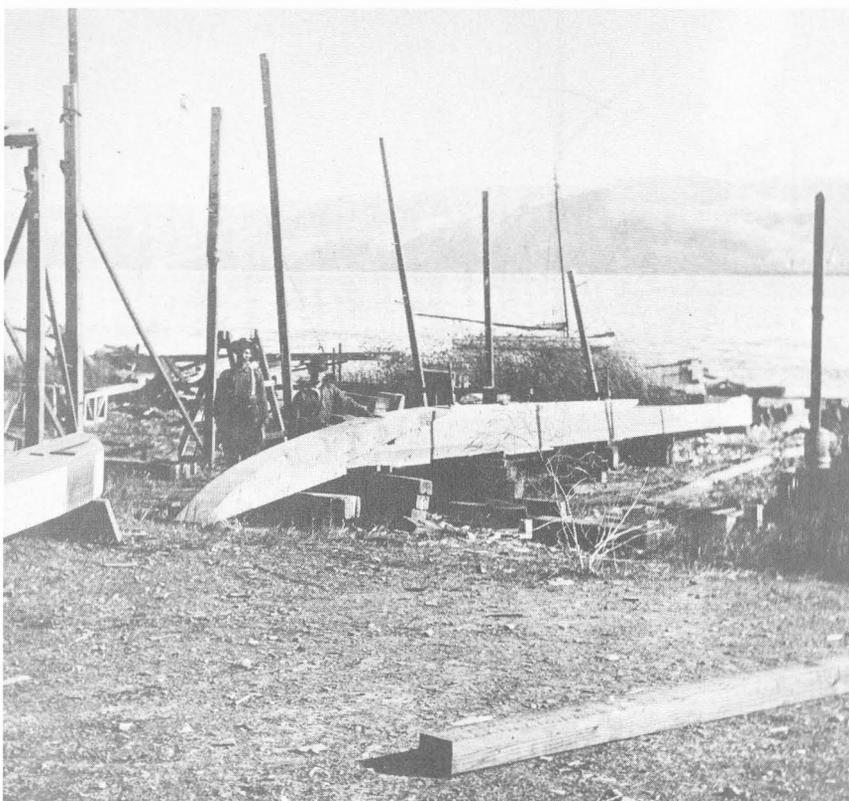
Rediscovering the Shipyard

In 1985, Benicia city historian Peggy Dunbar Martin, working with local volunteers, began a comprehensive inventory of local historical resources. The survey extended beyond buildings to industrial complexes and sites, including a site she believed had once supported Matthew Turner and James Robertson's shipbuilding activities. At her invitation, maritime historians and archaeologists from the National Park Service and the

state Office of Historic Preservation visited the site in spring 1986. They waited with her as the tide dropped to reveal the glistening, moss-covered remnants of the yard.

With the site of the shipyard rediscovered, work progressed to document the archaeological remains of nearly four decades of shipbuilding activity. In September and October of 1986, a volunteer group of divers from the San Francisco Sport Divers Association, members of the Benicia Yacht Club, the Benicia Historical Society, Benicia shipyard owner Joseph Garske Sr., and city employees, all working under the guidance of National Park Service archaeologists, began to map the surviving features of the shipyard—the ways, a marine railway, pilings from elevated shipyard buildings, a boiler, the abandoned remains of an early 20th century barge, and the submerged hulk of the ex-whaler *Stamboul* (pronounced stahm-BOOL).

Locating the hulk of *Stamboul* was another major discovery. The ship, built at Medford, Massachusetts, in 1843, had started out as an East Coast packet ship and was believed to have carried the first load of ice from the New England states to Egypt. She was double-hulled, and the ice was packed in straw. Later she was converted to a whaler and made several whaling voyages to the South Atlantic,



NAT'L MARITIME MUSEUM



JAMES DELGADO

Shipyard workers with ship timbers, circa 1900 at Matthew Turner yard.

View of the ways at the yard, May 1987.

Pacific, and Arctic oceans. Her registry was transferred from New Bedford to San Francisco in 1882.

In the last decades of the 19th century, San Francisco was the world's principal whaling port. *Stamboul* made several annual voyages from the Golden Gate to the Arctic for the next 14 years. In 1895, she was sold for scrap and partially stripped before Matthew Turner purchased her for use as a work platform. He had her moored at the end of the yard's pier, scuttled in place, and filled with ballast to hold her steady. Sheer poles and gear were erected on her decks to step masts and rig the vessels launched at the yard. Eventually, decay ate into her hull, and she slowly disappeared beneath the surface.

As a result of the archaeological study of the shipyard, including a five-day underwater excavation to expose part of *Stamboul's* mud-shrouded hull, plans were made to recognize the historical significance of the site by listing it as a nationally significant cultural resource on the National Register of Historic Places, and to develop it as a historical park and archaeological preserve.

Matthew Turner Shipyard Park

The shipyard site, threatened by encroaching urban development in the early 1970s, had been spared by citizen action and purchased by the city of Benicia as a waterfront park. The "West 12th Street Park" was then developed as a public recreational facility. In 1986, though, the discovery of the yard encouraged the Benicia City Council to redesignate the area as "Matthew Turner Shipyard Park." In 1987, the park was dedicated as California Registered Historical Landmark Number 973 by the California Department of Parks and Recreation. Since then, efforts initially spearheaded by Benicia councilwoman Linda Temple and now coordinated for the city of Benicia by Meridian Architects Inc., Benicia, have resulted in preliminary plans for a new emphasis at the park.

The park's existing parking lot will be redesigned to facilitate barrier-free public access, parking, recreational use, and an aesthetic approach to the park that will highlight the visible historic and archaeological features. "Shipyard" style benches, waste receptacles, and other park amenities will be added. At the center of the park a structure designed to resemble an open-sided shipyard shed will be erected. This shed will house the recently salvaged bow of Matthew Turner's 1891 brigantine *Galilee* and overlook the ways where she was launched. Interpretive panels will be installed along the shoreline in the park to detail the history and significance of the site and explain the visible features of the yard. A special panel will be installed to interpret the unseen but significant remains of *Stamboul*, one of only two known substantially intact American whaler wrecks in the United States.

Work on the park will begin in early 1988. While waterfront recreational development is not a new phenomenon in urban planning, the historic preservation and archaeological interpretive approach envisioned for the Matthew Turner Shipyard Park is innovative. The park concept has been encouraged and assisted by the National Park Service and has received positive attention from the National Trust for Historic Preservation.

The Matthew Turner Shipyard Park is a precedent for sensitive waterfront recreational development that is cognizant of a maritime past that is not always tangible, but is of interest to the public. The survival, preservation, enhancement, interpretation, and public use of a nationally significant historic site and its archaeological remains is unusual at a time of active urban waterfront development. As citizens continue to volunteer to bring about this project's fruition, the appropriateness will continue to unfold. □

JAMES DELGADO



Barge wreck next to ways. *Stamboul* wreck is immediately offshore.

James P. Delgado is chief maritime historian for the National Park Service.

A Taste of Salt

PHOTOS BY RON KUKULKA AND LIZA RIDDLE



Salt stack seen across a Leslie Salt Company crystallizing bed in Newark.

Solar salt farming requires long dry summers, reasonably clean water, plenty of wind, and extensive tidal land. In the United States, San Francisco Bay is one of only three suitable locations. The Leslie Salt Company farms more than 40,000 acres in the southern and northern part of the Bay. Its multicolored ponds amaze many airborne travelers, but few get to see the entire process, which requires five years.

In late summer, when Bay water is saltiest, it is captured in vast concentrating ponds. For about four years it moves through a system of ponds, which change color as the water evaporates. When it is saturated at about 25 percent sodium chloride, the water is pumped into smaller crystallizing beds in Newark, Redwood City, and Napa. The crystals grow. Harvest is September to December, in a race with the rains. The mineral-laden water with sodium chloride precipitated out

Bags of salt will be stacked on these pallets and loaded onto trucks.

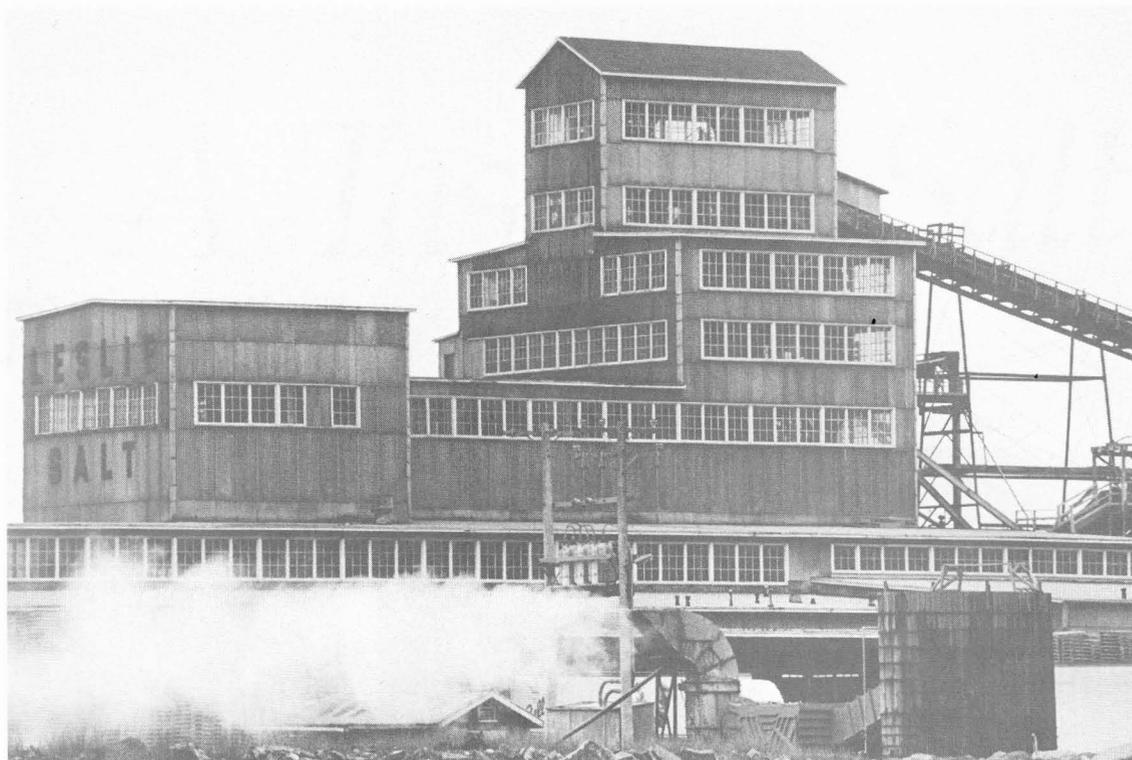




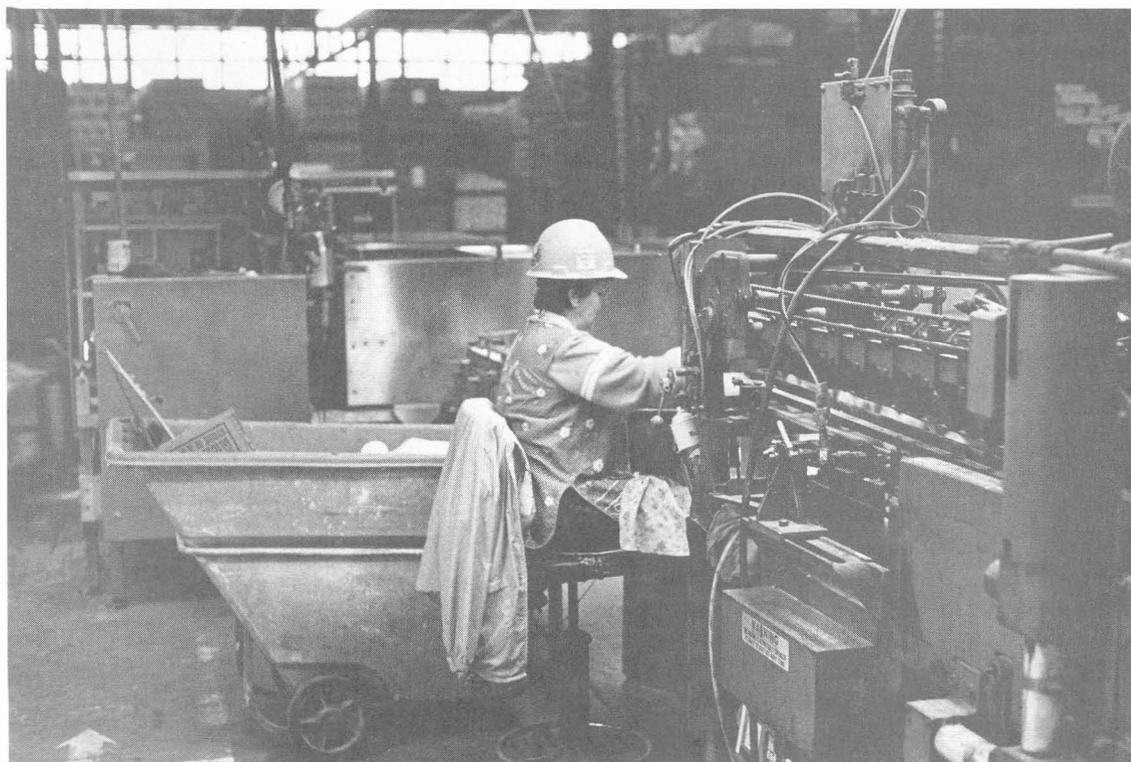
Wind-driven Archimedes Pump, once used to pump water through the pond system, is now part of a historical exhibit.



Salt spills off the arms of the gantry onto the salt stack.



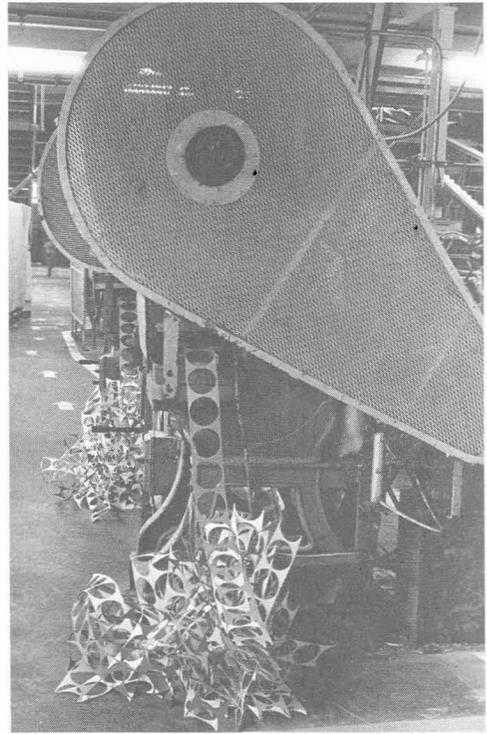
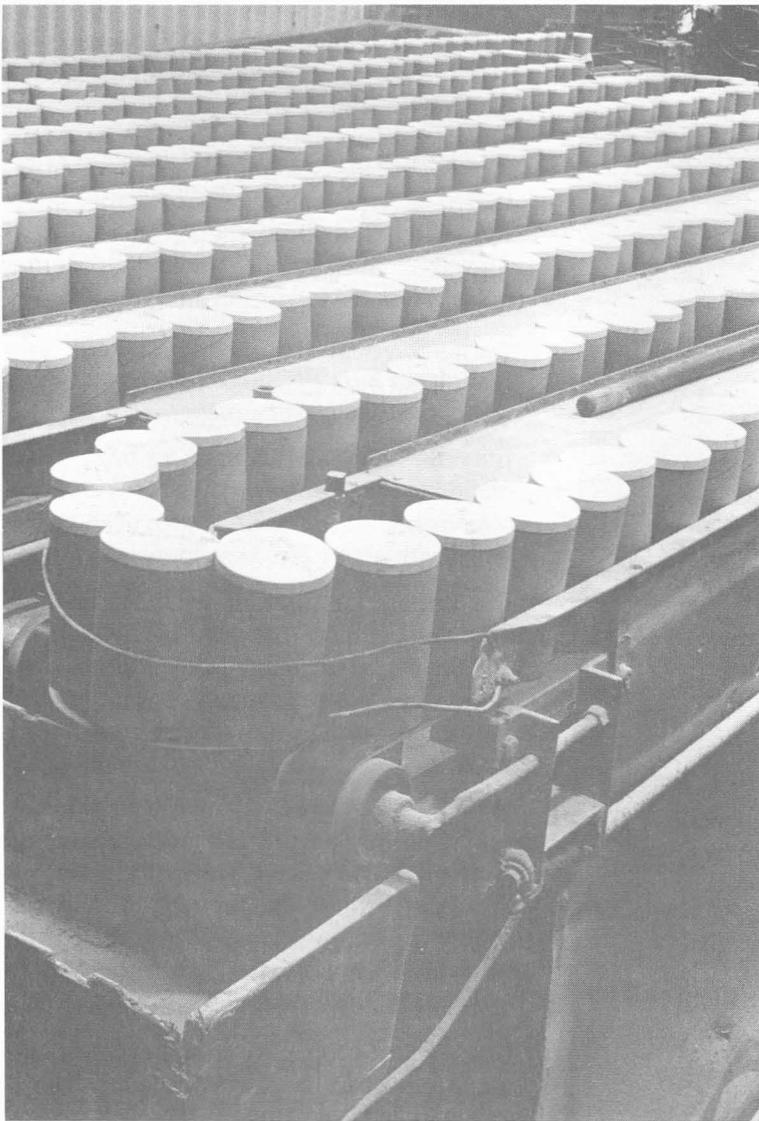
In this processing plant, built in the 1940s, salt is washed, screened, and packed. Some is conveyed to the refinery, where it is kiln- or vacuum-dried.



Gen Fasolis checks labels as the table salt containers move along on a conveyor belt.

(known as bittern) is drained. Salt crystals are scooped mechanically into miniature cars to be pulled by a small locomotive on moveable narrow-gauge tracks to the wash house, where it is cleaned with brine. Then it is moved by conveyor belt to giant stacks. It remains there until packaged for industry or until further processed.

Industry uses nearly three-fourths of the salt harvest for producing chlorine, caustic and soda ash, paper, dyes, ceramic glazes, nuclear coolant, and for other uses. The food processing industry and farming use about 20 percent. Only 3 percent of the harvest winds up on the table in a salt shaker. □



Salt containers are produced in a large airy space in the refinery.

Ridge Views

AN INTERVIEW WITH JIM AND JUDY TARBELL

For the past seven years, Jim and Judy Tarbell and Lucie Marshall have served as a voice for North Coast inhabitants by publishing the quarterly *Ridge Review*, "magazine of the Northern California Coastal Ridges." Put several issues together, and you have a rare insiders' profile of a unique stretch of coast. *Waterfront Age* editor Rasa Gustaitis interviewed the Tarbells in the *Review's* office, a converted chickenhouse in Casper, a tiny town between Mendocino and Fort Bragg.

Waterfront Age: *The Ridge Review is for people who live along the coastal ridges?*

Judy Tarbell: It's an attempt to bring information to the people who live between Branscomb and Bodega Bay, a stretch of about 100 miles with about 27,000 residents.

Jim Tarbell: We think of our little region as bounded by the end of the urban wilderness and the beginning of the real wilderness, the Sinkyone. We reach sometimes up into Humboldt and into Marin, but typically we're in western Sonoma and Mendocino counties.

Judy: There is, in truth, not much connection between coastal towns. The major roads run East-West, except for Highway 1, and the county seats are inland. When people go from here to somewhere else, they go to Ukiah or San Francisco.

Jim: A lot of people living in the Fort Bragg/Mendocino area have never been to Gualala, less than an hour's drive south.

WA: *That's amazing. So perhaps there is no need for connection?*



SEAN SPRAGUE

Jim and Judy Tarbell with Shamli, Crescent, and the Ridge Review family dog, Freckles.

Jim: These communities share a lot of the same concerns. The climate, the economics, they're the same; and the ocean. The environmental impacts are so huge that people's lives are similar.

Judy: A sheep rancher in Little River and a sheep rancher in Jenner will probably have similar experiences, but will probably never know each other. So we're a forum for people to get together on what's important to them. We did issues on the fishing industry, the wine industry, the sheep industry, the marijuana industry, on logging, and on education, on tourism, on money, on the rivers, and on the ocean. The attempt is to give people a sense of what's happening in the area.

Jim: We try to give information about who controls the resources, what's happening to them, what their potentials are; all those things that are important for residents of an area to know.

WA: *Each issue has a theme?*

Since our fourth issue. That was in 1982, and Herbert Kohl—he's a friend—was guest editor. Naturally, it was on education [author Kohl's speciality].

WA: *I was struck by the diversity of voices you publish.*

Jim: We find people who have something to say on the topic we're doing, and who are willing to write to get it out. That's why we often have articles from different sides. A lot of experts live up and down this coast. But we rarely get anyone who can discuss an issue from some kind of wise Olympian point of view. And that's fine.

WA: *Many highly educated and accomplished people live here on the North Coast, though you're far from any big city. So your community is not just rural, it's also cosmopolitan.*

Judy: Certainly a lot of people here are smart and educated, whether they came in from outside or were born here. But I've learned enormously—information I consider vital—from people who don't have degrees, but have lived here all their lives.

Jim: A real key to moving here is to listen to people who have lived here. That's part of the point of *Ridge Review*.

WA: *Do controversies arise?*

Jim: On the issue of noncode housing we found ourselves in the middle of one. We didn't actually engage in it, but there was a lot of comment in local newspapers. And on the marijuana issue, Judy was instrumental in getting a group of people together who had always said very nasty things about each other.

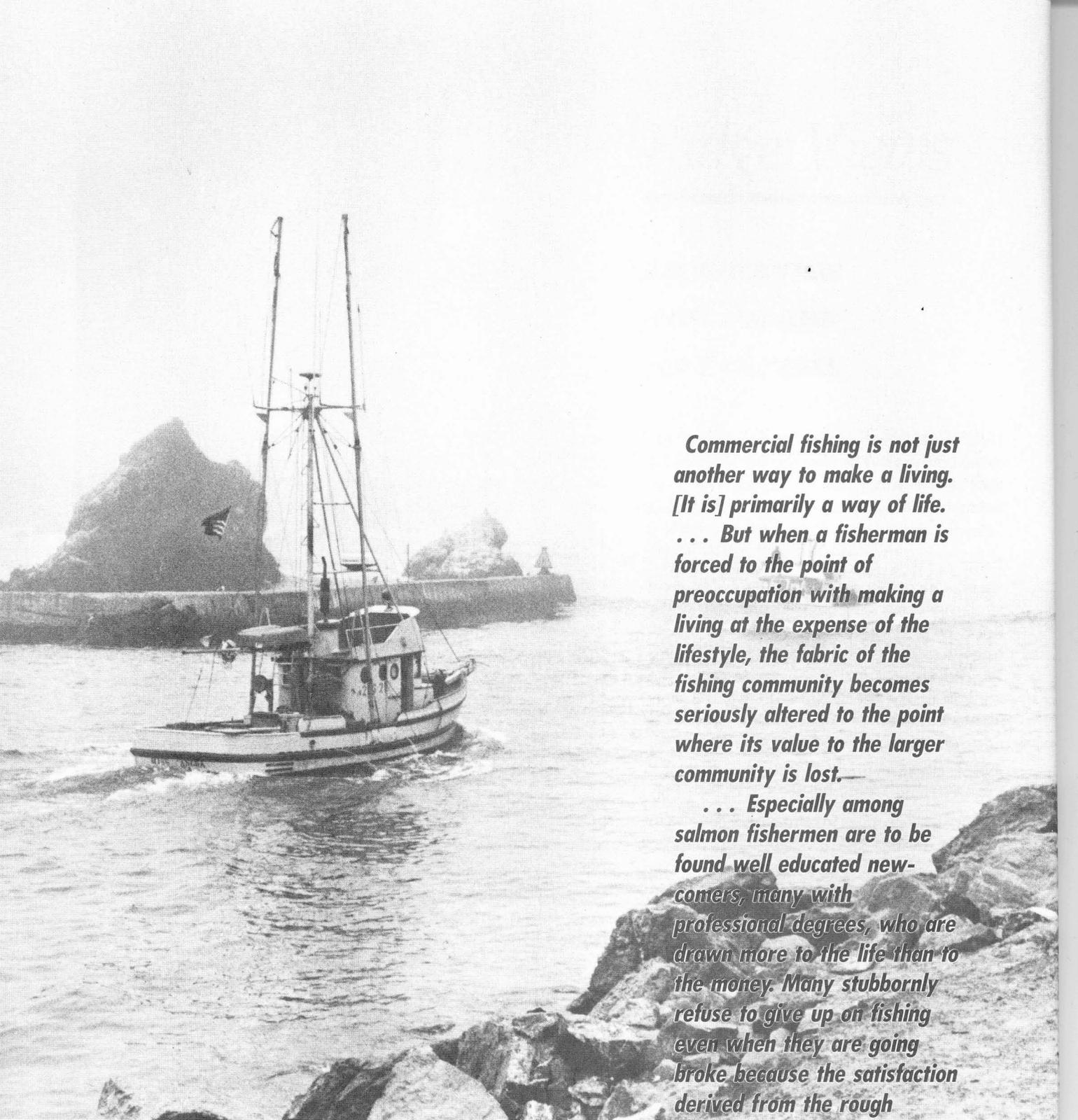
WA: *What happened?*

Judy: They looked each other in the eye and listened. That was the idea.

WA: *In your last issue, about the ocean, you refer to "Ridge Sea." What's that?*

Jim: It's what's out there.

Judy: The fishermen are the interface. It's their sea. But 85 percent of the people in California live within 35 miles of the ocean, and they all relate to the ocean—even if they don't see it out their back window, it's a big part of their life.



Noyo Harbor

Commercial fishing is not just another way to make a living. [It is] primarily a way of life. . . . But when a fisherman is forced to the point of preoccupation with making a living at the expense of the lifestyle, the fabric of the fishing community becomes seriously altered to the point where its value to the larger community is lost.—

. . . Especially among salmon fishermen are to be found well educated newcomers, many with professional degrees, who are drawn more to the life than to the money. Many stubbornly refuse to give up on fishing even when they are going broke because the satisfaction derived from the rough nobility of the profession of fishing beats the rewards of the professions from which they came.

Paul Wood, Bodega Bay fisherman
for 15 years

WA: *The magazine really gives a sense of the place. I was fascinated reading fishermen on their industry, finding winemaker John Parducci advising newcomers to "Start Small." And of sea otters versus abalone. You cover the landscape, the seascape, and local people in their habitat.*

Jim: The whole living environment. A lot of bioregionalism omits human habitation in the bioregion. We see it as central.

WA: *It's not easy for a small magazine to live so long—seven years, now. How have you managed?*

Judy: Lucie Marshall is one reason it survived in the early years. She had writing and magazine expertise. She had lived in Gualala for ten years and knew all the people.

Jim: The printing business, Black Bear Press, was the economic secret. We bought it in 1981, and it was the vehicle for the magazine and provided an income.

WA: *You no longer own it now, though.*

Jim: No, but in selling it we made an agreement that we could use it to put out the magazine. We print 3,500 copies now, on a weekend. We figure it costs us \$12 an issue for paper, telephone, mileage, and distributing costs. Just paper and plates is probably 50 cents an issue. The key is that we print it ourselves.

WA: *A.J. Liebling has said that "Freedom of the press belongs to those who own one." But can you make a living by publishing Ridge Review?*

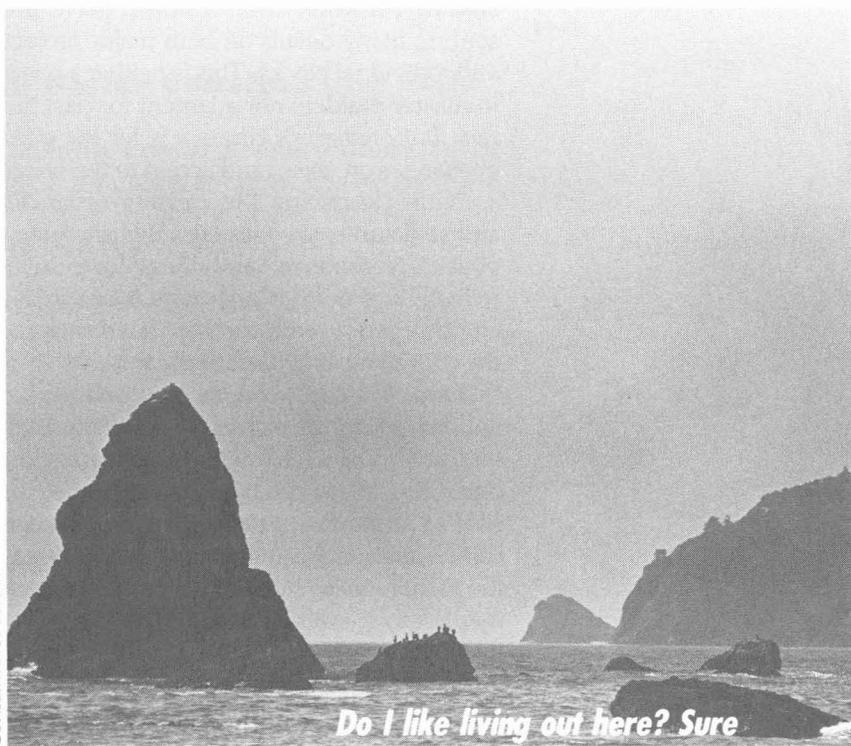
Judy: It's how we live now.

Jim: I think all communities could have their own *Ridge Review* that looks at how communities are run and what the forces are in a community. If you have a printing press you can do it.

Judy: There has been a lot of encouragement to us to grow, to move out into all Northern California. But there is a sense of *Ridge Review* family. That is, if you're a reader and you find

someone outside this area reading *Ridge Review*, you'll probably go up to that person and say: "Where'd you find that magazine?" And if you go outside this contained area, that would be lost.

Jim: We're telling the story of one area. That idea is applicable to a whole lot of others. Lessons from it, maybe, are applicable to other places. But the whole idea is to keep it the story of one area. □



Trinidad

Do I like living out here? Sure I do, I love it. It's foggy and windy, just miserable lots of days. But I like the smell of it. Like being on a ship, only it doesn't move around so much. I don't think I'd like living anywhere else.

Resident, in *Ridge Review*

Maritime Manhattan

Manhattan Water-Bound: Planning and Developing Manhattan's Waterfront from the Seventeenth Century to the Present, by Ann L. Buttenwieser. New York University Press, 1987. \$35, 243pp

In Ann Buttenwieser's view, the waterfront is or should be for people. Her research and conviction have made the Manhattan waterfront her neighborhood. In this book, she takes the reader around this neighborhood, sharing her knowledge of how it grew, presenting many details on both major projects and individual blocks. This is neither a paean to master builders nor a lament for past glories. Buttenwieser's concern is for the effect of changes on use of and access to the water.

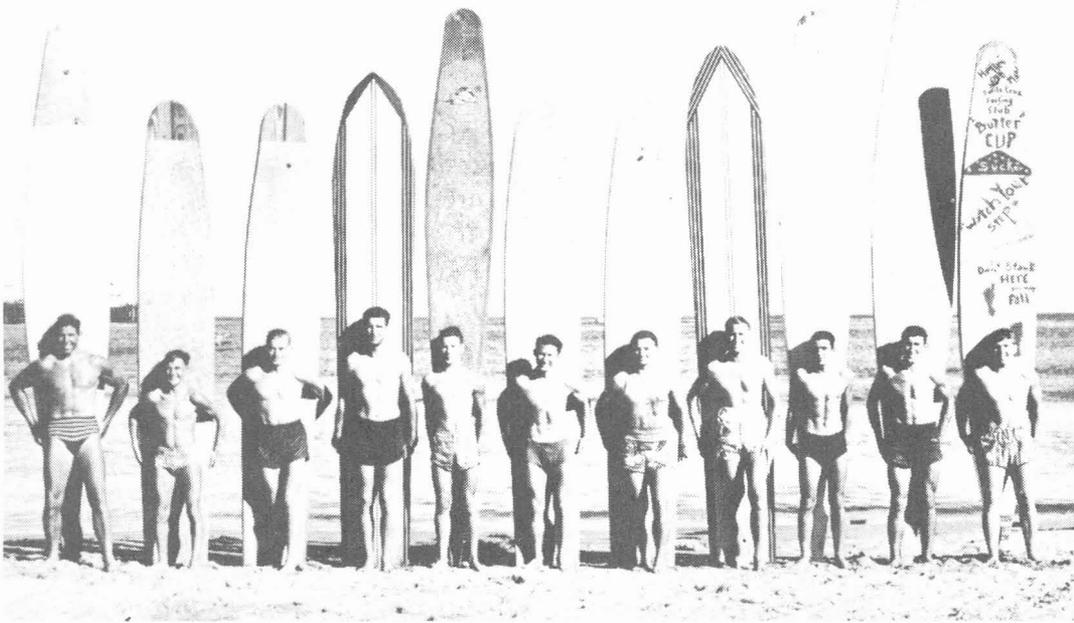
While describing the creation of landfill and structures, she tells tales that show how politics, commerce, and ideas have intertwined. The book is organized more or less chronologically, with each section discussing the prevailing approach to the waterfront for that era. The focus moves from one area to another, as each stretch of the waterfront was built according to technology and ideas of the times, and as each phase of growth forced the next to locate further along the shore to accommodate new waterfront uses. In this way the author makes sense of the variety of treatments along Manhattan's shore. She uses these tales instructively, and the final effect of this well-written history is a sense of the roots of the current discussion on the New York City waterfront and the growing interest

in its public use.

In New York City, much of the waterfront is publicly owned, but public ownership is not synonymous with public access. Outside of the 40 percent of New York's 578 miles of waterfront controlled by the Department of Parks and Recreation, little of the shoreline is accessible to the public, even on Manhattan, where public ownership is greatest. As Buttenwieser points out, the historical use of the waterfront was and is to generate revenue for the city. She traces this value from the grants and charters that set control of the waterfront. While in California public ownership of land is commonly used to secure land use control or public open space, the New York tradition puts public land to commercial use, usually through a leaseholder or concessionaire. So, even though the city owns the greater part of the Manhattan waterfront, it is mainly the parks that provide public space at the water's edge, and these mostly in the northern half. Still the commercial value prevails. Creation of much of new public access has been in conjunction with development projects, as mitigation for open space impacts or as trade-offs for zoning variances.

Buttenwieser's work looks to the future as well as recounting the past. Her book gives an understanding of the antecedents that are shaping the discussion of development of New York City's waterfront. There has been a growth of interest in making the waterfront more accessible for residents and for tourists. But legislatively there is no point of enforcement, and with no voter initiative process in New York state, it is unlikely that there will be legislation directly providing waterfront access for the public. However, civic groups see it as a public need and are advocating this goal. So the framework of the discussion about the waterfront is moving away from simply commercial use to more informed perspectives. Some commercialism is still involved, such as using public access as a way to create a better business environment and to boost tourism. In a city where public access must compete with other land uses (not





A coastal cultural asset: Santa Cruz Surfing Club, 1941.

all water-related), public access must often justify itself on economic grounds.

There are echoes of the past in the ideas now put forth for the waterfront. Butenwieser makes these origins evident, and it is striking to see how the sense of place and often even the uses of a neighborhood linger. She also chronicles the long periods of inaction, which again occur in our day and are all the more deplorable as a large portion of the waterfront is idle. New York may never treat waterfront access as a public right. But there is a growing sense of the special character of the waterfront, and, as the commercial water-dependent uses wane, that their proper successors are public water-dependent uses.

The only caveat about *Manhattan Water-Bound* is that readers will need a good street map of the island to keep track of locations, especially if they are unfamiliar with the geography. Even though there are maps of the areas under discussion, they do not give the perspective of the whole island. The time graphs at the beginning of the book are very helpful in getting oriented to the different eras and the changes in transportation modes, and the photographs do an excellent job of evoking past visions of the waterfront.

—Karen Tsao

Karen Tsao is director of Harbor Park, City of New York Parks and Recreation Department.

Of Roller Coasters and Rats

California Coastal Resource Guide, by the staff of the California Coastal Commission. University of California Press, Berkeley: 1987. \$14.95, 384pp

I've spent years exploring the beaches and communities along California's coast, but this intriguing guide illuminates many subtle secrets that had eluded me. Everything is here—from roller coasters to wetsuits to the enigmatic sheephead, a fish that starts out life female, but changes at age seven to male. The detail of this guide makes it clear that the Coastal Commission took to heart the challenge to produce a revealing inventory of the many pieces that comprise the whole of the California coast.

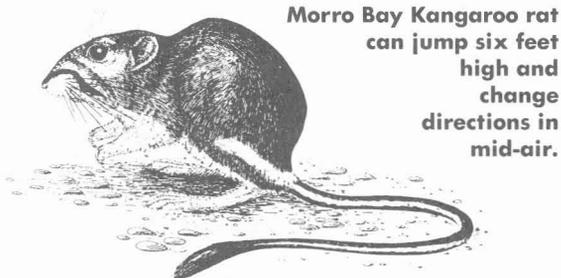
It was the late Lenard Grote, former chairman of the Coastal Commission, who originally envisioned a coastal resource inventory to accompany the acclaimed *Coastal Access Guide*. There is no doubt that this book meets and exceeds his goals in several respects. Now the public not only can find the beach, but it also is offered a chance to understand what makes California's coast so special.

The first two chapters are devoted to the natural resources that shape the coast. The chapter on geography includes sections on streams, dunes, wetlands, beaches, and waves and discusses the role of each in

sculpting the shoreline. Tragically, appreciation of the essential role played by nutrient-rich wetlands and estuaries has come too late for 90 percent of the original coastal wetland acreage in California. That loss sharply increases the need to make sure that the remnants of our coastal wetland system are left alone to work their magic.

Living plants and creatures are the subject of the second chapter. This is where you can find out whether sea lions are as promiscuous as harbor seals—I'm not going to tell. Or, what is it, exactly, that creates a pygmy forest?

The real innovation of the guide, however, is the third chapter, in its coverage of the cultural factors that influence California's coastal zone. This chapter includes an exhibit of typical architectural styles and the sometimes



**Morro Bay Kangaroo rat
can jump six feet
high and
change
directions in
mid-air.**

saucy, but true "Coastal Timeline," fascinating contributions to coastal lore. Articles on lighthouses, amusement parks, and recreation provide some historical perspective. I particularly appreciated the attention given to the role of Native Americans.

The remainder of the guide is a county by county inventory of notable sites and activities. The same clear reference maps found in the *Access Guide* direct the reader to points of interest. The accompanying text provides insights to the wide spots in the road or the county park. Discussions of the derivation of Spanish names and locales gives a sense of continuity and history of the settled coast.

There are features on many subjects sprinkled throughout the guide. They range from

the Santa Cruz long-toed salamander to submarine canyons, and they contain great trivia, such as the fact that the Morro Bay Kangaroo Rat can jump six feet high and change directions in mid-air. All in all, this guide is not only useful and informative, but also fun.

—Ann Notthoff

Ann Notthoff is a senior project planner for the Natural Resources Defense Council, San Francisco, and has been working on coastal management issues for ten years.

SF Bay: Taking Stock

The Saved Bay, A Catalogue of the Protected Areas of San Francisco Bay, by the Bay Planning Coalition. Ellen Johnck and P. Randolph Freeman, eds. San Francisco: Bay Planning Coalition. \$45, 56pp

A title more modest than *The Saved Bay* should have been chosen; however, this booklet usefully, and mostly accurately, compiles properties owned by preservation-minded agencies in and adjacent to San Francisco Bay. Each property is briefly described and shown on 18 maps. The stated purpose of this report is to stem the flow of negative information "promoted" about the Bay, by surveying "in a positive fashion" how many acres are actually "saved" or protected. The implication is that nefarious individuals, or perhaps even agencies, have been busily convincing folks that the Bay is in poor condition when it may not be. Widely reported facts show otherwise, of course. The Bay Planning Coalition, a membership organization that includes many prominent landowners, developers, and their consultants, may reflect a somewhat narrower perspective than that of the general public.

The Coalition suggests that a new program for determining whether more Bay should be saved ought to be undertaken and that, if so, the public should buy this land rather than relying on existing regulatory

controls and acquisition programs. It fails to note that the public already has rights and property interests in many Bay lands, and does not show why taxpayers should spend limited public resources to purchase additional interests in those lands.

Many tidal lands are subject to the public trust, a matter not discussed in this booklet. The trust, an existing public property interest, is often sufficient to protect the lands from filling or draining. Lands subject to the trust are purchased with that impediment, much like lots with an existing easement for a street or sidewalk. Just as the lot buyer cannot thereafter reasonably expect to use the land under the sidewalk or street contrary to the purposes of the easement, so the owner of underwater lands subject to the trust cannot reasonably expect to fill or drain them.

All the remaining Bay and some adjacent wetlands also deserve and enjoy some level of land use control. How the Bay is to be regulated was determined by the Legislature back in 1965, when the McAteer-Petris Act created the San Francisco Bay Conservation and Development Commission. The Porter-Cologne Act, which empowered the Regional Water Quality Control Board; the 1899 Rivers and Harbors Act; and the Clean Water Act also imposed controls on activities in the Bay. These federal and state regulatory programs emphasize protection while allowing development that is needed, is water-oriented, and provides substantial public benefits.

In questioning whether the Bay needs different and further protection, the Coalition may be at odds with much of the public in the Bay area. Polls and surveys indicate that we cannot afford to allow the few remaining natural wetlands to be lost, except in rare cases when there is no alternative and substantial public benefits would arise. In light of the regulatory constraints and strong public opinion in favor of protection, the thoughtful developer will concentrate on projects on high and dry land rather than on fill schemes.

There are a few errors in the report. One property, M-5 on Map 2, consists mainly of upland acreage that neither a layman nor an expert would ordinarily classify as "shoreline." Property A-6, on Map 13, is described on Page 18 as part of the San Leandro Bay Regional Shoreline. Actually, it is the former Alameda dump known affectionately as Mount Trashmore, owned by the city of Alameda, not, as indicated in the report, by the East Bay Regional Park District, the East Bay Municipal Utility District, or the Port of Oakland. Nor is the property "saved," because the City has consistently proposed that it be developed for an office park. Perhaps the most misleading among entries of "saved" or "protected" lands is that of several thousand acres of salt ponds in Napa County, owned by the Leslie Salt Company. As readers following the proposal for a race track and office park in the Hayward salt ponds are aware, the fact that salt ponds are within the jurisdiction of the U.S. Corps of Engineers or the BCDC does not necessarily foreclose development.

It is noteworthy that all the land listed as "saved" has been bought and is now owned in fee by agencies or nonprofit organizations, such as the Trust for Public Land and the Nature Conservancy. Regulation does not appear to have prevented any land from being developed, although the report implies that it may do so in the future. And that is probably as it should be. Regulation controls appropriate land uses and precludes private activities that harm our common resources without providing a corresponding public benefit. But acquisition permanently "saves" land for a wide variety of public purposes.

—Alan R. Pendleton

Alan R. Pendleton is the executive director of the San Francisco Bay Conservation and Development Commission. This review presents his views and is not intended to represent the point of view of the Commission.

The Saved Bay is available from the Bay Planning Coalition, 666 Howard St., #301, San Francisco, CA 94105. \$45.

Conference Log

Continued from Page 7

around the country.

The conference was a forum for exchanging information and for encouraging projects by industry, government, and private groups to reverse the process of environmental degradation. It also aimed "to help focus world attention on the restoration movement," according to John Berger, founder and executive director of a Berkeley-based organization, Restoring the Earth, which put together the gathering. That restoration has advanced beyond the exploratory stage and can be considered as a movement was suggested by land use attorney Joseph Petrillo, former executive officer of the State Coastal Conservancy, who enumerated several indices: it is not only an academic, but also a governmental activity; professional groups have appeared, including biologists who design and maintain restoration projects, and attorneys who specialize in the law of restoration; databanks on restoration are appearing; and government funds and programs for restoration are being developed.

In 1984, when the University of Wisconsin, planning an arboretum under the leadership of Aldo Leopold, committed itself to reconstruct a prairie ecosystem in a horse pasture, only a tiny group of people realized the significance of that act, the Arboretum's William R. Jordan III told the conference. The project was never published. Only "a drawerful of notes" was left as record. Now, enough restoration is underway to have led to the formation of the Society for Ecological Restoration and Management. (For information: University of Wisconsin-Arboretum, 1207 Seminole Highway, Madison, WI 53711.)

"We must ask not how to preserve or protect these systems, but how to *inhabit* them, bringing with us all the stuff we've accumulated on the journey to the moon—VCRs, snowmobiles," Jordan told the conference.

"Unless we do that, these systems are doomed. If our population can reinhabit them, we will fall in love with them—not because they cure cancer, but because they are our home."

Papers and talks were presented on efforts to restore degraded streams through volunteer work by citizens groups; to protect watersheds by comprehensive watershed ordinance and long-term planning; on waste recycling through natural systems; and on restoration as a profit-making activity. There were sessions on ecologically sound development; mined land stabilization; on restoration of rivers, estuaries and forests; creation of marshes; and many other topics.

Peter Grenell and other staff of the State Coastal Conservancy reported on conflict resolution for resource management.

"You don't need to be smart to be successful. You only need to be committed," observed Marion Stoddart, founder of the Nashua River Watershed Association in Fitchburg, Massachusetts. "One person can do the work of a thousand. The differences that have been made have been made by one or two people who really cared."

Conference proceedings will be published. For more information, write to Restoring the Earth, 1713C Martin Luther King Jr. Way, Berkeley, CA 94709.

—Rasa Gustaitis



KEN DOWNING



Mystery Photo

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**How well do you know the California coast? Identify this royal piece of property and receive a year's subscription to *Waterfront Age* absolutely free.**

**Several readers correctly identified the mystery photo in the winter issue as one of Leslie Salt Company's giant salt stacks in Newark, on San Francisco Bay. See more on Pages 36-37 of this issue.**

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