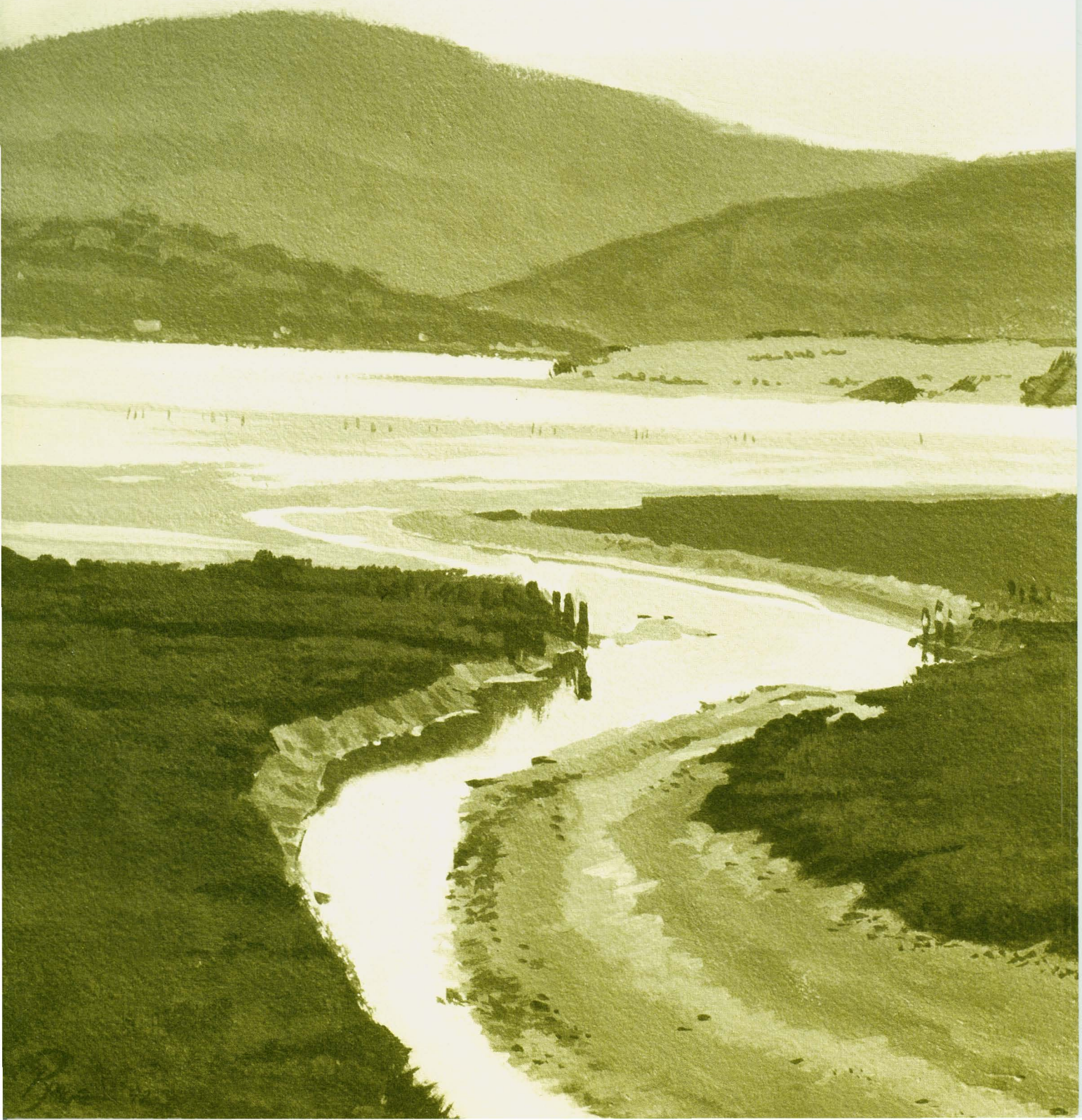
Volume 8, Number 2

Summer 1992

California

Coast & Ocean



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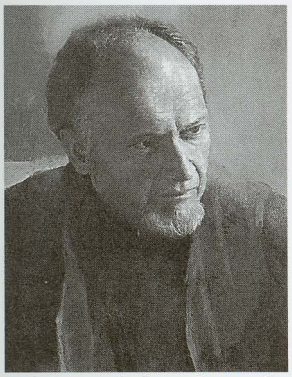

***Ralph*, acrylic/board, Martha Borge**

Cover Artist

The work of Ralph Borge has been in exhibitions throughout the United States, and in major museums, including the Museum of Modern Art in New York. He is known mostly for poetically realistic, puzzling, and evocative paintings. Lately, however, he has focused on the landscape of West Marin County, as has his wife Martha Borge, who is also a widely recognized painter. They live in a white Victorian house at Point Reyes Station, which they open Sunday afternoons to the public as an art gallery exhibiting their work. Millerton Point, shown on our cover, is a mile down the road, on Tomales Bay.

CALIFORNIA COAST & OCEAN is published by the STATE COASTAL CONSERVANCY in association with the ROMBERG TIBURON CENTERS, San Francisco State University.

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CALIFORNIA COAST & OCEAN (ISSN 1052-5823) is published quarterly.
 Direct all correspondence, including editorial submissions, to CALIFORNIA COAST & OCEAN, State Coastal Conservancy, 1330 Broadway, Suite 1100, Oakland, CA 94612. (510) 464-1015.

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California Coast & Ocean

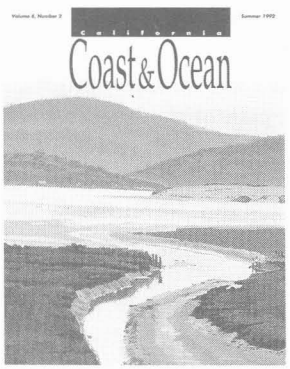
Departments

Are our kids adapting to the coastal environment?

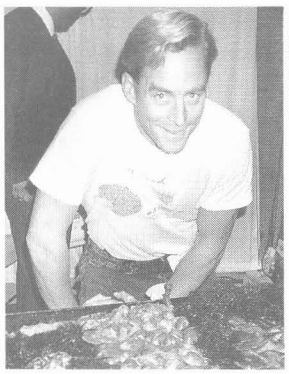
GARY HAFNER

Stories begin on page 16

Features



Cover: *Sunset Off Millerton Point*, oil on prepared paper, Ralph Borge, 1992



WESLEY MARX

Oysters, anyone? **page 6**

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From The Executive Office

by Peter Grenell

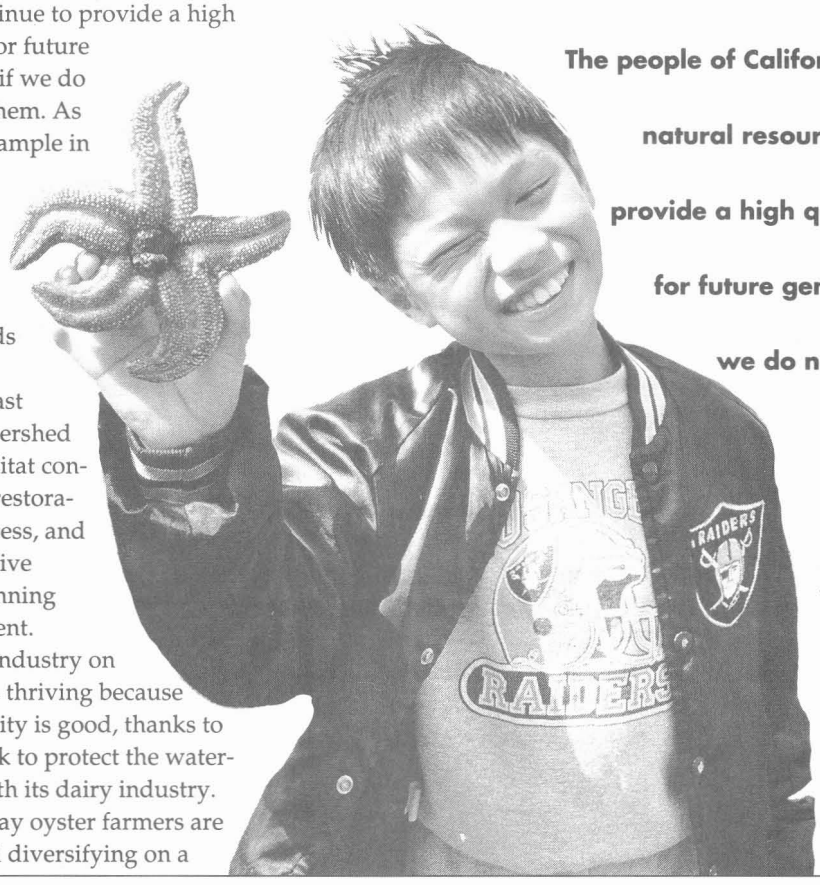
As we deal with our present fiscal crisis through budget cuts and other painful measures, we need vision and imagination to protect our coastal resources. We must take stock of what we have and call on all our resourcefulness—the Governor's "Resourceful California" concept is apt—to chart a path into the next century, recognizing that economic health can only be guaranteed if natural resources are protected and social equity exists.

Let us shift our focus beyond the condition of the public purse for a moment—just long enough to notice our wealth. The people of California possess natural resources, especially along our coast, that can sustain our growing population and continue to provide a high quality of life for future generations — if we do not squander them. As we show by example in this issue of *Coast & Ocean*, and will further describe in future issues, livelihoods and jobs on California's coast depend on watershed protection, habitat conservation and restoration, public access, and resource-sensitive waterfront planning and development.

The oyster industry on Tomales Bay is thriving because bay water quality is good, thanks to successful work to protect the watershed, along with its dairy industry. The Tomales Bay oyster farmers are expanding and diversifying on a modest scale, even though in the central and southern parts of the state, and on the East Coast, pollution has ravaged this form of marine aquaculture (page 6). According to a recent report from the National Research Council (page 13), the United States lags behind other nations in mariculture. Public support for such development would pay off economically while adding to the many attractions that draw visitors from other states and nations to our coast, where they support visitor-serving businesses. This industry would have to be developed together with water quality safeguards and improvements along much of our coast.

This is but one of many instances where protection of the coastal environment supports the state's economy. In our spring issue we reported how the creation of the Elkhorn Slough National Estuarine Research Reserve catalyzed further watershed restoration efforts, some of which sustain local strawberry farms while protecting wetlands and, at the same time, helping to make Moss Landing a magnet for environmental tourism. We will expand further on this theme in the fall issue, when we describe the successful Morro Bay watershed protection program. The State Coastal Conservancy has played a key role in all these efforts, working cooperatively with others.

As these examples suggest, coastal resource protection, restoration, and use generate significant economic and employment benefits. Our focus on deficit reduction should not overshadow the extreme importance of timely planning and investment that capitalize on these values. As Resources Secretary Douglas Wheeler said at a recent River Heritage Conference, we must make big plans if we are to stay wealthy in natural resources.



The people of California possess natural resources that can provide a high quality of life for future generations—if we do not squander them.

Our efforts will be in vain, however, if the next generation in this demographically changing state lacks the necessary sense of stewardship. This is especially true for the coast, along which most of the state's population lives. We must therefore invest seriously in educating all the state's children about the natural wealth they will inherit as California citizens, and foster its appreciation, enjoyment, and intelligent use rather than exploitation. Articles beginning on page 16 discuss this question. ❐

REGINA MCGRATH

Ebb and Flow

Recent Conservancy Actions

In June, the Conservancy authorized:

• To the Sonoma Land Trust, up to $257,500 toward acquisition of an agricultural conservation easement on 368 acres along the Petaluma River, southeast of the city of Petaluma, in **Sonoma County**. There is considerable development pressure in this area. Purchase of the **Cloudy Bend** easement will provide permanent protection for productive farmland, open space, and wildlife habitat. The land trust, which assisted the Conservancy in preparation and appraisal of the easement, is contributing $100,000 toward this acquisition. Eventually, title to the easement will pass to the Sonoma County Agricultural Preservation and Open Space District, which will reimburse the land trust.

• To the **city of Richmond,** up to $194,000 for the construction of a quarter-mile link in the **Marina Bay Shoreline Trail.** This trail link will connect the trails, completed with Conservancy assistance, near Friendship Park and along Meeker Slough to the proposed regional park shoreline trail to Point Isabel, thus allowing for almost four miles of continuous trail along San Francisco Bay.

• To the East Bay Regional Park District, up to $250,000 to develop a 1.2-mile **Wildcat Creek Trail** along the flood control channel alignment of Wildcat Creek at the **North Richmond shoreline of San Pablo Bay**, resulting in new access in an underserved area. At the western end of the trail, overlooking Wildcat Marsh, a wheelchair-accessible observation platform will be built and interpretive panels will be installed to help visitors identify plants and animals in the marsh and creek. The Wildcat Creek Trail will provide a safe crossing for pedestrians and bicyclists across the four-lane Richmond Parkway and will be a link in the San Francisco Bay Trail. The trail project grew out of a 30-year effort by community volunteers and public agencies to create an environmentally sensitive flood control project that incorporates recreational elements. Construction is to be completed by September.

• $100,000 for an option to purchase a 160-acre oceanfront parcel known as the **Spring Ranch**, between two noncontiguous segments of Van Damme State Park, near the town of Little River in **Mendocino County**. The Department of Parks and Recreation has long wanted to add this property to Van Damme State Park to preserve its spectacular scenic values and to expand coastal trails. Due to budget constraints, however, the Department is unlikely to be able to acquire this property before late 1994. To preserve the opportunity to buy the land when possible, the Department asked the Coastal Conservancy to acquire an option to purchase. Members of the Spring family are firmly committed to preserving the scenic values of the western portion of the property. Working together with the staffs of the Coastal Conservancy and the Department of Parks and Recreation, they have agreed to a plan that will address their needs while assuring the long-term preservation of most of the ranch as open space. This plan provides for a sale of the western portion of the ranch to the state of California. The Spring family will retain ownership of the eastern 40 acres.

In May, the Conservancy authorized:

• To the **city of Arcata**, Humboldt County, $150,000 to complete the **Arcata Marsh** restoration effort begun 14 years ago with the Coastal Conservancy. The city will use the funds to build a 41-car parking area, benches, a bridge, a boardwalk that will allow guided groups to have access to a pond for educational purposes, as well as interpretive displays and 225 feet of barrier-free trails connecting the parking lot to the proposed Arcata Marsh Interpretive Center, and to

RASA GUSTAITIS

ITT Marsh

Ted Naguchi came out of retirement to manage the restoration of the ITT Marsh for the city of Palo Alto. The restoration project, which uses treated city wastewater, was largely funded by the Coastal Conservancy. It includes an extensive monitoring program. Naguchi expertly guided construction from beginning in fall 1991 to completion in April.

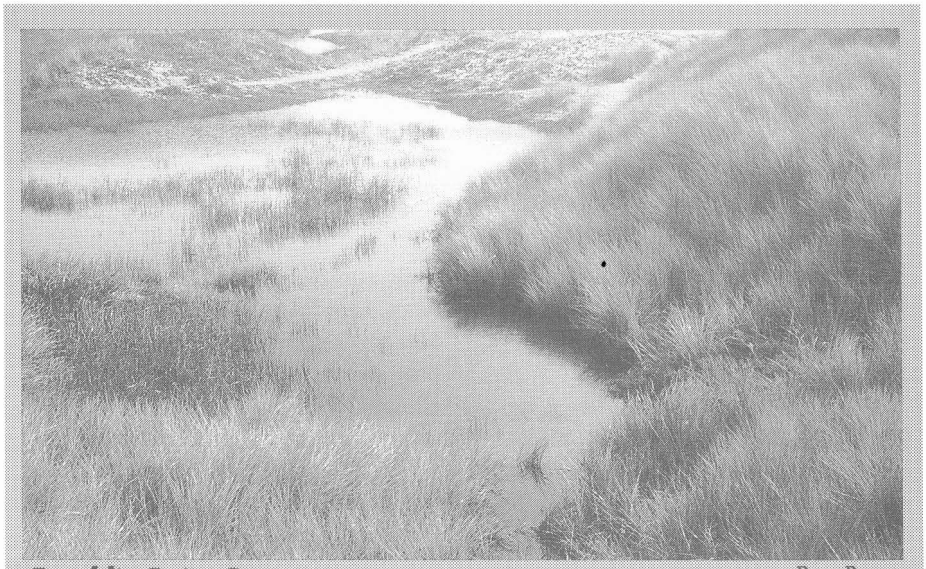
trails around the Arcata Marsh and Wildlife Sanctuary.

• To **Sonoma County,** $400,000 toward the purchase of the 130-acre **Lorenzini Property**, which will link two regional parks, Salt Point State Park and Stillwater Cove County Park, and will fill a mile-and-a-half-long gap in the Coastal Trail. The acquisition of this property will provide a heavily forested wildlife corridor along Stockhoff Creek, which runs between the two parks and is a spawning stream for steelhead. The parks now provide habitat for mountain lion, bobcat, black bear, gray fox, and nesting osprey. The owner had planned to put the land on the market after selectively harvesting the timber if the county had not found funds to buy it. Although current zoning would probably permit just one house, such development would have ruled out the chance of preserving the property for public recreation and wildlife. The Conservancy's funds for this acquisition come from Proposition 70. The county plans to provide $100,000 toward the full purchase price of $500,000, and expects to complete the acquisition by November.

February actions included:

• To the **city of Manhattan Beach,** $365,000 was authorized to complete reconstruction of the **Manhattan Beach Pier,** which attracts hundreds of thousands of visitors each year. The city has spent $1,370,000 beyond the federal funds previously committed to the project because of the costs incurred in removing and replacing the deck and repairing piles and beams. Construction will be completed this July.

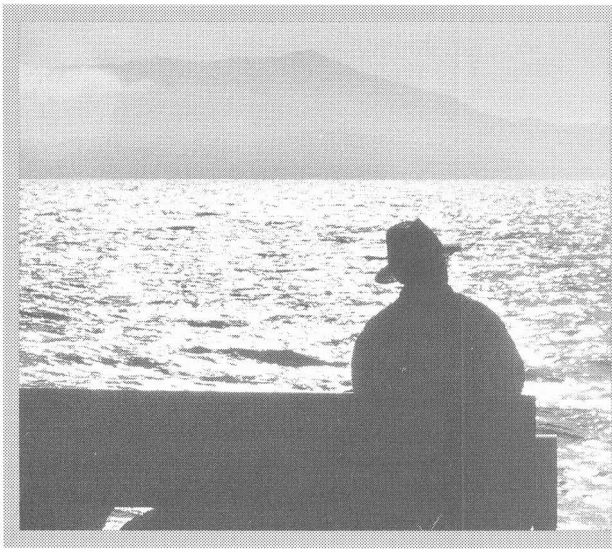
• To the **city of San Diego**, up to $300,000 to use in building a 2,500-foot pedestrian path that will connect the **Ocean Beach Pier**, parking, and other access facilities. The city is contributing $150,000 from a State Parks and Recreation Department grant to the project. In addition, in a cooperative project, the city and the Coastal Conservancy provided a ramp that crosses the sand so wheelchair riders can reach the ocean.



PETER BRAND

Franklin Point Dunes

The Coastal Conservancy has acquired Franklin Point Dunes, 120 acres of prime dune and wetland habitat and almost one mile of wild and scenic beach on the San Mateo coast. The dunes are home to several threatened and endangered species, including the elephant seal. They were acquired with $1.1 million of Proposition 70 funds and will be transferred to the State Department of Parks and Recreation, to be managed as part of Año Nuevo State Reserve.



Berkeley Waterfront

The perimeter shoreline path around Berkeley's North Waterfront Park is now open to the public. This all-weather path accommodates pedestrians, bicyclists, and wheelchair riders. The Conservancy joined with the city of Berkeley to open the path, which offers spectacular views of San Francisco Bay and provides access to an additional 50 acres of open space.

DAVID HAYES

In Other News

Commission Cleans Up

Coastweeks will kick off this year with coastal cleanup day, September 19. Events running through October 12 will focus on promoting awareness of our fragile shorelines and increase participation in efforts to improve our coast. Last year, a record number of volunteers collected 328,850 pounds of trash from California's beaches. For the second year, the California Coastal Commission won an award for its Adopt-A-Beach shoreline cleanup day. The Commission was among 100 winners chosen in the Take Pride in America competition sponsored by the U.S. Department of the Interior. For information or to schedule an event, call the Commission at (415) 904-5214.

The Conservancy will celebrate the successful completion of an eight-year effort to preserve Point Cabrillo in Mendocino on August 22 at the site. All are welcome! Parking is limited. Try to carpool, and be ready to walk a bit.

Conference Log

Our River Heritage

Secretary of Resources Douglas P. Wheeler urged some 400 government officials, planners, and conservation activists gathered at California's River Heritage Conference not to let the government's fiscal straits diminish the power of imagination. "We cannot be constrained in our thinking if we are to have grand plans, and we must have grand plans to protect our resources," he said.

The announced aim of the conference was to "find solutions in the past, common ground in the present, and sound policy for the future" of California's rivers. It was convened by several state and federal agencies and University Extension, University of California, Davis, and held May 18-19 at the Radisson Hotel in Sacramento. It focused on successful projects to protect or restore rivers, river corridors, urban riverfronts, and creeks. These ranged from the creation of the Smith River National Recreation Area, to efforts to "regreen" the Los Angeles River and to create the San Dieguito Regional Open Space Park in San Diego.

Although the nation's rivers are "in worse shape than ever in history," according to Kevin Coyle, executive director of the 20,000-member nonprofit group American Rivers, "there is no state where river issues are more complex or more important, and where there is a better chance to realize a vision" than California. The vision is of healthy river systems flowing from headlands to sea or desert floor, providing for human water needs and habitat needs along the way. As a step toward a "cogent, coherent river policy" aimed toward that vision, Coyle urged that the state government inventory river resources and assess needs. At the close of the conference, Secretary Wheeler assured conference participants that this assessment would be part of his agency's future agenda. (In early July, conference coordinator Nancy Stone said preliminary work for it had already begun.) Earlier, Drew Parkin, rivers program manager for the North Atlantic Region of the National Park Service, told how river and watershed assessments became useful planning and conservation tools in Maine and four Pacific northwestern states.

Laurel Marcus of the State Coastal Conservancy showed how, in the case of the Russian River, river channel degradation "costs all the people along the river a lot of money—so that river restoration is in everyone's interest." Restoration of riparian and aquatic habitat can only be effective if the river is considered as a dynamic system, she said. The extent and causes of changes on the Russian River came to light in the course of geomorphic and hydrologic studies, which, Marcus stressed, are "as important as land acquisition and riparian studies," yet are often omitted in watershed and river corridor assessments. Such studies were part of a $450,000 planning effort for the 100-mile-long Russian River corridor by the Coastal Conservancy, in conjunction with the Mendocino County Water Agency and Circuit Rider Productions Inc. They showed not only severe streambank erosion but also a dramatic drop in both the riverbed and the groundwater level during the past 50 years. These changes resulted from the construction of two large water storage reservoirs, filling of wetlands to create more agricultural land, gravel mining, streambank reinforcement structures, and other activities. Efforts are now underway to contact all landowners along the river to learn the extent of their problems and involve them in restoration projects.

Working with riverside or streamside landowners is essential to the success of restoration projects, several conference speakers agreed. "Creekside landowners make terrific friends and terrible enemies," said Susan Sanders of the Putah Creek Council in Woodland, Solano County. The nonprofit council has been working since 1987 to enhance public awareness of the creek and to protect and restore it. "A key element in our success in defending Putah Creek has been the ability to find and keep allies," she reported. "Befriending creekside landowners, elected officials, and state agencies requires knowledge, tact, and good public relations efforts, and can be achieved with just a few dedicated people and a positive attitude."

The group started with a creek cleanup and some canoe trips. This modest, noncontroversial beginning built a base for the Putah Creek Council among neighbors, without creating enemies. In another session, Pete Dangermond, whose firm, Dangermond & Associates Inc., is preparing a plan for a proposed San Joaquin River Parkway, said that citizens seeking the parkway had first organized to fight against a development. The parkway plan was therefore "on the wrong foot from the beginning with some longtime landowners," he said.

Enlisting creekside landowners to the creek's cause may take considerable patience and persistence, as landscape architect Walter Hood found out during a project to turn Courtney Creek, in Oakland, from a disheveled, trash-strewn, and sometimes dangerous green corridor to a friendly, healthy community green space. "I knocked on hundreds of doors

Continued on page 48.

AQUACULTURE

Heroes of the Half-Shell

For Tomales Bay oyster farmers, clean water pays. Farther south, pollution has forced growers to close down.

by Wesley Marx

For the past 13 years, John Finger and Michael Watchorn have been making a living as oyster growers on Tomales Bay, 25 miles northwest of the Golden Gate Bridge. While the oyster industry elsewhere in the nation and in the state is in serious trouble, they and a few other enterprising growers here have managed to carve out a niche for themselves, largely because the bay's water is clean and its watershed is being protected and restored.

"We started out with one oyster species [Pacific oyster]," said Finger, co-owner of the Hog Island Oyster Co., stopping to talk at the exhibit of his prize products during a major seafood trade convention in Long Beach. "Today we raise three different oysters [Kumamoto, Hog Island Atlantic, and the Euro-Slat or Belon] and are branching out into mussels and clams."

Elsewhere, once abundant coastal shellfish have been devastated by overfishing, development, pollution, and disease. The

RON KUKULKA

National Oceanic and Atmospheric Administration's (NOAA) 1990 *Shellfish Register of Classified Estuarine Waters* describes "an almost inexorable trend that threatens to destroy the harvest of wild or natural shellfish . . . throughout the Nation's coastal areas." The Chesapeake Bay and Gulf of Mexico harvests have so seriously diminished that in 1990 the West Coast outproduced the East for the first time in history. However, most Pacific growers have trouble just maintaining their production at 1988 levels and, according to the NOAA study's co-author, Dorothy Leonard, "the California shellfish industry is struggling for survival." According to the *Register*, "Declines in water quality in Southern California resulting from urbanization have restricted most harvesting in the State to shellfishing areas north of San Francisco Bay."

In that gloomy light, the story of the oyster growers on Tomales Bay is cause for some modest cheer. They have not only survived, some of them are expanding and diversifying.

Finger and Watchorn, the largest of seven small oyster producers on the bay, came here in 1980 to open a shellfish lease on 400 acres for International Shellfish Enterprises of Moss Landing. They were both recent college graduates with degrees in marine biology, Watchorn from the University of California, Santa Cruz, and Finger from Southampton College in Long Island, New York. Both wanted to make a career in aquaculture. "Originally, I wanted to raise striped bass after I graduated," said Finger. "But the only job opening was in oysters." He was not fully delighted by the job assignment: "This can be a windy, cold place in the winter," he said.

Tomales Bay is a 15-mile-long, mile-wide drowned rift valley on the San Andreas Fault, a trough between the Point Reyes Peninsula and undulating hills that are

BRIGGS NISBET

Michael Watchorn and John Finger, founders of Hog Island Oyster Co. on Tomales Bay, market their delicious product to restaurants and lucky passers-by.

mostly used for grazing dairy cattle. Because the bay opens to the ocean, into the prevailing winds from the northwest, it has never been attractive to recreational boaters. Partly for this reason, its shoreline has only two small marinas. This is fortunate for the shellfish growers: Large-scale marina development has adversely affected more than a quarter of the sensitive waters in half the shellfish-producing states, according to NOAA. Oysters have been grown commercially on the bay since late in the last century, especially after pollution closed down shellfish harvesting in San Francisco Bay some 50 years ago.

A Half-Shell Hero

Williams Shellfish Farms, run by Katherine Williams and family, is the sole oyster grower left on Morro Bay.

PHOTOS: WESLEY MARX

The International Shellfish Enterprises venture turned out to be a fiasco. "I think they were thinking in terms of an oyster empire with a fast payoff," said Finger. "They went after big tideland leases and expensive, high-tech equipment. They forgot that they were dealing with a farm, not a factory." In 1982, the company went out of business, abandoning its leases.

Watchorn and Finger, however, were convinced they could succeed if they started out small and simple. One of the country's biggest seafood markets was only an hour's drive away. More importantly, local residents were committed to resource protection. They had prevailed against urban development pressures, had actively protected dairy ranching, and were working to restore damaged riparian habitat and protect the bay against pollution. All this was cause for guarded optimism for the local shellfish industry's future.

So, in late 1982, the partners founded their own firm, naming it the Hog Island Oyster Co., after the only island in Tomales Bay, and started with a five-acre, 25-year lease. They bought a yellow frame house, formerly a general store, in the shoreline hamlet of Marshall. They hoped eventually to open a restaurant that would serve oysters, gathered outside their back door.

Risky Business

How oyster growers do in a particular year depends in large part on circumstances beyond their control. As much—or even more—than farmers' fortunes depend on the weather, those of shellfishers' depend on water quality. "Water quality poses the greatest problem for shellfish growers," states the California State Lands Commission's 1991 *California Comprehensive Offshore Resource Study.*

The source of the pollution may be municipal or industrial effluent, urban and agricultural runoff, faulty septic systems, or spills of various kinds. Natural algae blooms sometimes produce biotoxins. Whatever the cause, closures can mean financial disaster to growers.

Whenever bacterial, chemical, or trace metal pollution exceeds guidelines developed by the National Shellfish Sanitation Program, the State Department of Health Services forbids harvesting and imposes quarantines. The Department of Health Services regulates growers, while the State Water Resources Control Board and its regional water quality control boards are responsible for regulating dischargers impacting shellfish-growing waters.

The federal-state National Shellfish Sanitation Program regulates not only harvesting but also processing and shipping of bivalve molluscs: oysters, mussels, clams, and scallops. It was established in 1925 after outbreaks of cholera and typhoid were traced to contaminated shellfish.

Health standards for oysters have to be more stringent than they are for finfish because bivalve molluscs are filter feeders. They pump prodigious amounts of water through their gills to secure their diet of tiny marine plants (phytoplankton) and other

organic particles. In the process, they also absorb bacteria, viruses, trace heavy metals and other contaminants, which can build up in an oyster at levels 20 times higher than those measured in surrounding water. Cooking can remove bacteria (though it is not a guarantee against viruses and does not affect trace metals). But many people enjoy the slippery oyster meat live, intestinal tract and all, on the half-shell, washed down by the oyster "liquor" that remains pooled in the empty shell. (To one 19th century gourmet, to cook an oyster was to commit "treason to gastronomy.")

Oysters consumed on the half-shell in the West have traditionally been Eastern oysters, grown naturally on the Atlantic and Gulf coasts. Oyster growers on the West Coast have traditionally produced Pacific oysters (known as Japanese oysters until World War II) for the high-volume, lower-priced "shucked" market, to be sold packed in jars. Because these nonindigenous oysters will not reproduce in these cold coastal waters, they are cultivated in hatcheries, then planted by growers near the shore. The native Olympia oyster has long been scarce because of overharvesting and destruction of its habitat.

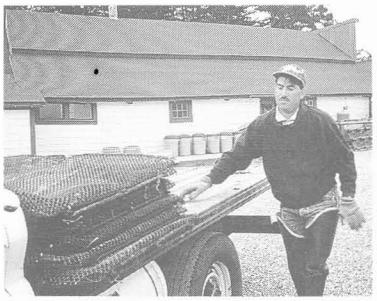
To raise oysters for shucking, "you just drop a clump of oyster seed, attached to empty shells, into the intertidal zone. Eighteen months later, you come back to harvest your crop," said Finger. For the half-shell trade the oyster must have a uniform shell free of barnacles and other fouling agents. That means you must grow them singly rather than in clumps, and it means more work but a higher price for the product.

Cold, Hard Work

Finger and Watchorn decided to venture into the half-shell trade, undeterred by the knowledge that no Pacific grower who had tried to raise it as the principal product had succeeded. "We put our seed in plastic mesh bags to protect them from starfish, rays and other predators," said Watchorn, who had just come in from inspecting the crop. "We set the bags on platforms made of iron rebar two feet off the bay bottom. At low tide, when the bags are exposed, we check and shake them so the oysters don't clump together or stick to the platform. We may also shift the bags around to different growing areas." This constant care has led to the survival of 80 to 90 percent of the young oysters planted—very good, by industry standards.

Between shaking these bags in the cold wind and trying to convince restaurant chefs that their cultivated Pacific oysters were as good as the Eastern oyster, the pair put in some long days. But the hard work has paid off. Hog Island, with 1.5 million oysters a year, is putting 60 more acres into production, expanding into clams and mussels, and also considering whether to start raising the native Olympia oyster. "There are still some natives left in the bay and their seed will occasionally set on our own oysters," said Finger. Other growers on the bay have also moved on from the shuck trade, and Tomales Bay has become the state leader in single oyster production, with over 2.5 million produced in 1990, reports Bob Hulbrock, aquaculture coordinator for the California Department of Fish and Game.

The annual Tomales Bay harvest of 230,000 pounds is modest compared to the harvests from Humboldt Bay and Drakes Estero. It is only 13 percent of California's total 1.6-million-pound, $4.7-million-a-year harvest. Most of the state's oysters are raised on Humboldt Bay and Drake's Estero. There



BRIGGS NISBET

BRIGGS NISBET

RON KUKULKA

John Finger carefully tends the oyster crop. Hog Island Oyster produces 1.5 million oysters annually.

continue to be minor harvests in the Santa Barbara Channel and on Morro Bay. But because Tomales Bay produces for the half-shell trade, its harvest is worth nearly $1 million a year.

The state also shares in this oyster prosperity. Growers pay an annual rent for shellfish leases on state tidal and submerged lands and an annual tax on shellfish production. "In 1991, California received some $30,000 in revenue from the Tomales growers," said Hulbrock. The highest bid for a state shellfish lease—$150 per acre in annual rent for an 11-acre site—was recorded in Tomales Bay in 1988, according to Hulbrock.

A Half-Shell Hero

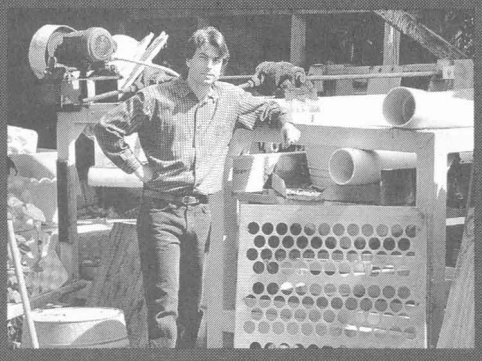


Photo: Wesley Marx

Water pollution forced Jeff Young to close his oyster farm in the Santa Barbara Channel. He is now suing the city of Santa Barbara and the Goleta Sanitary District.

Cows and Oysters

Only because local residents have successfully worked to protect and restore their watershed is the Tomales Bay shellfish industry alive and well today. The 223-square-mile watershed drains into one of the least despoiled major coastal bays in California, but that hardly means it is pristine. Two hundred years ago, what is now grazing land was a mixture of native bunch grasses, oak savannah, and forest, with mixed evergreens and redwoods in the valleys and on north-facing slopes. Stream banks were shaded by willows, alder, and maple. From the steep slopes and ridgetops, oak woodlands extended inland.

In the early 1800s, the Spanish introduced cattle, and in the 1860s dairy farms appeared. The native perennial bunch grasses held moisture year-round and provided fresh tasty food to cows during most of the year. These grasses were, however, displaced by introduced annual grasses here as elsewhere in California. Cattle grazing and tromping caused stream banks and slopes to erode.

Logging, poorly cut roads, and residential development accelerated soil erosion in the watershed. Landslides denuded steep slopes, and high volumes of river-borne sediment flowed into the bay and accumulated at the mouths of creeks. The bay began to shrink. Shellfish beds were increasingly smothered.

By the 1960s, plans for a new freeway from San Rafael to Point Reyes Station threatened not only aquaculture but also dairy ranching on Tomales Bay. In 1980, the prospect of dense development was eliminated by the creation of an agricultural zoning district permitting only one house per 60 acres. But that was not enough to protect dairy ranches: It still permitted ranchettes that could splinter the larger holdings essential to dairying. Then, an unusual coalition of local interests developed to fight urban encroachment and preserve dairy ranching. The nonprofit Marin Agricultural Land Trust was formed and began to acquire conservation easements on farmland. Today, two-thirds of the Tomales Bay watershed remains in agricultural use. There are more cows (20,000) than people (11,000) (see *Coast & Ocean*, Fall 1990, p. 9).

In 1982, the State Coastal Conservancy, together with the Marin County Resource Conservation District (RCD), other resource agencies, the nonprofit Inverness Foundation, and the Audubon Canyon Ranch, launched a watershed restoration program. The first round of repairs began after the 1983 floods and included restoration of five creeks near Inverness, large erosion sites in the Lagunitas Creek drainage, and repair of the Livermore and Olema marshes. Next, the Conservancy provided $1 million to fund a six-year effort to restore the Walker Creek watershed. Stream banks trampled by cattle were fenced and replanted with willow and alder. Large erosion gullies were regraded and plugged with check dams. Old dirt roads were regraded and repaired. The Marin County RCD helped ranchers shift to practices that reduce erosion and prevent waste from cows from flowing into the bay. Some ranchers began to experiment with planting native perennial bunch grasses.

Much more needs to be done, however, because damage caused by past land use practices is hard to repair. In 1990, the Marin

County RCD reported that "the [Walker Creek] delta has now reached the oceanic zone where it could have a great effect on the water circulation and the flushing action of the bay."

A modest rainfall can send coliform bacteria counts in the bay zooming, directly affecting oyster beds and the growers. Whenever a half inch of rain falls in the watershed, shellfish harvesting is shut down. It cannot begin until after four to five rainless days have passed. "We were shut down for a month because of late winter rains in 1991," said Finger. The Tomales Bay growers are anxious for the State Department of Health to conduct a comprehensive sanitary survey of the bay to pinpoint pollution sources better. The last such survey was done ten years ago.

In addition, a wastewater project outside the watershed now worries oyster growers. The city of Santa Rosa is considering a plan to pipe tertiary treated wastewater westward, to irrigate pasture in the Estero Americano and Estero de San Antonio watersheds, directly north of the mouth of Tomales Bay. Though treatment would remove harmful bacteria, the wastewater would still contain heavy metals, including zinc, copper, and lead. Finger fears that runoff will transport the toxic metals into the nearshore circulation system, where they would accumulate in his oysters. He chairs the local Environmental Action Committee, which is fighting the Santa Rosa waste disposal plan.

Cautionary Tales

Clean water is the bottom line for any shellfish operation as growers to the south can testify from bitter experience. Morro Bay was a leading producer until the mid-1980s, when the shellfish industry there collapsed almost completely because of pollution. A dye tracing study by the U.S. Food and Drug Administration found that the city of Morro Bay's sewage, which is discharged into the ocean, was being carried into the bay on the incoming tide, contributing to high bacteria counts. The Environmental Protection Agency had granted the city a waiver to provide less than secondary

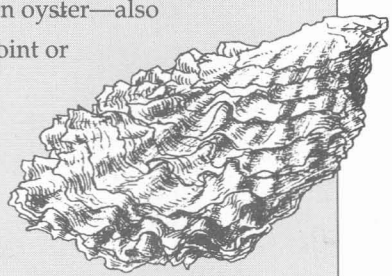
Bon Appétit!

"There are three kinds of oyster-eaters: those loose-minded sports who will eat anything, hot, cold, thin, thick, dead or alive, as long as it is *oyster*; those who will eat them raw and only raw; and those who with equal severity will eat them cooked and no way other."

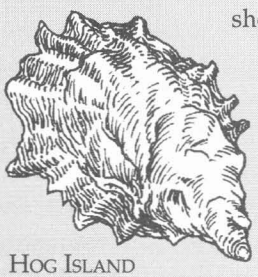
—M.F.K. Fisher, *Consider the Oyster*, 1941

For seafood aficionados, there's nothing quite like the taste of a cool, raw oyster slipping across the palate. In California, the hefty Pacific oyster is a favorite—on the barbecue as well as on the half-shell—but four other species of mouthwatering mollusks are likely to be found on the menu of your local oyster bar.

The Eastern oyster—also called Blue Point or Cape Cod, Apalachicola, Chesapeake or wherever its region of origin—is native to the Atlantic coast and the Gulf of Mexico, but is also grown on the Pacific coast. Sweet and mild-flavored, it is a favorite for the half-shell market.



Hog Island Sweetwater



Hog Island Kumamoto

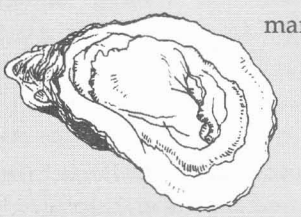
The small Olympia, native to the West Coast, is touted by Euell Gibbons as ". . . the finest flavored oyster of them all." It is a slow-growing species, difficult to cultivate, a taste treat for the dedicated tide pool comber from Alaska to Cabo San Lucas.

The Kumamoto, closely related to the Pacific oyster, is highly regarded by half-shell enthusiasts, particularly since it does not become soft and watery during the summer as do some of its cousins.

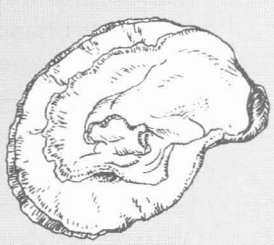
Olympia

The Belon, native to France, has a distinctive, slightly metallic flavor that is ideal for eating raw. Like many things of quality and character, it is loved by some and hated by others.

—Briggs Nisbet and Dick Wayman

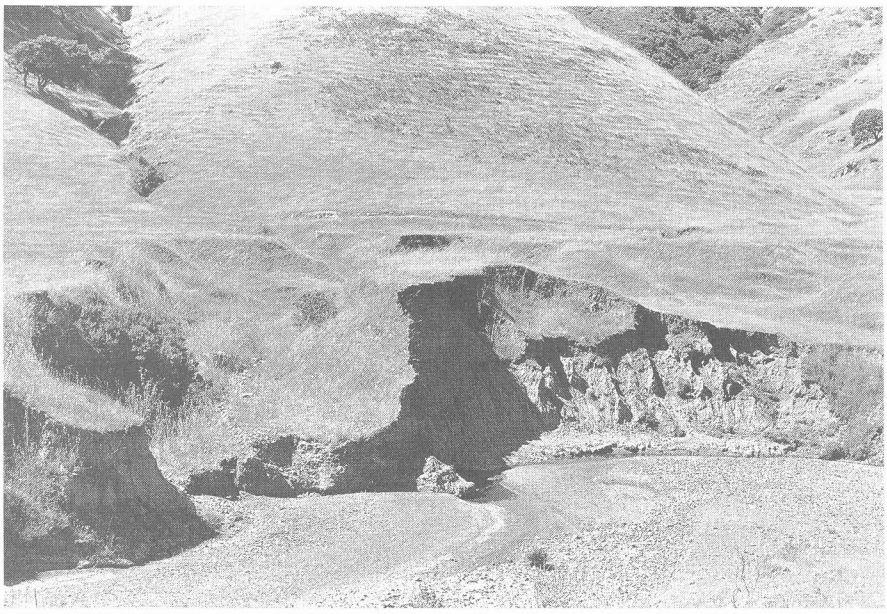


Hog Island Atlantic

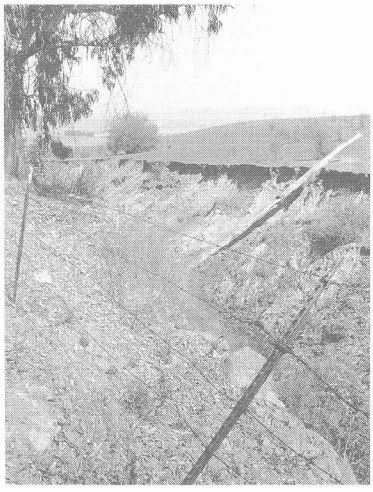


Drawings by Lee Adair

treatment. In 1986, after the city began to chlorinate its sewage in response to an EPA order, bay water quality improved somewhat. Major nonpoint source pollution problems persist, however. The bay is now the focus of a joint effort by the Coastal Commission and the Water Resources Control Board to improve control of such pollution.



PETER GRENELL



PETER GRENELL

Soil erosion in the Tomales Bay watershed threatens the bay's water quality, although residents have taken steps to curtail the damage.

Today, the sole remaining oyster grower on Morro Bay, Williams Shellfish Farms, operated by Willie and Katherine Williams, produces about a million oysters a year for the half-shell trade. Mrs. Williams sells them at a weekly farmers' market in Long Beach.

Farther south, Jeff Young, a graduate in marine biology from Humboldt State University, thought he had found a way to escape nearshore pollution. He set out to grow oysters further offshore in the open waters of the Santa Barbara Channel, using the "long-line" method. This method, developed in Japan, uses "lantern" baskets suspended from buoy-supported ropes, which Young tends using scuba equipment. But three years after he started growing—and just as he was breaking into the restaurant market, he said—the State Department of Health Services shut down his harvest after high coliform counts were found in his oysters.

The source of the bacteria is still in dispute. Young has filed suit against the city of Santa Barbara and the Goleta Sanitary District four miles to the north, charging that their combined discharges into the ocean caused the pollution. Santa Barbara's sewage undergoes secondary treatment. Goleta has a waiver from the EPA to provide treatment at a lower level than that. The two municipal dischargers blamed defecating seabirds and storm runoff. The high counts persisted during dry weather and at water depths of 40 feet, according to Pat Wells, sanitary engineer at the State Department of Health Services.

In 1986, the EPA ordered Goleta to upgrade its submarine discharge, and the Regional Water Quality Control Board directed Santa Barbara to disinfect its discharge. Both complied, and the coliform counts dropped below levels requiring closure of oyster harvesting, according to Wells and NOAA. Young said that if he succeeds in winning his claim for $700,000 in alleged damages from the extended closure, he plans to restart his operation. To assure himself of a livelihood, however, he is also studying law.

Still farther south, in Agua Hedionda Lagoon, in Carlsbad, similar pollution problems shut down the five-year-old business of Richard Glenn, a marine scientist, who was the state's leading producer of farmed mussels. He grew some 140,000 pounds a year and sold them to Italian restaurants as far away as Chicago. But in 1990, after high coliform counts closed his harvest, he decided to move to bluer pastures: Baja California. "Carlsbad, as part of a local permit, wanted me to stipulate that I would not hold the city or a local sewage disposal plant responsible for any pollution damages to my mussels," Glenn said.

Today Glenn is part owner of a 250-acre mussel farm in Todos Santos Bay. He still must comply with standards of the National Shellfish Sanitation Program. To export shellfish to the United States, Mexico has agreed to abide by these standards. "Monitoring tests by myself and the government have found no bacterial problems," Glenn said. Even here, however, the future is uncertain. Seven miles to the north of his growing area lies the fast-growing bayfront city of Ensenada. While the city sewage treatment plant provides secondary treatment with

United States Lags in Marine Aquaculture

Farming of shellfish, marine finfish, crustaceans, and seaweed is a rapidly growing industry in many countries, as is ocean ranching of anadromous fish. In the United States, however, marine aquaculture is still struggling to become established. According to a report by a National Research Council committee, the United States accounts for only two percent of the world's production, in both dollars and volume, and of that, 80 percent is oysters, a declining industry.

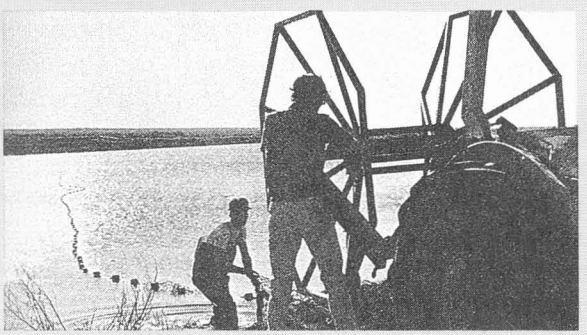
By neglecting to develop marine aquaculture, the United States is foregoing opportunities to create new jobs, improve the trade balance, provide a reliable source of seafood and augment threatened fish species, according to the report, *Marine Aquaculture: Opportunities for Growth*, published in May.

With wild stocks dwindling and seafood consumption increasing, the United States has remained dependent on imports for 64.7 percent (1986) to 43.3 percent (1990) of edible supplies during the past decade. Freshwater fish farming has expanded, but marine aquaculture has been held back by several constraints. These include difficulties and costs of using coastal and ocean space, conflicts with other users of the coastal zone, public concerns about environmental and aesthetic impacts, poor water quality, and high labor costs, reported the council's Committee on Assessment of Technology and Opportunities for Marine Aquaculture in the United States, chaired by Robert B. Fridley, executive associate dean of the University of California, Davis. The National Research Council is the principal operating agency of the National Academies of Sciences and Engineering.

These issues can be resolved with support from the federal government, the type of support the government has given to land-based agriculture, the committee states. It recommended that Congress commit $12 million to research and develop technology, address environmental issues, and provide economical systems for marine aquaculture; and that the Department of Agriculture take the lead in promoting this industry. Although the National Aquaculture Act of 1980 declared that marine aquaculture was in the national interest and authorized funding, no funds have been appropriated.

Investing federal funds in developing marine aquaculture would soon pay off economically, Fridley observed. Worldwide seafood consumption has quadrupled since 1950, while the human population has doubled. In the United States, consumer demand has grown not only with population but per capita as well, stimulated by health concerns and immigration of cultural groups from Southeast Asia. The increased demand comes at a time when "virtually all of the established major world fisheries and most of the recently discovered and exploited resources are already fished at, if not beyond, their limit of sustainable yield," according to the report. Marine aquaculture could meet the growing demand while providing year-round jobs "that maintain links to traditional life styles" in coastal communities where traditional fishing is in decline.

By neglecting this industry, the United States is foregoing opportunities to create new jobs, improve the trade balance, provide a reliable source of seafood and augment threatened fish species.

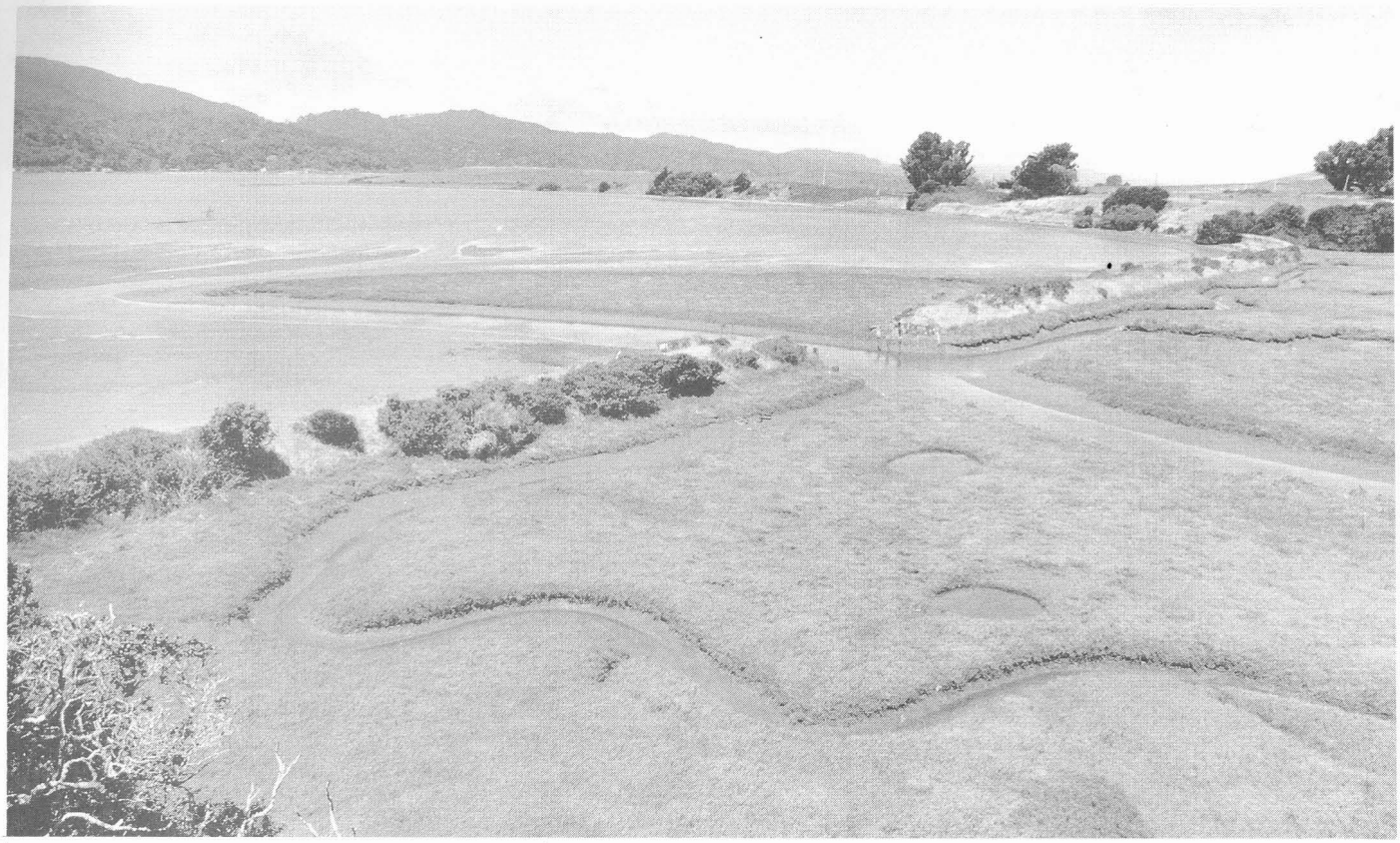


Reel and seine used to harvest fish from earthen ponds.

Photo Courtesy of the National Research Council

Oyster culture is the oldest form of marine aquaculture in the United States. Clam farming is a new but growing industry on the Atlantic coast and in the state of Washington. Abalone farming is being attempted in Hawaii and California (see next issue of *C&O*). "The American lobster defies commercial cultivation because its aggressive nature makes it necessary to grow each lobster separately," the report states. Among finfish, striped bass, sturgeon, halibut, swordfish, and shark have been considered for commercial cultivation. Seaweeds offer promise. They are grown commercially in several Asian countries, both for human food and extraction of polysaccharides agar, algenic acid, and carrageenan used in a variety of foods and pharmaceuticals. More than $50 million worth of nori seaweed is imported from Japan each year.

The report concluded that "a number of benefits will accrue to the nation from the addition of an economically vital, technologically advanced, and environmentally sensitive marine aquaculture industry." For this industry to grow and be healthy, however, it must have federal support for developing "an advanced scientific and engineering base, along with a reasonable and predictable regulatory framework." —*R.G.*



RON KUKULKA

Oysters have been grown commercially on Tomales Bay since late in the last century, long after pollution extinguished shellfish harvesting in San Francisco Bay.

disinfection, many dwellings and other structures in the area are not hooked to the system. Runoff from unsewered areas has required some local beach closures.

The current holder of Glenn's former lease in Carlsbad has received a permit from the Department of Health Services to harvest mussels on condition that he transfers the crop to tanks for controlled purification (depuration) in purified salt water for 48 hours. State aquaculture coordinator Hulbrock points out that "depuration is a significant added cost for the grower and, ultimately, the consumer." The victim of the pollution, not the polluter, bears the burden. On Tomales Bay, Finger said, "I'd rather concentrate on cleaning up and maintaining water quality."

The World In An Oyster

With population pressures rapidly growing, how long can Tomales Bay oyster growers hope to thrive? Between 1960 and 2010, the number of people living on the nation's coastlines will have increased by almost 60 percent, from 80 million to over 127 million, according to NOAA. The fate of shellfish growers to the south, such as Jeff Young and Richard Glenn, demonstrates the susceptibility of the industry to environmental quality. Whether Tomales Bay or Agua Hedionda Lagoon is the harbinger of California's shellfish future remains to be seen.

Much more than the shellfish industry is at stake. "Shellfish serve as the nation's first line of defense in safeguarding our water quality," NOAA's Dorothy Leonard said. "You know you're losing the quality of your water, and your quality of life along the coast, when you start to shut down your shellfish waters." ❐

Wesley Marx is author of The Frail Ocean: A Blueprint for Change in the 1990s and Beyond, *(1991, The Globe Pequot Press) first published in 1967. His other books include* The Oceans: Our Last Resource, *and* Acts of God, Acts of Man. *He served on a National Research Council panel on marine monitoring.*

by Andrew Lam

Ghosts of the Pacific Ocean

Ever since our exodus flight from Vietnam, it has not been easy, I don't think, for many of us Vietnamese to love the Pacific Ocean. Since the first wave of boat people started in 1979, the ocean, together with all things affiliated with it, has become a symbol of sadness and departure in our collective consciousness. The beach, the sounds of the waves and the stench of the sea, all these remind us too much of the horror we have suffered to set foot on the American shore.

"For every boat person who survives," Vietnamese shake their heads and remind one another, "there is another boat person who drowns."

I know some Vietnamese who go to the beach now but they don't go to enjoy so much as to mourn. An old woman I know throws jasmine flowers into the waves at the death anniversary of her children who drowned. Another man, a family friend, goes to the ocean on the eve of April 30, the day South Vietnam was defeated. He stares toward the horizon in the direction of our homeland, then cries. It's the only time he goes to the ocean each year, he says.

Me, I used to love the ocean as a child. The pristine sand and the coconut palms and the warm sea breeze form the best part of my childhood memories. But that was Vietnam, that was when I never thought I would grow up and become American, a member of a minority. My sense of the ocean and coast is different from what I experience of the Californian beach.

Yes, I do go to the beach sometimes, but no, I do not feel at home there. I feel like a foreigner on it, in fact. The American emphasis on the body and the muscle is so strong that it makes me feel self-conscious and awkward. I do not have this problem when I go to the beach back in Vietnam or Thailand. Nobody stares at me there. Here, it is as if you are not qualified to be on the beach if you do not have blond hair and stomach muscles.

If you watch "Bay Watch," a popular TV show about the dynamics at a southern California beach, where do you see an Asian face? The beach is blond and tanned, or so Hollywood would like you to believe, while the Asian character, if he ever is seen, is portrayed as a vicious gang member or a heavily accented waiter working in Little Saigon.

So how can a Vietnamese in America learn to love the ocean and the coast on this side of the Pacific, you ask? I really don't know. Older generations are too busy working and/or are too poor to concern themselves with something as extravagant as the coastline. For the 17 years my parents have lived in California, only 12 miles from the beach, they have been to it maybe twice. After all, what can a community whose 60 percent still live under the poverty line do to protect a coastline while they still struggle to pay rent in the inner cities? Honestly, I don't think we think much about the coastline as we worry about the high crime rate and the growing racial violence that to us have become a more immediate environmental concern.

And yet, deep down, I think it is also a matter of identity that will make a person want to preserve and protect the land he lives on. Many Vietnamese adults think that they are Vietnamese living in America, see themselves as refugees and not as Americans, and to them environmental matters are seen simply as native-borns' concern.

As a friend of mine says: "Most environmentalists are white and in some way anti-immigrant. It is hard to imagine a Vietnamese or Chinese immigrant working side-by-side to save the environment with a bunch of people who perceive us as part of the problem."

The younger generation of Vietnamese, void of the memories of the exodus flight, is more likely to love the coast. More rooted in American soil, they may see the coast as beautiful and seductive without the implication of sorrows. But they must feel welcome in America before they join the green movement.

Andrew Lam is associate editor of Pacific News Service.

Who Will Mind Our Riches?

California's paltry investment in environmental education threatens our coast and other resources.

by Rasa Gustaitis and Regina McGrath

A sixth grader assigned to write an essay on whether she wanted to be immortal explained why she did not. "I would not want to see people chop down the very last redwood tree. I would not want to hear that whop and that swish of the tree falling to its bearial (sic) ground. I wouldn't want to see the world come to an end."

An adult reading such an essay is shocked and pained. It tears at the illusion of childish innocence. But this 12-year-old girl was expressing a feeling that many, if not most, children and young people share. Having watched endless documentaries about endangered species and various kinds of pollution, and heard uncounted admonitions about the need to "save" various creatures and even the entire Earth, many children and young people are overwhelmed by a sense of impending destruction.

This bleak feeling will usually dissipate during a walk through a forest, a day with a fishing reel, a moment spent on a sea cliff, smelling the sage, watching brown pelicans glide past like dinosaur birds returned from extinction. Direct experience of nature is one proven antidote to futuristic nightmares. It will almost inevitably replace despair with wonder and a sense of belonging.

DRAWING: KAREN EZEKIEL

Isolation from nature, and the apocalyptic outlook prevalent among the young will shape the future of our natural resources unless a different vision takes hold. In recognition of this probability, some innovative environmental education efforts have sprung up in California schools.

But as more and more of the state's growing population lives in cities, suburban developments, and edge cities from which they commute to workplaces and recreational sites linked by freeways, direct experience of nature is harder to come by. It also appears to be becoming less popular. Many young people prefer to work out in a gym rather than engage in some outdoor sport or activity. They will spend a half hour on a treadmill instead of taking a long walk, use a rowing machine rather than a row boat. It's quicker and more convenient, it's more comfortable to those who shun open spaces in fear of crime, and it's a trend. Even rock climbing can now be done in physical fitness centers, on specially built walls.

This isolation from nature, and the apocalyptic outlook prevalent among the young will shape the future of our natural resources unless a different vision takes hold. In recognition of this probability, some innovative environmental education efforts have sprung up in California schools. They range from one-day field trips to yearlong curricula, to work-study programs, and schools-within-schools. Many are cooperative efforts by resource agencies, research institutes, foundations, and conservation groups, sometimes drawing support from corporations. These efforts share three major goals: to provide direct experience of natural environments, to educate about the interdependence of personal well-being and natural systems, and to empower young people to become effective decision-makers on major environmental issues they will confront as adults. Most of these efforts also seek to introduce students to environmental career opportunities.

Perhaps the most far-reaching and comprehensive among recently launched programs is the U.S. Forest Service's Commencement 2000. It aims to develop environmental professionals among ethnic minorities and women, and thus enable the Forest Service to recruit a staff that reflects the state's changing demographic profile. The program begins in elementary school, and continues through high school and into college, with the prospect of employment always a focus. It provides mentor relationships for teachers and students with wildlife biologists, civil engineers, archeologists, hydrologists, and others among the Forest Service's environmental professionals. It takes students and teachers on week-long trips into national forests, helps with college preparation, and provides work-study opportunities. (See page 32.)

As the word "minority" ceases to have meaning in a state where no ethnic majority exists, the Forest Service is creating a model that is sure to be valuable to other resource agencies. The reasoning that led to the inception of its program is outlined in a Commencement 2000 document:

"Concern has been expressed by forward-thinking individuals in natural resource agencies and mainstream environmental organizations who see the demographic and subsequent political shifts away from rural centers of power to urban people of color constituencies. The concern is not that a shift is occurring but that these constituencies are generally uninformed and unconcerned about wilderness and conservation issues. They are more concerned with inner city environmental and social justice issues and frequently do not make the connections between urban problems and natural resources held in public trust for the benefit of all . . . The lack of involvement of people of color must be addressed if natural resource and environmental policies are to benefit society as a whole."

In keeping with that line of thinking, other resource agencies and many conservation groups have expanded their role in the schools. In coastal watersheds, students help to restore creeks and raise anadromous fish to be released into them, in cooperation with the Department of Fish and Game, anglers' groups, and local organizations. In national estuarine reserves, marine sanctuaries, and wildlife reserves, workshops for teachers are offered, along with guided field trips and related classroom study materials. Although most schools no longer provide transportation for field trips, some elementary schools manage to pay for buses by sending children out to sell candy and other fundraising.

"It takes a lot to get kids away from the

manufactured environment," said Nancy Helsley of the Mountains Restoration Trust. "But unless we have people who care about these things and have some investment, nobody will care if a motorcycle racetrack is put into a state park one day." The nonprofit trust, created by the Coastal Conservancy, has been engaged in environmental education for almost ten years. Last year, its trained docents led 1,700 children on study trips in the Santa Monica Mountains. Schools and youth groups will take part in a new program to restore valley oak savannah in Cold Creek State Park.

The Audubon Society's Los Angeles education program is extensive. It works to help young people take an active interest in the natural world by enhancing the teaching of science in elementary schools. Its *Audubon Adventures*, a four-page newspaper on timely topics, in English and Spanish, goes to 17,000 students, along with a teachers' guide. Recent issues describe sea turtle life cycles and bird migration patterns, and issues related to these. The society offers a field study program to the Ballona Wetlands, providing teachers' workshops and trained docents to lead students on two-hour trips to investigate bird and animal life of the marsh and learn about the value of wetlands to wildlife. Because the trips would be impossible for many of the schools if they had to provide transportation, the Audubon Society has secured some outside funding for buses. It is expanding its bilingual program in partnership with the Los Angeles Unified School District.

In some schools, children study their drinking water and compare results with those from other schools in the United States and Canada, with whom they communicate by electronic mail as part of the National Geographic Society's Kids Network program. (See page 26.) Schools participating in the MARE program devote a year to ocean studies, which culminates in Ocean Week. (See page 23.)

"In-school environmental education programs are a highly leverageable investment in the future," a foundation president commented recently in a newsletter for grantmakers. He pointed out that such programs not only build an informed citizenry for the future, they pay off in the present because "kids take those lessons home to their parents and thus, such programs can be the basis of broader changes in community behavior." Without such programs, efforts to restore urban wetlands, urban stream corridors, and other fragile habitats are sure to be undermined.

Hit or Miss

Yet only a minority of the almost 5 million students in the state's public schools benefit from the abundant possibilities available, especially along the coast. Those that do are "shining jewels or beads," a teacher has commented, but "we need some string." They are islands in search of a continent, said another teacher.

California has invested little at the state level to assure that all children receive a solid education about the natural resources that, as citizens, they will inherit. Nobody at the State Department of Education evaluates what the state's 4.8 million schoolchildren learn in this area. No full-time staff is assigned to coordinate or develop information or plan statewide. The sole person assigned to environmental education, consultant Bill Andrews, divides his time between administering the Environmental Education License Plate Grant Program (EELP) and working with the department's science safety and science curriculum units. The EELP program is the state's only funding program for environmental education. Last year it awarded 52 grants totalling $804,000 for projects. The state has 4,867 elementary schools, 136 junior high or middle schools, and 802 high schools. The limitations are obvious.

To be sure, many states do less than California. But some are significantly more cognizant of the "highly leverageable investment." Wisconsin's legislature has provided funding to make sure the mandated environmental education occurs. In Maryland, the state board of education mandated four years ago that programs be designed "to enable students to make decisions and take actions that create and maintain optimal relationships between themselves and the

environment, and to preserve and protect the unique natural resources of Maryland, particularly those of the Chesapeake Bay and its watershed." The Maryland board acted after schools had assessed what students knew about environmental issues and found that many felt that "things were getting worse and are out of control," as a state education official said. Maryland funded a major outdoor education program about the Chesapeake Bay as part of a state and federal effort to improve bay water quality.

Nothing of that sort is on the boards for California, where public education is increasingly weakened by state budget cuts and increasingly being abandoned by urban middle-class families that can afford to send their children to private schools. Lack of state leadership, coordination, and funding for such basic services as buses for field trips puts many opportunities for learning about the natural world out of most students' reach.

Lack of state leadership, coordination, and funding for such basic services as buses for field trips puts many opportunities for learning about the natural world out of most students' reach.

The Way It Works Here

California is, however, making an effort. There have been pilot tests with a more ecological approach in the California Assessment Program, which tests what children learn at various grade levels. Though environmental education—a somewhat nebulous concept—occurs within many disciplines, including social studies, history, and art, it is mostly part of the sciences. According to Andrews, the current (1990) science framework is less sharply divided among different sciences and natural systems than the 1988 version.

The state frameworks guide schools in developing or adopting specific curricula, from which teachers prepare lesson plans. Popular curricula that focus directly on environmental studies also include: Project Wild, (and a variant, Aquatic Wild) an interdisciplinary program that provides activities focused on wildlife and responsible human actions, available from the Department of Fish and Game; Project Learning Tree, available from the State Department of Forestry; and MARE (Marine Activities, Resources and Education), developed by the people who developed Project Ocean for the Oceanic Society before it became the Ocean Alliance and sold rights to the program. A new state-sponsored elementary school curriculum, "A Child's Place in the Environment," is being developed with EELP funds at the Lake County Department of Education by Olga Kleimar. It will require children to work in a laboratory, test their own hypotheses, draw, diagram, and assemble a portfolio.

More than a fifth of the middle and high schools in the state participate in the Scope, Sequence and Coordination Project, designed by the National Science Teachers Association to make science understandable and enjoyable for all students. It began in 1989 in this state with a three-year grant from the National Science Foundation and is expected to continue even if the grant is not extended. The program includes hands-on science of the kind that enhances environmental literacy. It comes with the recommendation that students experience the natural world directly before learning terms, symbols, and equations.

An effective curriculum responds to the special needs of students who use it. In California schools, and elsewhere, this means that cultural diversity is considered. "The overarching challenge of environmental education is to create not a single American identity, which education in general has often sought to do, but at least to engender a common loyalty to and identification with this landscape we all call home," commented Running Grass, founder of the Three Circles Center and a leader in promoting multicultural environmental education.

One program seeking to do so is Community Connections, developed at the Oakland Museum by Sandy Bredt. It tries to link social and natural systems by, for instance, showing that what endangers other animals also endangers people, and by exploring the concept of niche from the perspective of students within families and life forms in an ecosystem. In other programs, students study water in their taps and nearby streams, and trace it through the watershed and water cycle.

Today teachers must take care not to frighten and discourage children with too much dismal information. For this reason,

some teachers are firmly opposed to teaching about nature by starting with the endangered species list. They emphasize cultivating an awareness and respect for wildlife first and foremost.

Whether a particular curriculum becomes established in schools (and is used as designed) depends in large part on whether teachers receive adequate training and encouragement. Many have scant background in science and are overwhelmed by so many problems and challenges that they need incentives to venture into new areas. Under an EELP grant, the National Wildlife Federation's CLASS (Classroom Learning Activities in Science and Social Science) curriculum was adapted for use in California and introduced in southern California through teacher workshops. The Department of Education declined to provide funds for these training sessions elsewhere in the state, according to Nina Winn, former director of the curriculum/instruction unit at the Orange County Department of Education. She was disappointed. Andrews responded that the curriculum has been in demand and that schools are still buying copies.

The State Department of Education launched a new initiative this summer to help teachers take advantage of available instruction materials and programs. It held a two-week Leadership Institute for Environmental Education at Humboldt State University to introduce 25 teachers to "Child's Place," as well as other environmental curricula, to meet scientists, go on field trips, and to hear Native American perspectives from Hoopah, Yurok, and Karouk people, who live on the North Coast. Two similar institutes are planned during the next two years, for a total of 100 teachers. The participants have pledged to pass on what they have learned to others in their districts. Their school districts have pledged to provide them with computers and modems so they can communicate with each other during the year via EcoNet, an environmental information network.

In a further effort, Andrews is conducting a national survey of curricula on specific areas of environmental education, including water, energy, air quality, waste management and animal, plant, and human communities. After the survey is complete, available curricula will be evaluated by experts assembled by Andrews, and a booklet will be prepared to help teachers choose. Compendia on water and energy are already available.

At The Head of the Class

No matter what the framework or curriculum, however, it is the teacher who gives it life. What happens between teachers and students in the classroom and, especially, on field trips and in outdoor schools, may well determine whether students are inspired with a sense of wonder and respect for nature, whether they evolve a sense of stewardship, and whether they will take part in public decision-making later.

California does not require any outdoor education, though traditionally, students between the fourth and sixth grades have had an opportunity to go on a week-long trip with their teachers, helped by parent aides. With funds ever more scarce and family budgets also shrinking, this has been increasingly difficult to arrange. Nevertheless, many schools manage because they find the experience so valuable.

George Washington Elementary School, in the shadow of I-5 in Burbank, spent $10,000 last year to send 85 fifth graders to an outdoor school for a week. "The buses alone cost us $1,300 compared to $900 the prior year," said principal Joan Bacca. This school is so poor that it held a fund drive to buy paint so volunteers, including Bacca and her husband, could paint the school on weekends. "But the trip is so meaningful for the kids, we try to do it every year," Bacca said.

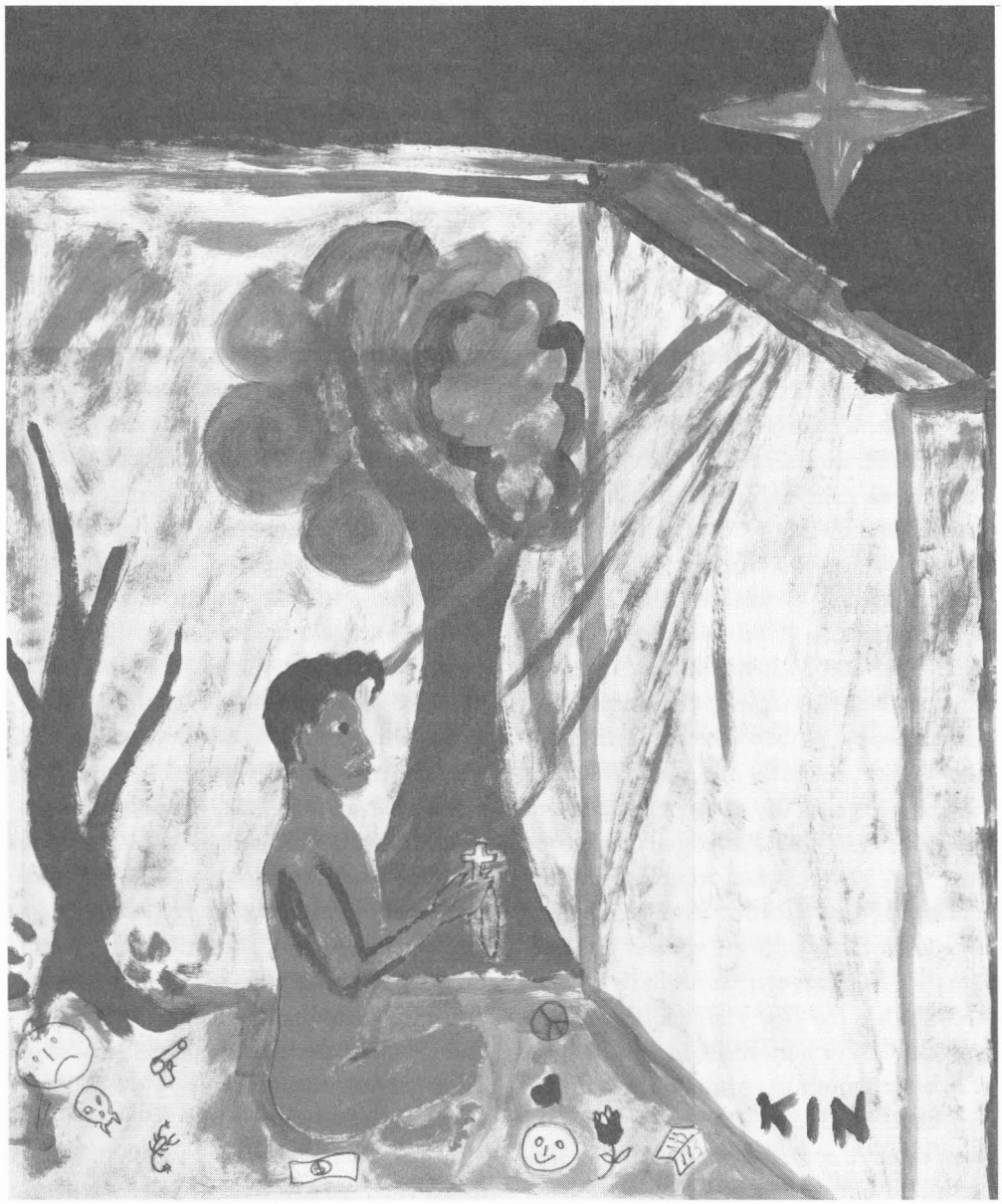
At Ybarra Elementary School in Los Angeles County, children and their families raise the $150 per child fee for a week-long stay by fifth graders at one of Los Angeles' two outdoor camps. The fundraising begins the year before and takes six months. Everyone, including kindergartners, sells candy. Families are expected to contribute $5 a week. Those unable to can apply to the PTA for "camperships." Principal Erin Stern said, "It's a lot of effort but well worth it. We try to go early in the year because the camp

helps kids bond to each other and to their teachers." Beyond elementary school, however, only the fortunate students get to learn about the natural world beyond the confines of their schools' walls.

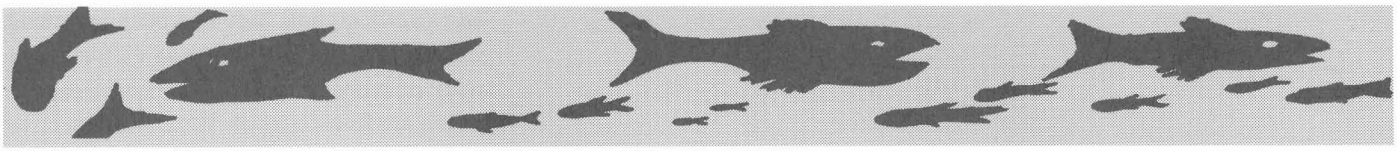
Whether California will keep its commitment to protect the coast, the ocean, the forests, deserts, and other natural areas will depend largely on the ability of our schools to build an informed and committed constituency. Untold numbers of teachers give their time and spend their own money toward these goals. Volunteer groups and resource agencies offer much support. As our population grows in size and diversity, all of us have a big stake in these efforts' success. But unless the state commits the needed resources and leadership, we will doubly forfeit our inheritance by failing both our children and our natural resource heritage.❐

At the first statewide conference of the California Science Teachers' Association, October 2-4 in San Jose, an effort will be made to create an umbrella group to help increase the effectiveness of environmental education efforts in California. For information, call (916) 489-0921.

A directory of environmental education programs mentioned, and some additional resources, are available from Coast & Ocean, *State Coastal Conservancy, 1330 Broadway, Suite 1100, Oakland, CA 94612. Send stamped, self-addressed envelope.*



Kin, who is 16 and a Mayan, made this painting at the Larkin Street Youth Center, which serves homeless youths in San Francisco's Tenderloin district. His name means "Sun" in his native Lacandon language.



Ocean Week: A Tale of Two Schools

It was Ocean Week at Kensington Hilltop Elementary School and everyone was learning and having a great time. Second graders were dissecting squid on blue plastic plates, using yellow and red plastic scissors, under the expert direction of science teacher, Elsie McCracken. After they cut their squid open and determined whether it was male or female, she had them puncture the ink sac and use the ink—to their delight—to write their names in their notebooks. Then she showed them how to pull out the esophagus, find the brain, and locate the muscles that operate the squid's siphon. What kind of observations were heard: "That's his brain?! Squids must be really stupid!" and, "I am not going to eat this!"

In fact, after the second graders had relinquished their scissors and rushed off to wash their hands and eat lunch, teacher Blanche Malankowski-Smith collected the dissected cephalopods and carefully washed them—to be fried and eaten by another class.

The squid dissection and calamari feast are part of the Ocean Week program, the highlight of a multicultural year-long science program, MARE (Marine Activities, Resources and Education), developed by Roberta Dean, Craig Strang, and Catherine Halversen, for kindergarten through eighth grade. (The team also founded Project Ocean, formerly associated with the Oceanic Society and now managed by the Tarlton Foundation.) Based at the University of California's Lawrence Hall of Science in Berkeley, MARE (Latin for sea and pronounced mar-eh) uses hands-on activities, cooperative learning, sheltered instruction for students of limited English, and field trips to teach languages, social studies, math, and science, all with the ocean as focus.

When a school chooses to offer MARE, all teachers agree to teach marine science throughout the year and to participate in Ocean Week. At Kensington Elementary, the community got involved as well: The PTA decided to hold its white elephant sale at the end of the week, using the ocean as a theme.

PHOTOS: REGINA MCGRATH

Kensington is part of Contra Costa County's bankrupt Richmond School District, which the state stepped in to manage in school year 1990-91. But it is nestled in the green hills in an upper middle-class neighborhood, far from the Chevron refinery that dominates the low-income Richmond flats. Most of the children attending Kensington are white.

The Ocean Week program can cost from $3,000 to $15,000, depending on faculty size, location, and extent of teacher training required. MARE provides the training, as well as program materials, consulting, and onsite assistance during Ocean Week. The intensive teacher training (two to four days of in-service, onsite training by MARE staff with an optional 11-day summer institute) is designed to instill

teachers with enough confidence to continue the program on their own.

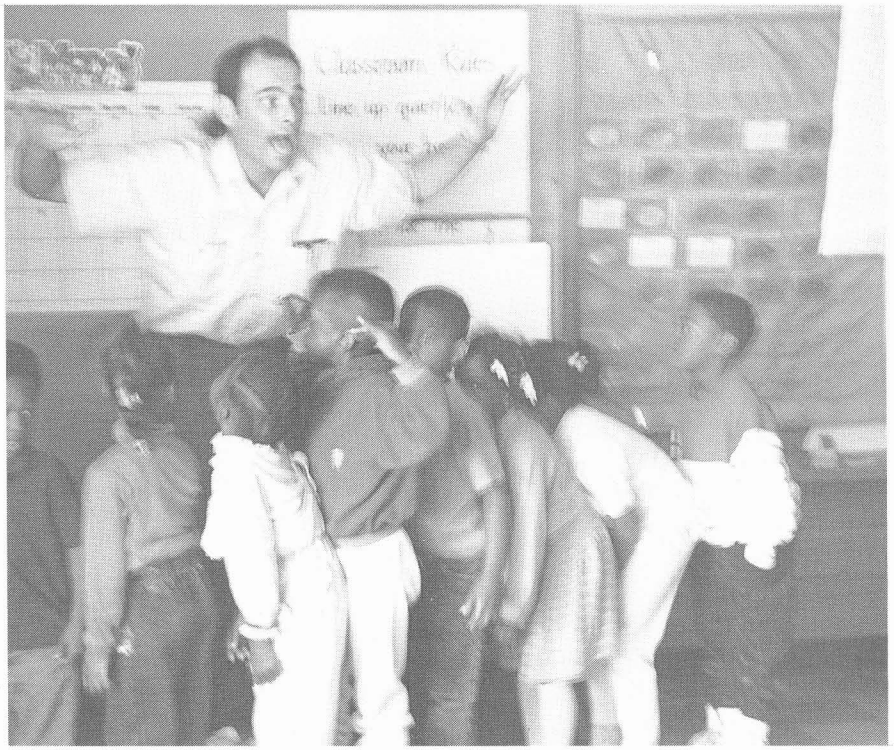
"We are able to have Ocean Week because the parents raised the money and are willing to participate," says Malankowski-Smith. "The PTA even provided money for supplemental books, slides, and videos recommended by MARE staff." Whenever she needs parents to volunteer, she said, she gets them. (Three mothers were helping during the squid dissection; one was informed by her son that he would like to eat squid for dinner that night.)

The parents' and teachers' efforts were paying off, judging by how well informed the children were. Vocabulary words on the second grade blackboard included: gastropods, bivalve, cephalopods, chitons, plankton, nekton, and benthos, and the children knew what creatures belonged in each group. Paper models of squid, anatomically correct inside and out, were suspended from a clothesline strung across the room. Children correctly identified (and pronounced) an echinoderm, several live specimens of which were passed around by the MARE staff.

The second graders had been keeping a daily journal, in the shape of a turban snail, of things they had enjoyed doing during Ocean Week. In another booklet, shaped like a scallop shell, they had been inventing math word problems, such as, "I went on a walk on a beach and I saw ten sand castles. There are five doors on all ten castles. How many doors are there all together?"

What were these second graders going to do in the afternoon? Just learn how to clean up an oil spill, figure out why birds have different kinds of beaks, and learn where sand comes from. In their spare time during Ocean Week they were creating a mural of creatures usually found in the rocky seashore, to be hung in the school's hallways.

A little awestruck, this visitor ventured into the fourth-grade classroom where a kelp forest hung suspended from the ceiling. The stipes (stems) were made from yellow and green yarn, blades (leaves) from fragments of green trash bags, and air bladders from balloons. Stuffed sea otters grasped yarn sea urchins. Jellyfish devised from transparent sandwich bags could be seen among the kelp. Some third graders from nextdoor were discussing why sea otters are necessary to the health of a kelp forest while passing around a pair of blue cellophane glasses through which the kelp forest truly looked like it does under water, far from the sunlight that plays on the ocean surface. Most of the students were so enthralled that they ignored the bell for recess. What was written on the blackboard here? "Imagine you are a sheepheadfish. Describe a day in your life. How do you use kelp? Who are your predators?"



When the visitor got to the fifth grade, she felt maybe she should repeat elementary school. Here the children, who were studying the open ocean as habitat, were mapping an ecosystem. By arranging 3 x 5 inch index cards, on each of which was written a fact, they were trying to relate the upwelling of the California current to the food web of the creatures who live there.

By the second day of Ocean Week at Kensington, the program was such a success that the teachers were already planning to repeat it next year. The program continues in some 85 schools nationwide, according to Strang. "About 95 percent of the schools we go to continue on their own," said Halversen, stopping to talk while eating a quick lunch.

PHOTOS, PAGES 24-25: DEWEY SCHWARTZENBURG

She would next go off to help some fifth graders play "Apples and Ocean," in which students look at the planet's limited supply of fresh water and consider what they can do to protect it.

Besides learning about human impacts on the ocean, students learn about ocean-related career possibilities. "We promote the concept that women can be scientists. We try to break stereotypes," says Dean.

Coronado School

Coronado Elementary School is in the Richmond flatlands. About 80 percent of the children are African-American, and most of the rest are Hispanic. The school could use another coat of paint, but that's the least of the problems. There is no PTA and volunteers are scarce. When Ocean Week was held in June, only four of 20 teachers who took the fall training were still at the school. For much of the year, students had had a succession of short-term substitute teachers. The bankrupt school district paid for Ocean Week at Coronado with state and federal funds.

Resource specialist Helen Cardiff tried to explain the squid dissection to about 20 second graders over a crescendo of excitement. The children had no diagram to work from and spent most of their time fighting over who would get to use the scissors (two children shared each squid). There were no paper models of squid here. On the walls were some tired-looking posters, from Pepsi Co., featuring famous black people in history. When Cardiff asked what a predator is, the only answer she got was, "a movie."

The children did not seem to have much background for the new information brought to them by Ocean Week. Certainly none chimed in about creatures seen on family vacations to Hawaii, as had children at the Kensington school. They had not spent the prior week building paper models of squid, nor drawing diagrams in notebooks. In fact, they did not have notebooks. They wrote in squid ink on their plates. After the abbreviated dissection, which was interrupted repeatedly by calls for order, the children went to wash the squid ink off their hands in a restroom—where they found neither soap nor paper towels—then ran off to collect their lunches.

The goals of Ocean Week at Coronado School were, of necessity, much more modest than those at Kensington. "Some of these kids haven't even been to Tilden Park [a large park in the Berkeley hills]," said Cardiff. "Some don't realize they're living by the bay." She was planning to take her class and some third graders to Angel Island on the ferry, "so they can see the Richmond Bridge," which is in their neighborhood, she said. Children were also to be taken on a walk to the Richmond Marina, via a freeway overpass. "We try to show the kids how to walk or take public transportation to the shore," explained MARE's Dean. Some children also went to Drake's Beach in the Point Reyes National Seashore and to Marine World Africa USA.

Principal Gary Moe saw Ocean Week as a way to end the school year for the children on a positive note. But a superhuman effort on the part of everyone will be required to continue the program and to build on it next year, particularly in light of impending cuts in state funds for education. "There's some teachers working pretty damn hard out there," notes MARE's Strang. "Despite what's happening in the district and the state, they did manage to have their kids participate in Ocean Week . . . They may not win the war, but they are winning some battles." —*R.McG.*

After the abbreviated dissection, which was interrupted repeatedly by calls for order, the children went to wash the squid ink off their hands in a restroom—where they found neither soap nor paper towels.

A Magnet for Change

PHOTOS, PAGES 26-28: GARY HAFNER

The recipe for school success is old and often proved: Take energetic, imaginative teachers who love to learn and to pass that love on to children. Give them the freedom and resources they need. Watch. Results will surpass expectations. Take, for instance, Gary Hafner and his team at Emerson Elementary School in east San Diego.

Any teacher or student entering Emerson starts with several strikes against him. The year-round school is in a low-income, highly transient neighborhood that is a first stop for many immigrants. Spanish is the main language for some 80 percent of the students, and, though 25 percent use English to some degree, 55 percent do not have functional use of the language. The turnover of both teachers and students is enormous.

Seven years ago, in an effort to improve ethnic balance, the San Diego Unified School District designated Emerson a magnet school with special focus on basic skills. This brought an infusion of federal money but failed to bring about the hoped-for change. So the district decided to add another area of concentration, marine science. It was a natural choice, as the school had just been adopted by Sea World Inc., through the district's Partnership In Education program.

To provide teacher training and a curriculum, the school contracted with Project Ocean, developed by the Oceanic Society. Hafner and 17 other teachers were given special training, which included visits to nearby aquaria and research facilities, to prepare them to teach about biological, physical, and human interactions in marine environments. Project Ocean provides a framework for each grade, assigning a focus on major habitat types: kindergarten and first grade: rocky seashore; second grade: sandy beach; third: marshes and mud flats; fourth: kelp forest; fifth: open ocean; sixth: coral reefs. The particulars are developed as teachers choose, in keeping with the school's location and available resources.

When the program began, most children at Emerson had never seen the ocean, though they live only a few miles from some of the most beautiful stretches of San Diego's shoreline. "A lot never get north of Highway 94, two miles from here," Hafner said. Three years later, however, at the end of the 1991 school year, many of these students knew more about marine environments and animals than some teachers do. Each had taken at least two field trips a year to some coastal site, and most had visited Sea World at least once to participate in one of 11 educational programs. Many knew how to call up information from computer data banks, how to gather facts by observation and compile them into graphs and charts, and how to relate one place on the globe to another. Almost all sixth graders left Emerson with a basic grasp of how science works and a wider view of their relationship to the ocean and coast.

How It Was Done

All that—as is so often the case—was only accomplished by virtue of enormous effort by one dedicated teacher and his team.

Gary Hafner came to Emerson eager to try computer and video technology as a means to challenge and motivate children, and to teach "minimal science skills and basic phenomena of science." He had taught for 15 years in magnet schools, had a master's degree in computer education, and was convinced that "most of this technology is misused."

The school had $30,000 in federal funds to remodel and outfit a lab. To stretch that to the maximum, Hafner made an offer to the principal: "Let me build, design, purchase, and I will throw in my labor for free." The principal agreed, and Hafner began to build the environment he wanted, spending uncounted hours of his own time on construction, research, and acquiring equipment.

He had been allotted two classrooms. One he made into a laboratory, with metal-top work tables and shelves stocked with jars and tanks. (Last spring, a huge tank was inhabited by a 20-pound endangered loggerhead turtle. It had been captured newly hatched in Mississippi because it had small chance of surviving in the wild and was now doing time at various schools as ambassador for its kind. If it continued to grow and stayed healthy it would be released in its native habitat some six months hence.)

Hafner divided the second room into a direct instruction arena, a computer learning center designed to resemble an undersea submersible vehicle, and a media studio equipped for laser disc videotape editing.

Students come to this science lab for an hour a day, for six days, four times a year. They gather on rug-covered bleachers in the arena, where Hafner and his Spanish-speaking aides introduce them to new material they are about to study. They use texts, software, and borrow from the press and the media, adapting and translating as seems appropriate. Skits, puppets, films, videotapes, slides, and other learning aids supplement their words. Sometimes they invite expert guests, from Sea World and marine research institutions.

All children work in groups on various marine science projects in the computer center, though not all work on the computers. Teachers select several students from each class who, they believe, can benefit and can work cooperatively.

Two computers are connected by modem to educational programs: the National Geographic Society's Kids Network, and Prodigy. They can be used as "animated textbooks," allowing students to ask questions and get replies. They are also used for on-line communication. One Kids Network program, "What's in our water?" has students gather information about their local water supplies from government agencies, as well as by direct sampling and analysis. They share this information by modem with 11 other schools in this country and Canada. Then they analyze and synthesize what they have collected.

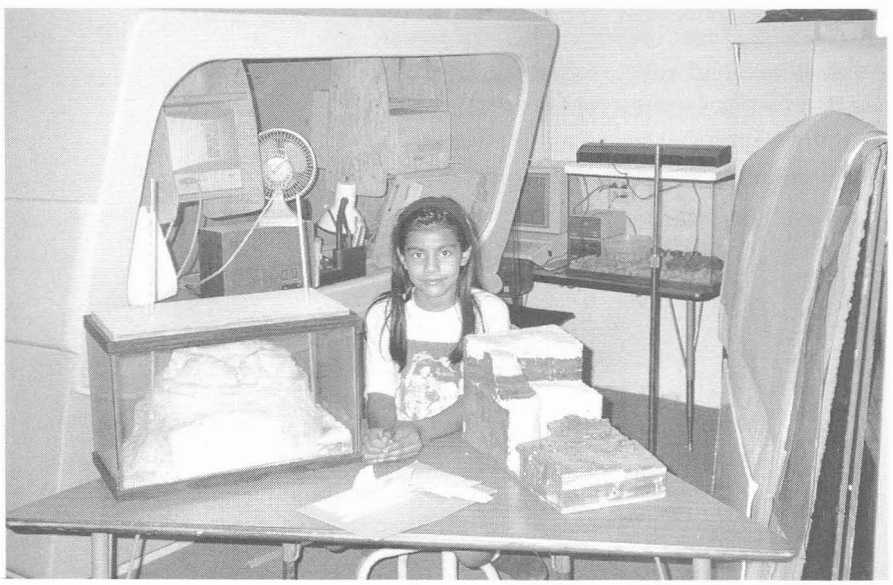
"It's a way of teaching science and applying it to real situations," says Hafner. "They learn to graph. They learn how to locate something on the globe by latitude and longitude. Facts are not important. It's how you process them and what analysis skills you use that matter. I try to avoid factoids: useless information that has nothing to do with its role or relationship to other things. The goal is to make information contemporary and timely. We work with real issues, such as San Diego Harbor, which is one of the three most polluted harbors in the United

For some, Hafner's lab is a window into a much wider world and perhaps the first step into a life as scientists or resource managers.

States. Many people in this community feed themselves and support themselves by fishing. It's crucial that we look at this."

Showing a visitor around his domain on a day when the children were off, Hafner stopped to check the E-mail and found a letter from Bullis Purissima School in Los Altos Hills: "Our global address is 37N 1229W. The source of our school's drinking water is the Hetch-Hetchy reservoir." Someday, he said, he hopes to have a school in Mexico as part of the network.

"We also make a lot of videotapes with the kids," Hafner continued. "Instead of regular tests we do expert interviews in which the kid is the expert and other kids interview him. And we do commercial-type tapes in which the kid talks about whatever he is studying. 'Hey, this is my animal, and he's pretty tough. Has to be, with water



banging at him every day . . .' Or we give them problems and solutions, and have them produce a video."

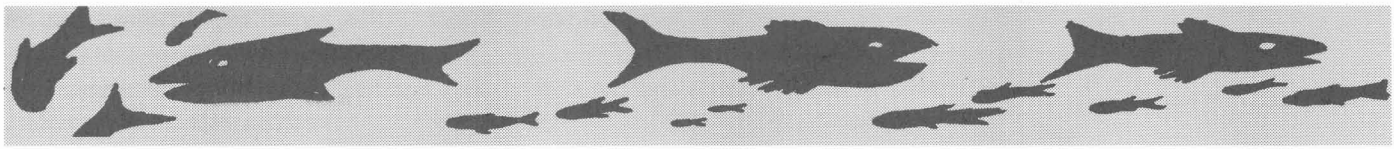
Children who stay in the school the entire four years should graduate with a basic understanding of the coast and ocean. For some, Hafner's lab is a window into a much wider world and perhaps the first step into a life as scientists or resource managers. About 15 fifth and sixth grade girls took part last year in the Science Sisters program established at Emerson by biologist Karin Forney and others at the Southwest Fisheries Science Center of National Oceanic and Atmospheric Administration's National Marine Fisheries Institute. The girls went with their Science Center buddies to museums, research vessels, to job sites and laboratories, and to the beach. "We do some activities together to help keep them motivated, to give some idea of other options," said Forney. She said the program also fits with the Science Center's goal to recruit people from groups that are

underrepresented on its staff, such as Hispanics. "Our best students in science are characteristically females," said Hafner, "but there's a real problem with options for them in the community."

One-Man Show?

Many a teacher from more privileged schools would envy Hafner's science lab and his access to resources. But to build this program and keep it going, Hafner has had to forgo a great deal personally. He is not married and has limited time for social life. The struggle against entropy is constant. Since the marine science program started at the school three years ago, it has had three principals. All but four of the 18 teachers trained by Project Ocean have left. Most of them use the training they received, elsewhere. But their departure has left this struggling school ill-equipped to build continuity between the science lab and regular classrooms. There is also no continuity into high school, says Hafner.

"There has to be a consistent effort," he noted. "We need trained teachers and a common set of goals: to encourage curiosity and skepticism—that's what makes science work. We need to raise our expectations and assessments, and provide people to meet them—train them or change them. It's really sad now, seeing the kids go. They've had a lot of extra stuff here, but it's still a lot less than what kids used to get." —*R.G.*



Hostel Adventures

"What is a habitat?"

"It's when a bear is sleeping in a cave and wakes up in the spring."

"No, no! It's when you do something that you can't stop, like sucking your thumb."

"No! A habitat is a home."

"Right!" Denise Brown shouts. "You got it!"

The 13 fourth graders standing in a circle in front of her are holding hands as directed, but they are eager to leave this patch of grass and tear down to the tide pools below. Most have never seen a tide pool. But Brown wants to tame some of the wild energy they have built up in anticipation of what is to come.

The children—African-American, Samoan, and Cambodian—from San Francisco's Sir Francis Drake School are here as part of the Hostel Adventure program sponsored by the nonprofit American Youth Hostels Inc. (AYH). They arrived yesterday at the Montara Hostel, spent the night, and have walked from there to the James V. Fitzgerald Marine Reserve. They are about to see, firsthand, the marine life they have been learning about in their classrooms for the past month. "All right. Now let's do the habitat lap-sit," calls trip leader Brown, of the AYH.

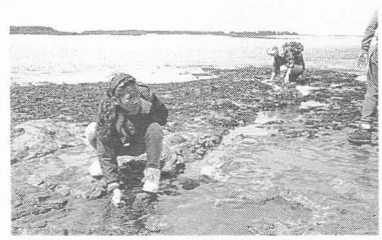
She has been working up to the lap-sit since they arrived yesterday, first getting them to hold hands, play cooperative tag, and do a blindfolded trust walk. "We do these focusing activities because I need to trust the kids to follow directions in this unstructured environment," she says. "They're cooperating more today, and there is less pushing and shoving. Getting them to work as a team can make a big difference when they get back to the classroom." (One child, who did not catch on to the necessity of cooperation, was escorted back home earlier this morning.)

The children form four groups, "water, food, space, and shelter," then make a circle, each holding onto the shoulders of the child in front, sitting on the knees of the one behind. "Let's see how well we can maintain the circle when all the waters leave," says Denise. The circle collapses into a laughing pile of kids. The principle of interdependence has been demonstrated. At last, the children are free to scramble across slippery rocks to search for sea anemones, turban snails, hermit crabs, coralline algae.

Brown extracts from her bulging backpack some papers with drawings designed to help children identify and keep track of life forms they see. She distributes them to the two teachers, one teacher's aide, one parent, and her own assistant who have come with the group. The game now is Tide Pool Bingo.

Planning Ahead

Since 1986, the AYH Hostel Adventure program has brought over 5,000 children,



PHOTOS, PAGES 29-31: REGINA MCGRATH

aged 8 to 18, from economically disadvantaged neighborhoods in the San Francisco Bay Area to coastal hostels and the shore. These children have come mostly from the Hunter's Point, Inner Mission, and the Western Addition districts of San Francisco, and from east and west Oakland. The program aims to introduce the living coast to these children, teaching them about living creatures and habitats, and helping them to get along with these creatures, and with each other.

Much advance preparation is required, and many obstacles must be overcome, before a trip takes place. The school must raise the necessary funds for lodging, food, transportation, and an AYH staffer's time. The children must be prepared, and must have their parents' permission. None of this is a simple matter in a school with too little money, overworked teachers, and a diverse student population.

Sir Francis Drake, in Hunter's Point, a predominantly African-American part of the city, has the highest percentage of children on public assistance (Aid for Families with Dependent Children) in the San Francisco Unified School District, according to principal Bonnie Bergum. It is a consent decree school, which means that under the terms of an out-of-court settlement reached in 1984 between the National Association for the Advancement of Colored People, the State of California, and the San Francisco Unified School District, the quality of education had to be upgraded and the student body desegregated. To comply with the decree, the district has been busing in children from the Tenderloin district, mainly children of recent Cambodian immigrants.

Because it is a consent decree school, Sir Francis Drake receives about $300,000 more in state funds than it would receive otherwise. This money provides salaries for three teachers and several paraprofessionals. Much of the remaining is being spent on outdoor education, by agreement of the parents and teachers. "Under the terms of the decree, we have to provide all fifth graders with an outdoor education program," says Bergum, "but we decided the experience was so valuable that we try to provide something for all grades—even the kindergartners are going on a field trip this year." "What this means is that we can take the kids on one camping trip a year," explains Gillis Kallen, who works at the school one day a week as outdoor education resource teacher. "If a class has more than that, it's because the teacher got something for free or did some fundraising."

Teacher turnover is high in inner-city urban schools, making planning difficult. This fourth grade's teacher, for instance, Karen Osher, has been with her class for only three weeks and is these children's third teacher this year. Because one of the previous teachers had planned ahead, applying to the Hostel Adventure program for a 50 percent "hostelship," these children went free of charge. The hostelship reduced the cost of lodging from $9.00 to $4.50. The school paid for that, as well as for food, Brown's time, and transportation.

To qualify for the trip, each child was required to earn a certain number of points. All did. However, the parents of five Samoan girls denied permission. Osher called the parents to reassure them, but they did not change their minds. "Samoans are reluctant to let their daughters stay away from home overnight," she explains. "The only reason one Samoan girl was able to come is because our paraprofessional, Faapio LaLusa, is Samoan and the parents knew she'd be along." Though other parents were enthusiastic, only one had come along: Herbert Boston Sr., whose wife is a Head Start teacher and who has been volunteering in the San Francisco public schools for 15 years. "I just can't take care of mine—that's not how it works," he explained. "I take care of mine and somebody else's too, and I don't mind."

Osher shepherded the children from San Francisco to Montara Hostel by public transit, the city's Municipal Railway, and

Samtrans, while Kallen brought the food (bought by Osher on her own time) in her own car. "It would be nice if we had a small van to drive the kids around in, but there's no money for that sort of thing," says Kallen. The teachers cooked dinner, supervised the children as they cleaned up, and slept in the same room with them. They all retired at 10:00 PM and rose at 6:00 AM to face the second long day of the trip, which was to end with a night hike by starlight.

Not surprisingly, the teachers look a bit tired today.

As the tide starts to creep in, the children reluctantly withdraw from the rocks to discuss their finds. Although the elusive chiton was never found, other treasures turned up, like an abalone shell, a rock riddled with holes by boring clams, and a sea urchin's shell fragment.

Later, around the picnic table above the beach, over ham and cheese sandwiches, the children are enthusiastic about what they learned. Brown tries to nail down some lessons in coastal stewardship:

"What kinds of things would you tell your family if they come to visit the tide pools?"

"Put the animals back where you found them."

"Don't run on the rocks."

"Be nice to the animals, don't throw them around."

Satisfied, Brown retires to the shade to eat her lunch. "Later today we're going to have the kids go solo—sit quietly by themselves on the beach and just give them a chance, to be with themselves," she says. "They rarely have quiet time at home in the city."

Barbara Wein, executive director of American Youth Hostels, said, "We are really committed to the Hostel Adventure program. We haven't had any problems that would make us rethink this program. If anything, we have more attitude problems with kids from affluent areas."

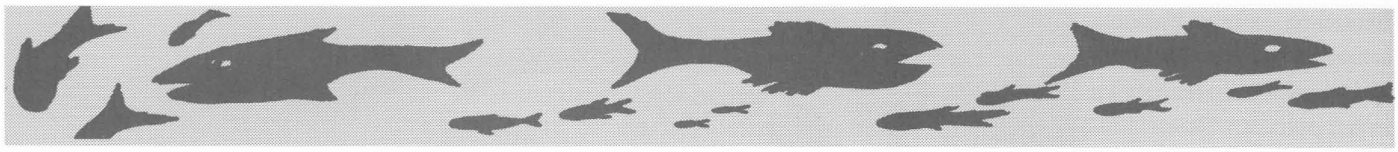
Success also requires a commitment from teachers, a willingness to give of their own time so their students have a chance to learn outside the classroom about the natural world. With school budgets being brutally cut and demands on the teachers continuing to grow, it is the exceptional teacher who will find the time and energy for such a commitment. Yet without it, children who could benefit the most from this program—and many other excellent environmental education programs available to schools—may never get a chance to participate.

Only time will tell if any of the children from Sir Francis Drake School who today discovered how a sea anemone reacts when you stick your finger in it will become marine biologists, rangers, scientists, or natural history teachers. But their Hostel Adventure at least offered them an inkling of the living coast.

—*R.McG.*

For more information, to sponsor a hostelship, or to volunteer as a trip assistant, write to Hostel Adventure/AYH, 425 Divisadero St. #307, San Francisco, CA 94117, or call (415) 863-1444.

This program aims to introduce the living coast to these children, teaching them about living creatures and habitats, and helping them to get along with these creatures, and with each other.



Forest Service Taps City Youth

The U.S. Forest Service was aware it needed to recruit more nonwhite people for its professional staff in California. The population was changing, and it needed to change with it. But how? Where were the needed foresters, ecologists, hydrologists, geologists, archeologists, wildlife biologists? Too few people of color had chosen these and other environmental careers.

The problem the Forest Service faced was not unique. Many resource agencies have struggled with it. But its solution was bold and imaginative: "We decided to grow our own."

The problem the Forest Service faced was not unique. Many resource agencies have struggled with it. But its solution was bold and imaginative: "We decided to grow our own," in the words of anthropologist Amahra Hicks, recruited from the Institute for the Study of Social Change at the University of California, Berkeley, to launch the program from the Forest Service's Pacific Southwest Regional Office in San Francisco.

So began Commencement 2000, a long-range strategy that goes to the root of the problem. It begins with elementary school children, trying to interest them in environmental issues by linking the urban environment with natural resources. (Where does your water come from? Let's trace it to its source.) The program follows the children who show an interest into middle school, through high school and toward college. It brings professionals into schools to talk about the kind of work they do and sets up mentors in various fields for teachers and students. It provides extended experience for the students in national forests and arranges for students to be employed in national forests during school vacations. "Once we've got them, we never let them go," said Hicks. The goal is to develop a pool of diverse, competent potential recruits for the Forest Service so that, by the year 2000, it can reflect the state's population profile.

Regional Forester Ron Stewart has put resources into the Commencement 2000 program, realizing that the Forest Service must plan for the future in an innovative way.

"We know environmental jobs will be there," Hicks said. "Some of our growth areas will be: recreation, air quality, range and watershed management, and wildlife management. The educational requirements for many of our jobs are similar to those for jobs in industry."

The program was launched two years ago in three Oakland schools: Parker Elementary, King Estates Junior High, and Castlemont High School. All are inner-city schools with predominantly African-American student populations. Parker was selected because it already had an environmental program, the Inside Out Academy, started two years ago by the Three Circles Center, an organization founded by Running Grass to cultivate multicultural environmental and outdoor education and recreation.

Cooperating in Commencement 2000 are Merritt Community College, College of Natural Resources at the University of California, Berkeley, the National Park Service, Bureau of Land Management, East Bay Municipal Utilities District, state and municipal agencies, citizen's groups, San Francisco Foundation, and private companies.

Shadowing

Johnny Chambliss is one of seven Castlemont students "shadowing" Forest Service professionals this summer, and living with Forest Service employee families, to get a practical sense of their jobs and lives. Chambliss was to spend four weeks in the Lake Tahoe Basin Management Unit, then three weeks in Eldorado National Forest with wildlife biologists. "Maybe I can come back and work next year, after I graduate," he said. He is aiming for Humboldt State University and a wildlife biology major.

As a child in North Carolina, Chambliss used to enjoy the woods, fishing, spending a lot of time outdoors. So he was interested when, midyear in 1991, "I noticed a couple of my friends going to these meetings," he said. A noontime club had been formed, to which guests came to talk about their jobs in forests and parks. "Then during spring break there was a week's trip to Eldorado National Forest. My biology teacher got me to go. We got snowed in, we went on night hikes and owl hoots. When we came back, a lot of the kids were interested in the Forest Service."

For Greg Byers, that interest has led to a decision to go into civil engineering. "Once I saw it, I was hooked for life," he said. "They work outside a lot, and even though they work a lot, they have fun." He has chosen to shadow a civil engineer. "I met her last year [through the program]," he said.

Kimani Birden was also to be on the "shadow" program, but leaped a step ahead when he was accepted for a cooperative summer job in the Mad River Ranger District, to work with wildlife biologists on a study of the endangered spotted owl. He has been going on "hoots," at night with biologists, calling the owls, locating them, giving them live mice and then watching where they fly, to locate nests. As a child, Birden used to hunt jackrabbits with his father and uncle. But he discovered that "I'd rather just sit in the forest and admire the surroundings." His career choice is firm: wildlife biology.

Next year, an academy of natural resources will be established at Castlemont High School, the first such environmental science school within an inner-city high school in California, Hicks said. The Commencement 2000 program is to expand to schools in Sacramento, which have a diverse population of Asians, Hispanics, African-Americans, European-Americans, and Native Americans, and to Humboldt County schools with sizable Native American student bodies. Eventually, the goal is to establish programs linking schools with all 18 national forests in California.

District Ranger Robert Smart at the Eldorado National Forest believes that many other resource agencies and even corporations will discover that they have a vested interest in expanding these efforts. He is

KATHY SLOAN

enthusiastic about his own experience with the Oakland students he and his staff have hosted thus far. "You have a sense you are finally beginning to score, that something can be done about our social problems. . . that there are other ways to live," he said. "We're reaching into groups of folks who have not had an opportunity to learn about the natural environment. Even if they don't choose to work with us, they will be more enlightened citizens."

Asked how the program ties in with her prior work, studying the resurgence of racism on the Berkeley campus, Amahra Hicks smiled. "This," she said, "is a joy." —*R.G.*

In the Presence of Giants

by June Jordan

As my father-in-law hoisted an ax above his shoulder and brought the blade, heavy and swift, to tell against the slender trunk, my son, Christopher, raced up to him and angrily asked, "What the hell are you doing?"

Christopher's grandfather did not, as I recall, manage to make any sensible reply. Christopher's challenge back then bitterly underlies today's international movement against deforestation, from Brazil to California.

Some things take time.

Violence is fast.

It happens unexpectedly. It comes like a tornado.

It pierces flesh that bleeds. It spills into the water. It calls you a name that is not your name. It knocks you flat. Violence is popular. As 2 Live Crew, the rap group, formulates the issues, it's "nasty as you wanna be." And fast.

Other things take time.

Some things take time.

Exactly 27 years ago, I was 27 years old. My son was five. Martin Luther King Jr. dedicated his "I have a dream" oration to 250,000 Americans standing in one place. Racist maniacs blew up a Birmingham, Alabama, church and, thereby, murdered three black children. South Africa stole Nelson Mandela out of his natural, free life. His wife, Winnie Mandela, began a harrowing and militant vigil, without precedent.

Almost nobody was thinking about trees.

Two years before all of that, in 1961, I found myself sitting on the screened-in porch of a farmhouse in New Hampshire. Just on the far side of the dirt road out front, my father-in-law was bracing himself to cut down a tree. It was not a big tree. It was not especially beautiful. I remember that particular beech tree as somewhat older than a sapling and I can still see the heart-shaped leaves that glitter easily in that mountain-morning light.

Before moving west to California, I had never seen redwood trees and, certainly, I had never thought to write about trees of any kind, for any reason. My notion of political urgencies did not encompass the preservation of things as against human beings, although once, on a brief visit to Berkeley, I remember walking through Tilden Park with a friend who had me touch an unmistakably ancient black oak tree. She had described to me a then-current controversy that appeared to pit the future of this tree against the perceived needs of nearby Berkeley residents.

"Of course," I remember her saying, "Of course, if it's a choice between people and a tree, it's the tree that goes, as far as I'm concerned!" I remember feeling uneasy about her certitude: For me, it was not clear that my own interests, for example, should easily supersede the living requirements of the amazing wild "thing" that arched and

whirled and rooted down, all at once, so close to where I stood, breathing clean air.

Some things take time.

And I have moved. I am writing these words less than 20 minutes away from that old oak tree. And tonight my mind moves from anxiety about the safety and good health of Nelson Mandela to the safety of our common environment and, hence, to the safety of trees.

Mandela is six-feet, four-inches tall and 72 years old. He walks in the world, lucid and relentless and free even as he kept himself lucid and relentless and free despite 10,000 nights in prison.

When I enter a grove of redwood trees, I feel I have slipped inside a cathedral of purity and strength. This hallowed space is not religious: You do not worship anything but what you can see and what that actuality allows. You do not raise your voice. You do not lower your eyes. You do not hurry anywhere. The expansive and compounding significance of age as history becomes a promise you believe your own life will manage to keep. You feel how small you are and you do not feel afraid. In the presence of these giants, you understand serenity as something earned, something integral to the accomplishment of freedom.

I feel this way in the presence of Mandela.

I feel this way inside a grove of redwood trees.

I drove into Mendocino County, and I came upon the western offices of Georgia-Pacific, one of the two main logging corporations in the area. At the edge of a tiny, nominal lawn, there seemed to be a weird museum exhibit or sportsman's trophy of some sort. The thing lay there, trapped and enormous, behind a chain link fence. What could it be, that huge dead mass captured inside such strange, such smug confinement?

"This is a section of the largest redwood tree known to have grown in Mendocino County."

A large bronze plaque explained everything in boastful detail: *"This redwood was felled in Big Bear Creek, April 18, 1943.*

"Estimated age: 1,735 years.

"Height: 334 feet.

"Diameter of stump: 22 feet.

"A saw 22 feet in length was used to fell the tree. Actual time required for cutting the tree was 60 man hours."

Some things take time.

Sixty hours is a micro-fraction of a minute in the context of close to 2,000 years.

Violence is fast.

Other things take time.

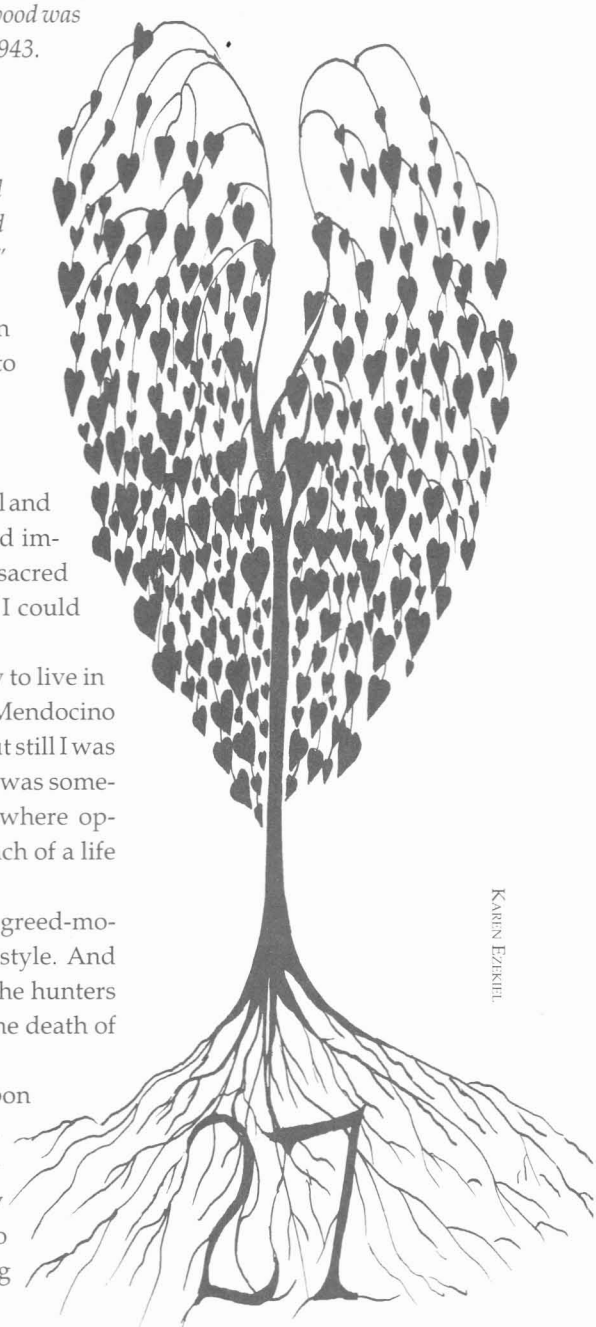
I faced this appalling memorial and images of black men lynched and images of Native Americans massacred overtook my consciousness and I could hardly stand where I stood.

I had traveled a very long way to live in California and, now, to explore Mendocino County in northern California, but still I was somewhere grisly and familiar: I was somewhere endangered. I was somewhere opposed to the slow and steady reach of a life that grows.

Deforestation is uninhibited, greed-motivated, head-hunting, Western style. And the hunters and the children of the hunters will not escape the meaning of the death of redwood trees.

Our very breath depends upon the preservation of these trees, these accomplishments of freedom. And I know it's late to try and make a sensible reply to Christopher's question of so long ago.

But we'd better try.



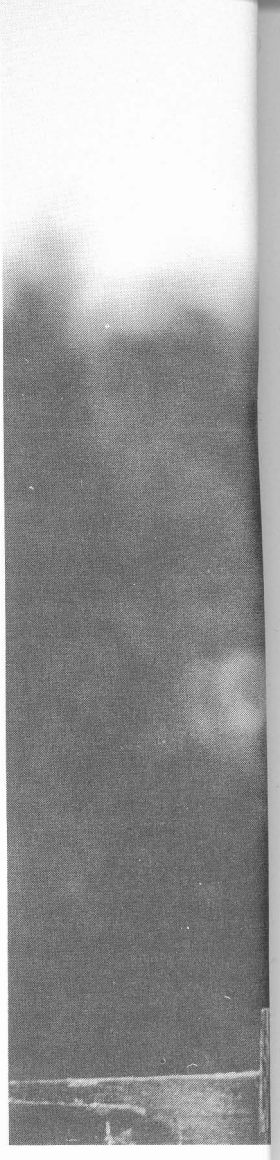
KAREN EZEKIEL

June Jordan is professor of Afro-American Studies at the University of California, Berkeley. This essay is reprinted, slightly shortened with her permission, from the August 1990 issue of The Progressive.

The Dune Community

It was not supposed to happen. 2,200 acres in the Nipomo Dunes were set aside for off-road vehicle use while other areas, damaged by motorized fun, were restored for the benefit of wildlife. But nobody told the least terns, and they settled down to nest in the midst of the danger zone.

The Least Tern Mystery



by Ken Anderson

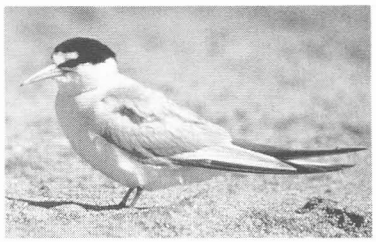
Oso Flaco Lake, in the Nipomo Dunes of San Luis Obispo County, was known as a popular foraging area for the California least tern, so Robert Burton, a wildlife researcher, was not surprised when he saw some of these endangered birds flying in from the south and heading back that way. He knew there was a protected nesting colony several miles south, on the Santa Maria River. But then he saw terns heading north, and was alarmed: They were headed straight into the Pismo Dunes State Vehicular Recreation Area. Following the birds on foot, Burton discovered two pairs were nesting in the open riding area, surrounded by off-highway vehicle tracks.

Burton called Don Patton, superintendent of the Vehicular Recreation Area. He called the ranger on duty, maintenance staff, and also Scott Johnston, least tern coordinator for the U.S. Fish and Wildlife Service. Within 48 hours of the nests' discovery, over half a mile of fence had been built, closing off about 200 acres. Another nest was found later outside the enclosure and was also quickly fenced.

Burton monitored the nests throughout the 1990 breeding season, as part of a bird and wildlife inventory he was doing for the Off-Highway Motor Vehicle Recreation Division of the California Department of Parks and Recreation. One nesting pair lost its eggs to either a coyote or a fox. Another successfully produced two fledglings. What happened to the third pair is not known, for the nest was found abandoned.

The California least tern (*Sterna antillarum browni*) is one of 12 recognized subspecies of least or little tern, three of which inhabit the United States. It is endangered in large part

ROBERT BURTON



DEPARTMENT OF FISH AND GAME

Why do the terns choose to nest in the chaos of the OHV area north of Oso Flaco lake rather than in the protected and tranquil area south of it?

because of its precarious nesting habit: in open sand areas on beaches along the coast from the San Francisco Bay to Bahia de San Quintin in Baja California. It feeds exclusively on fish, preferably in estuaries, bays, and freshwater lakes by the coast. Its population had diminished to near extinction two decades ago, as more and more people, their pets, and their vehicles populated the coast, and as wetlands were filled, polluted, and altered. In the early 1970s, only about 600 pairs of California least terns were counted.

In 1977, after both the state and the federal government had listed this smallest of the terns as endangered, the U.S. Fish and Wildlife Service adopted a recovery plan. By 1991, through a combination of protection measures, law enforcement, hard work by tern colony monitors, and favorable weather conditions, about 1,826 nesting pairs were found in 29 locations, including six in the riding area of the Pismo Dunes.

Fencing Out Cars

At the end of the 1990 breeding season, Off-Highway Motor Vehicle Recreation Division staff met with U.S. Fish and Wildlife Service staff to discuss the future. How were any future nests in the heavily used Off-Highway Vehicle (OHV) area to be protected? No one could predict whether the birds would return to the area where they had nested, clustered near the fence, or whether they would scatter more widely. Staff agreed that closing off the entire riding area for the nesting season was not an option: 750,000 people used it each year and the April through August nesting time coincided with the period of highest use. It was agreed that the Division would monitor Oso Flaco Lake and the OHV area throughout the 1991 breeding season and be ready to fence any new nesting sites. Meanwhile, the 1990 fences were removed.

The 1991 breeding season was slightly

ROBERT BURTON

ROBERT BURTON

(Above, right) Two least tern eggs at an abandoned nest site. (Above, left) Least tern enclosure.

more successful, with six nesting pairs, four hatched chicks, and at least two successful fledglings. None nested in the area used the previous year. The nests were scattered far apart, some 50 to several hundred meters from each other, so a separate circular enclosure, 22 meters in diameter, was built around each. Maintenance workers built the enclosures in 10 to 15 minutes, while Burton monitored the adult birds' activities. A small bunch of branches was put down to provide shelter for future fledglings. After the fences were up, the nest sites were monitored for several hours for the terns' reaction. In all but one case they returned to the nest. It was determined that in that one case, the disturbance had been introduced before the pair had fully established the nest.

Clues

The nesting colony Robert Burton discovered was not necessarily new—no more than America was new when Columbus discovered it. The terns may well have been trying to nest in the open riding area of the Pismo Dunes State Vehicular Recreation Area for many years. Because of the heavy vehicle use here, they are unlikely to have succeeded. In 1980, when the area south of the lake was still open to OHVs, Sharon Goldwasser and others discovered a colony of six to ten nesting pairs south of Oso Flaco Lake. Since then no tern activity has been observed immediately south of the lake—even though it is now protected against vehicle use.

This absence is extremely mystifying. The

Sleuth of the Sands

KEN ANDERSON

Robert Burton on the job.

How do you track down an egg laid by a tiny bird in a teacup-size sand hollow somewhere in a vast open dunescape? That was the challenge for researcher Robert Burton after he spotted some least terns courting on Oso Flaco Lake three years ago.

He found the solution using his eyes, ears, and feet. "I walked maybe 50 miles, searching south of the lake, where there were no vehicles, then started north," he said. "On top of a dune on the edge of the [OHV] riding area I heard the chattering call the terns make when they bring a fish [to a nesting mate]. And I thought: 'Oh, no!'" He located one nest, saw no others nearby, but figured there must be some. So he returned to the lake.

He had already noticed that the birds fed on the lake in the morning, "hung out on these old rotten duck blinds," then left in a group. "So I'd watch them until they'd disappear in the blue and then I'd walk to the place where I lost sight of them and wait till they made their next forage run. If I had picked the right spot, I would see them again. I could only watch them 100 to 300 meters at a time."

It took several days to find each nest. Burton's next problem was how to protect it until a fence could be built, and how to build a fence without frightening the nesting terns away. That year, and during the next two nesting seasons, he learned: It helps to put an empty beer bottle near the nest until the fence is built, because OHV drivers are careful of their tires; and it may be necessary to stand in front of oncoming OHV drivers to steer them away. On Memorial Day weekend 1991, one of the year's busiest weekends, when three terns nested, about 100 meters apart, "I felt like one

area south of Oso Flaco Lake appears to be perfect habitat for nesting least terns. It offers large areas of open sand, some flat areas, and some rolling dunes. Besides an occasional person on foot or horseback, nobody is likely to disturb birds here. So why do the terns choose to nest in the chaos of the OHV area north of the lake rather than in the protected and tranquil area south of the lake?

Robert Burton, a graduate student at San Jose State University, will explore the mystery this year. He will establish plots south of the lake and test two ideas. First, do the birds prefer or require sand that has been in some way disturbed? To find out, he will deliberately disturb sand in the plots to see if terns are attracted. Second, decoys of nesting terns will be set out to see if the birds can be lured to a safe area. They have been successfully deployed in other areas of California to attract terns. Both the OHMV Recreation Division of the State Department of Parks and Recreation and the U.S. Fish and Wildlife Service hope that a nesting colony can be established south of the lake and encouraged out of the OHV riding area. The riding area will continue to be monitored for least tern activity, and nests will be protected as they are found. ❐

of those Greenpeace people" who put their bodies on the line, he recalled. (Nevertheless, one nest was run over at night.) Burton also learned that you should wait to build a fence until at least two eggs are in a nest and the bird is incubating them. Before that, the activity may scare off the birds.

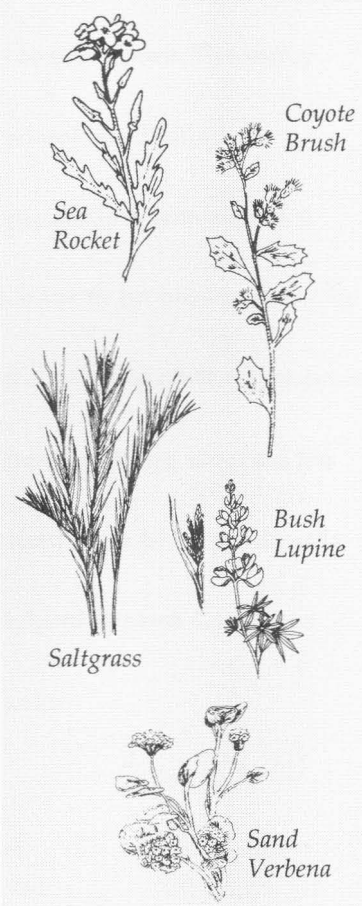
This year, probably because of El Niño, he found only four nests in the riding area. Some eggs were lost to "horrendously high winds," he said. But Burton, ever on the job 6 A.M. to 9 P.M. four days a week (mostly on his own time), found two eggs buried in the sand, abandoned. "I scooped out another nest, put the eggs in, and the nesting pair came back and hatched them," he said. If ever the birds wise up and settle in a safe neighborhood, south of the lake, nobody will be more relieved than Robert Burton. —*R.G.*

The Dune Community

Sculpting Shelter for a Lake

CAROL ARNOLD

by Ken Anderson



SKETCHES REPRODUCED BY PERMISSION OF THE CALIFORNIA COASTAL COMMISSION, COASTAL RESOURCE GUIDE, 1987.

Nestled in the Nipomo Dunes, among willows and rushes, Oso Flaco Lake is one of the last remaining freshwater lakes in public ownership on the central California coast. Together with the surrounding wetlands, it is also one of the most biologically rich and diverse natural areas in the state. The California least tern is only one of some 159 bird species observed here recently.

Until 1990, the future of this beautiful 50-acre lake was bleak. It was filling in and shrinking, largely because of the combined impacts of water diversion, agricultural development, unrestricted foot and equestrian traffic, and off-road recreational vehicle use in the vicinity. Since then, however, some of these processes have been considerably slowed down, in large part through a restoration program conducted by the Off-High-

PHOTOS: OHMV RECREATION DIVISION

Dune buggies tear up the sand at the Pismo Dunes.

way Motor Vehicle (OHMV) Recreation Division of the California Department of Parks and Recreation. The effort to extend the lake's life and habitat values has not only diminished the drift of sand into the lake, it has also provided valuable lessons in dune restoration, which may be useful elsewhere.

The OHMV Division owns, and until recently also managed, Oso Flaco Lake as part of the 2,200-acre Pismo Dunes State Vehicular Recreation Area, which extends to the north and west and is by far the most popular of the seven Off-Highway Vehicle (OHV) areas the Division manages. Three-quarters of a million people come to the Pismo Dunes each year to ride dune buggies, all-terrain vehicles, and motorcycles.

Motorized recreation has taken its toll on the dunes and the lake. An analysis of aerial photos taken between 1976 and 1990 showed that two or more acres of lake surface area have been lost to sand encroachment from the northwest, according to the *Inventory of Birds, Amphibians, and Reptiles at Oso Flaco Lake, Pismo Dunes State Vehicular Recreation Area,* prepared by researcher Robert Burton and funded by the OHMV Recreation Division. In addition, ground stakes installed and monitored to measure the advance of selected sand dunes indicated that some dunes were moving toward the lake at a rate of 18 feet a year.

The sand is coming via the ocean through a portion of the heavily disturbed and denuded open riding area of the Pismo Dunes State Vehicular Recreation Area.

Burton's study confirmed that the lake and its wetlands are valuable wildlife habitat. It identified 159 bird species, three amphibian, and eight reptile species at the lake during one year, 1990. Of these, 21 birds, one amphibian, and two reptiles are listed by the state and/or federal government as endangered, threatened, or as candidates for listing in various protective categories. Several protected plant species also occur in the wetland and the dunes.

The 2,000-acre OHV area was created in 1982, as part of an agreement between San Luis Obispo County, the California Coastal Commission, and the State Department of Parks and Recreation. About a mile of coastline and dunes (1,300 acres) to the west and south were closed to OHVs, and vegetation lost through OHV operation there was allowed to come back naturally. About 400 acres around the lake were designated as the Oso Flaco Lake Natural Area, off-limits to vehicles but within the jurisdiction of the OHMV Division. The State Department of Parks and Recreation had purchased the lake and the surrounding property from Union Oil and other private landowners in 1975 with OHV green sticker funds. In 1982

it closed the area immediately surrounding the lake not only to OHVs but also to overnight camping, and established a buffer of about a quarter mile between the OHV area and the lake.

More than this was needed, however. Sand continued to work its way inland from the shoreline, across the open dunes, eventually ending up in the lake or in the dune system advancing toward it. The Division therefore began to revegetate the buffer area to the north and west of the lake in attempts to stop the sand influx and stabilize the dunes.

Some of these early projects were not very successful, partly because inappropriate plant species were selected, partly because of the drought, and partly because sand dynamics were insufficiently understood. Further research indicated that restoration efforts should begin along the shoreline, in the remnants of foredunes, rather than in the lake's buffer zone.

Years of OHV riding had almost completely removed the foredune structure of the coastline here. The many wheels had killed vegetation, leaving bare dunes to be blown away by the wind. With the foredunes gone, nothing stopped the sand from blowing directly inland toward the interior dune system and Oso Flaco Lake. To protect the lake, the foredunes had to be rebuilt.

The foredune area had been closed to motorized recreation when the buffer area was established around the lake. In 1989, the Division installed four-foot fences on the shore side of the dune remnants. Within three months, sand collected behind the fences to a four-foot level.

At the same time, revegetation work was begun. Straw was crimped in and perennial native dune plant species were hydroseeded behind the fences. The seeds were collected locally, in the county.

The area is now stabilizing. Plants have germinated and established at a high rate, and the foredunes continue to grow as sand accumulates behind the fences. Additional fences have been installed behind the first ones. Hydroseeding is being tried in areas where it was not successful three years ago.

Different types of tackifiers (glues and binders) are being used to determine what materials best hold seeds and mulch in the windy coastal environment. Experiments are also underway with materials designed to control soil surface evaporation rates.

The significant progress in the foredunes has laid the groundwork for rebuilding the buffer area. Sand fencing and revegetation projects were completed this April. The OHMV Division signed a cooperative agreement with The Nature Conservancy, turning over much of the lake area's management to the Conservancy, which was already managing large areas of the Nipomo Dunes and showed great interest in Oso Flaco Lake.

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KEN ANDERSON

To visit Oso Flaco Lake, take Highway 1 about five miles south of the community of Oceano. Look for the small sign to the right for the road west, through farmland to the dunes. The walk from the parking lot to the lake is only a couple of hundred yards and well worth it.

The Division was established in 1982 to provide OHV recreation for the public while containing the impacts of that recreation to designated OHV areas, thus protecting areas of habitat value. It will continue its restoration program around the lake until it is stabilized, in cooperation with The Nature Conservancy, as part of its $450,000 a year revegetation effort in areas damaged by OHVs. Meanwhile, steps have been taken to diminish the impact of other traffic. Horses are now excluded from around the lake, and The Nature Conservancy is building a boardwalk to direct and contain foot traffic. Funding for the project is from the Coastal Conservancy under Proposition 70.

Regardless of how successful the Division and others are in diminishing sand deposition in Oso Flaco Lake, however, the lake will still eventually fill in, not only because some sand drift will continue but also because of the combined impacts of other natural forces and of various land uses in the vicinity.

Before dams were built on the Santa Maria River, it periodically flooded the lake, flushing out to the ocean some of the sand that had drifted in from the beach as well as some sediment brought in by Oso Flaco Creek. There was also much less sediment coming in, and less sand drifting in.

When much of the Santa Maria watershed—one of the largest watersheds in the state—was converted to agricultural production, stable vegetation was removed to make room for crops, including celery, broccoli, lettuce, and cabbage. Some fields to the south and east of Oso Flaco Lake now yield two or more crops per year. This creates areas of constant ground disturbance, heavy fertilization, and almost continual irrigation. Agricultural runoff makes its way into Oso Flaco Lake via Oso Flaco Creek, as shown by University of California, Davis, studies conducted for the OHMV Recreation Division. In addition, water is also pumped from Oso Flaco Lake for crop irrigation, then discharged back, laden with sediments and fertilizer, thus accelerating the eutrophication process. This has resulted in a tremendous increase in aquatic vegetation, especially creeping and erect emergents. Eventually, Oso Flaco Lake will turn into marsh, then perhaps shrink to a small creek meandering toward the ocean. It's all just a matter of time. ❐

Ken Anderson is a resource ecologist with the Off-Highway Motor Vehicle Recreation Division of the California Department of Parks and Recreation.

Yes In My Backyard!

Yes In My Backyard! *is a new feature for* Coast & Ocean, *introduced in recognition of the fact that saving the coast has always been, and will continue to be, a movement of citizens. Many small individual actions can mean a lot. We invite contributions from our readers.*

Going Native

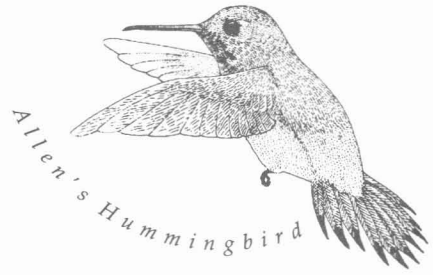
Almost all coastal residents have access to some patch of ground that can be used to help native plants and animals survive and to restore the natural environment. A yard, a strip along the driveway, a vacant lot can be transformed into a refuge for many wild species. Here we offer some tips on how to attract a variety of birds, contributed by Jeff Caldwell, native plant specialist with the Native Revival Nursery in Campbell, and by Bert Wilson, who with his wife Celeste operates Las Pilitas Nursery in Santa Margarita.

1. Forget bird feeders, unless your yard is totally barren. They only subsidize one segment of the bird population, such as sparrows, who take over native species' nest sites and interfere with their food supply.

2. Remember: gardens and yards in urban and suburban neighborhoods are a desert to insect-eating birds because of the heavy use of pesticides. You can help restore natural balance by using no chemical methods. With a native garden, that's easy.

3. Think native. Find the landscape that was there before your neighborhood was built. There may be remnants in undeveloped spots, or you will find it in reference books, such as Philip A. Munz's *California Flora*, or by consulting native plant specialists. Most of the coastline is coastal sage scrub, a highly diverse plant community. There is some closed pine forest in the northern part of the state. Local native plants grow easily, support local wildlife, and most require no water after they are established.

4. Be sure the species you select are native to your site, not just native to the state. A Sierra buckwheat is toxic to butterflies in Los Angeles, for instance. Lupine is native to the central coast dunes, but an invader in the Humboldt County dunes, displacing local dune vegetation.



5. Try for a naturalistic landscape, with layers of native plants. But be sure they will work together. Dry land species such as coffeeberry or pine cannot coexist with riparians, such as willow and elderberry. Most coastal dwellers do not have streams on their land, so they will want to stay with the dry land vegetation. Those who do should plan a transition zone, with transition plants, such as coast live oak.

6. Use no nitrate fertilizer. Mulch instead. Usually, once a summer is enough. You can use the trimmings off plants, should you decide to trim them, or use commercial bark mulch.

7. No scrap of dirt is too small. A couple of feet along the driveway might support fuschias, or monkey flowers, for instance, and bring in hummingbirds.

8. Cluster plants with like requirements for water and sun. If you already have an established garden, follow this rule when planting natives among existing plants.

9. Enjoy your garden. You may have planted to attract birds, but you will find that the garden is satisfying for many other reasons. And it requires almost no work, water, or further expense.

A few sources for native plants and advice:

Tree of Life Nursery —*retail on Friday, 9 A.M. to 3:30 P.M., $5.50 catalog*
P.O. Box 736
San Juan Capistrano, CA 92693
(714) 728-0685

Las Pilitas Nursery—*mail order, wholesale, retail one day a week, price list free, catalog $4.00*
Las Pilitas Road
Santa Margarita, CA 93453
(805) 438-5992

S and S Seed Co.—*$100 minimum order*
P.O. Box 1275
Carpinteria, CA 93013
(805) 684-0436

Theodore Payne Foundation—*Wed.-Sat. retail, $2.00 for price lists of seeds, plants, books*
10459 Tuxford
Sun Valley, CA 91352
(818) 768-1802

Moon Mountain Wildflowers
P.O. Box 34
Morro Bay, CA 93442
(805) 772-2473

Native Revival Nursery
855 Emory Ave.
Campbell, CA 95008
(408) 374-7349

Yerba Buena Nursery—*catalog $1.00*
19500 Skyline Blvd.
Woodside, CA 94062
(415) 851-1668

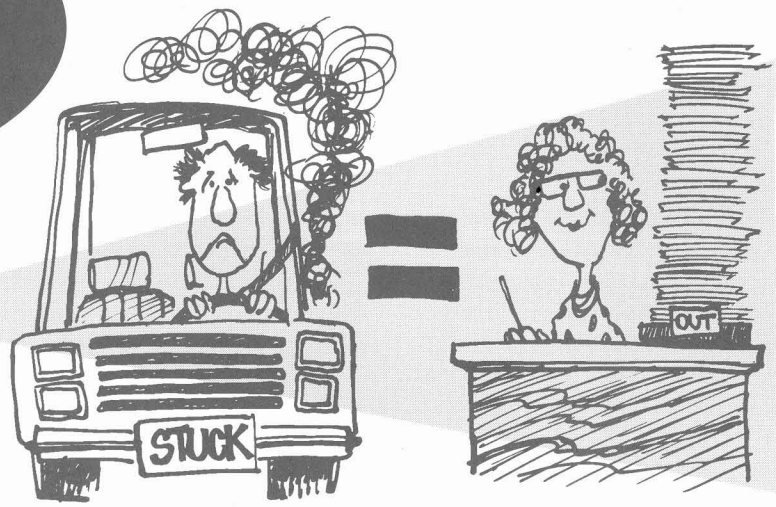
Wild Bird Center—*advice on birds*
926 El Camino Real
San Carlos, CA 94070
(415) 595-0300

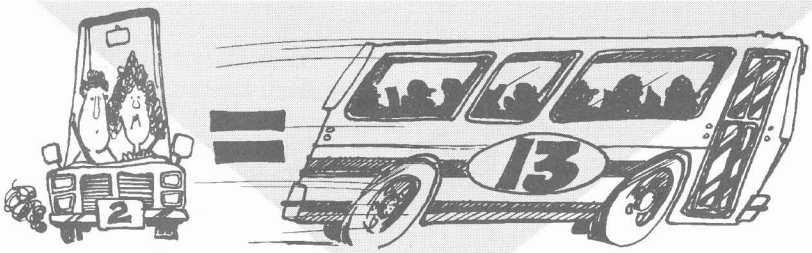
Larner Seeds
P.O. Box 407
Bolinas, CA 94924
(415) 868-9407

AUTO EMISSIONS arithmetic

DRAWINGS BY GEORGE RUSSELL

Every day, the time California's motorists spend delayed by traffic jams is equivalent to 50 people working full time for one year.

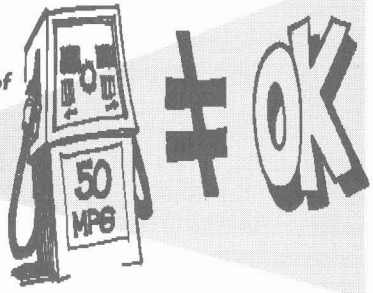


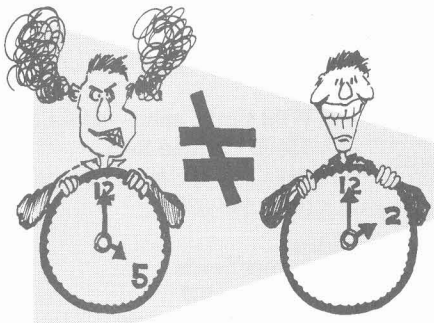


Today's average auto carrying two people has about the same energy and carbon impacts as an average urban transit bus carrying 13 people.

A five-mile trip produces almost as much air pollution as a trip twice as long because of the high quantity of emissions resulting from starting the engine. So frequent short trips (characteristic of city and suburban driving) are just as significant as the total number of miles traveled.

Even significant increases in cars' miles-per-gallon efficiency (i.e., to an average rating of 50 mpg) will not substantially lower total fuel use or carbon emissions from today's levels unless growth in vehicle miles traveled is also curtailed.





Traffic jams make more than your blood pressure rise: When two ten-mile trips are compared, one taking 11 minutes and the other taking 30 minutes, the second trip, with a 19-minute delay, can increase running emissions as much as 250 percent, to say nothing of the fact that it's a much less efficient use of gas.

GREENHOUSE UPDATE

Get Out and Walk

In the wake of Rio's environmental summit conference, a little-noticed report on global warming, published in late 1991 by the California Energy Commission, calls out for attention and response. It states that California put 310 million metric tons of carbon dioxide into the air in 1988, more than 12 nations, including Mexico, France, South Africa, and Australia. In fact, California accounts for about 1.5 percent of total world carbon emissions and about 6.5 percent of the U.S. total, according to the California Energy Commission's report, "Global Climate Change: Potential Impact and Policy Recommendations." For the year 2009, the state's carbon emissions are expected to rise to 184 million tons, a 32 percent increase since 1977.

What can you do to shrink California's contribution to global warming? Stop driving your car. The report notes that the state's transportation sector is by far the biggest culprit. So the next time you get behind the wheel, consider the facts noted on the page on your left, culled from the Energy Commission's report.

In our Fall 1989 issue, we offered highlights of the Energy Commission's interim report, "The Impacts of Global Warming on California," which projected potential effects on plant, animal, and human health. The 1991 report forecasts some of the economic consequences of global warming on the average California citizen's pocketbooks. So if you think this is somebody else's problem, consider a future with:

- Higher prices—for water, electricity, wood, fuels, farm products, and for goods requiring input of any of these.
- Changes in trade—resulting from changes in the availability and prices of some goods, and changes in the overall global economy. Some researchers estimate that the climate changes resulting from an effective carbon dioxide doubling will cut global economic growth by 3 percent per year.
- Changes in demographics—as a result of an increase in economic and environmental refugees from areas in the world that experience significant climate drying, warming, or economic disruption. This may be particularly significant for areas in North America, where immigration to California may be easy. Emigration as a result of these trends must also be recognized. A larger gap between income levels and economic strata within California may result.
- Shift of investments—from normal investments in the economy to investments necessary to accommodate climate change, thus reducing available capital necessary for maintaining a robust and growing economy.
- Greater investment risk—as a result of climate circumstances outside the experience of most investors. This could cause upward pressure on interest rates and cost of capital, further constricting the availability of discretionary capital.

A healthy economy should be able to accommodate any one of these changes. A healthy economy is, however, built on a foundation of stability and predictability. Global warming and its effects will lead to more instability and unpredictability.

For a free copy of the two-volume report (250 pages), write to the California Energy Commission, Publications Office, 1516 Ninth St., MS 13, Sacramento, CA 95814-5512, or phone (916) 654-5200.

Breathing Easier in L.A.

The air has been cleaned up considerably during the past decade, thanks to strict industrial emission controls. Further improvements, however, will depend largely on reducing automobile emissions.

Air pollution in the South Coast Basin declined by 50 percent in the past decade, and peak ozone levels dropped by 25 percent between 1981 and 1991, the California Air Resources Board reports. Excessive ozone was recorded in the basin on half as many hours as in the previous decade. But though this is good news, it is not good enough. "Southern California's ozone levels are still triple the state's standard for safe public health," says Jerry Martin at the Air Resources Board. A composite look at smog levels throughout the state's coastal cites found that ozone standards were still exceeded during 200-400 hours a year. "In most major cities in California, 50 percent or more of the air pollution is caused by tailpipe emissions," said Martin, "so the biggest single impact a person can have is to cut down on driving."

Book Reviews

L.A. Basin Basics

The Amazing L.A. Environment: A Handbook For Change, *by Mary Nichols and Stanley Young. Natural Resources Defense Council and Living Planet Press, Venice: CA: 1991. $6.95, 145 pp*

Checking out the cover of *The Amazing L.A. Environment*—with its surfer, palm tree, and howling coyote—I thought the book was for bubble-heads. But when I started reading, I found 145 pages of tough-minded, exemplary, condensed information.

With blocks of text, maps, diagrams, and cartoons, the authors—Stanley Young, a Los Angeles-based journalist, and Mary Nichols, senior staff attorney and director of the Los Angeles office of the Natural Resources Defense Council—describe the mega-housekeeping problems we have created for ourselves on this coastal plain that 14 or 15 million humans share with other life forms. Nichols and Young speak bluntly and name names: "Los Angeles County continues to dump partially treated sewage into Santa Monica Bay, relying on legal tactics to delay a final EPA decision to go to a cleaner process known as 'full secondary treatment' . . . Instead of making excuses, county engineers ought to be working on ways to clean up the Bay and just do it."

But they are not too blinded by anger to note success when they see it: "The Southern California Gas Co. is . . . hard at work on developing fuel cells, an almost pollution-free alternative to energy production . . . [It] has one of the highest passengers-per-ride ratio of any carpooling organization in the basin."

The book opens with a map that reinforces the importance of the mountain ranges that cut off Los Angeles from the rest of the continent and have such a powerful effect on our lives. The map is followed by the "Amazing L.A. Time Line," which proceeds from roughly 700 million years ago—"Earth's permanent crust forms"—and projects, hopefully, to the year 2020—"Air quality best in basin for a century." Salient moments noted along the way include: for 1888, "L.A. county population shoots up to 50,000 in real estate boom;" for 1959, "A.J. Haagen-Smit, scientist at Cal Tech, identifies the photo-chemical reaction that produces smog."

The book then divides into seven chapters, dedicated to water, air, energy, garbage, sewage, oceans, and wilderness and parks. Each describes a hypothetically oblivious southern California family trashing a particular resource, then gives a brief portrait of "The Way We Were." "For many hundreds of years the marine life in these coastal seas sustained the densest concentration of Native settlements on the continent," the oceans chapter starts. Today, "Dolphins, whales, and sea lions along the Southern California Coast . . . have the highest level of DDT and PCB concentration in the world."

The Amazing L.A. Environment is not, however, a book of regrets. Each chapter lists steps that individuals and communities can take. Phone numbers, addresses, and reading lists are given. Nichols and Young are far too intelligent and experienced to minimize the task in front of us. Their triumph is that they make the reader feel that it can be done. "A handbook for change" is just what it is.

Reviewed by Lewis MacAdams, who is a member of the board of directors of Friends of the Los Angeles River.

Land Trust Tools

Farmland Forever, *a videotape by Florentine Films for American Farmland Trust, Washington, D.C.: 1991. $20.00, 17 minutes, 44 seconds*

"Farmland Forever" is a brief introduction to a complex topic. A 17-minute video cannot begin to cover all the issues involved in selling development rights to protect farmland. But that was not the intent. This tape, made for American Farmland Trust, a national nonprofit farmland conservation organization, was designed to appeal to agricultural landowners and to serve local land trusts and other organizations trying to protect open space and farmland.

Five farmers tell in plain words how they have been able to stay in farming in the face of intensifying urbanization and rising land prices by selling their development rights. One is a dairy rancher in Marin County, another is an apple grower in the Connecticut River Valley, and three are berry farmers in upstate New York.

As the camera pans across green rolling hills and grazing Holsteins in west Marin County, we are introduced to Neil McIsaac, whose 380-cow operation is typical of the dairy ranches that give coastal Marin its rural character—only a few miles from the edge of expanding San Francisco Bay cities. Leaning on his tractor, McIsaac talks about the economic realities of ranching in an area where an 80-acre parcel with a house sells for $850,000—a price no farmer looking for dairy pasture could pay. A local agricultural land trust, however, has made it possible for some dairy ranchers to compete with urban development by offering to buy development rights to farmland. Not only is the land permanently protected for agriculture, but the cash helps farmers stay in business.

In the Connecticut River Valley, where the Williams family—Gordon, Mary Beldon, and their son Darryl—has grown apples for ten generations, Gordon tells how the sale of development rights provided $600,000 for capital improvements on their farm, including the installation of manure recycling equipment. In upstate New York, berry growers Mo Tougas and Kay Davidian sold their development rights to keep a small farm community intact. "I didn't need the money," says Davidian, ". . . I love the farm."

Besides being informative and persuasive, "Farmland Forever" is also entertaining. Original music and the lilting guitar of blues picker Ry Cooder make this video as pleasant as a walk down a country lane.

"Farmland Forever" may be ordered from American Farmland Trust, 1920 N Street NW, Suite 400, Washington, D.C. 20036; phone: (202) 659-5170. Cost is $20, plus $3.50 for shipping.

Reviewed by Briggs Nisbet, a consultant to the Conservancy's agriculture program.

Land Trusts in America: Guardians of the Future, *Land Trust Alliance, Washington, D.C.: 1992. $14.50, 14-minute videotape*

This 14-minute slide-to-video presentation from the Land Trust Alliance, the nonprofit clearinghouse for more than 900 land trusts nationwide, is designed to explain land trusts and their accomplishments to the uninitiated. The vocabulary is nontechnical, the examples are simple, and the effect on the viewer is a good-feeling glow. Both the soundtrack and the photography are inspiring, with many first-person success stories and unspoiled landscapes. This strength may be a weakness, however, for audiences in California, where much of the land trust activity is on urban fringes.

The six different land trusts featured in the film have a "Back East" feel, despite the fact that one of them—the Quail Ridge Wilderness Conservancy—is in California's Napa County. The landscapes seem to be too pristine, and the people seem to be too . . . well, *patrician* to make Californians feel like they are watching something relevant. It struck this reviewer as awkward that the narration repeats the theme of a land trust as the vehicle for "the community" to unite and take action, yet virtually all members of the communities that appear in the film are white. (The three or four shots that show people of color are, in fact, of California's Quail Ridge group, which makes a concerted effort to reach people of different backgrounds, going so far as to print its brochures in three languages.)

This limitation aside, "Land Trusts in America" does a very good job of painting a positive and easy-to-understand picture of how land trusts work. It's nice to see a film on "the environment" that leaves the viewer feeling less than suicidal!

Available for $21 ($14.50 for Land Trust Alliance sponsor members) plus $4 postage and handling, from the Land Trust Alliance, 900 17th Street NW, Suite 410, Washington, D.C. 20006-2501.

Reviewed by Janet Diehl, project manager of the Coastal Conservancy's nonprofit program.

The Conservation Easement Stewardship Guide: Designing, Monitoring, and Enforcing Easements, *by Brenda Lind. Land Trust Alliance, Washington, D.C., Trust for New Hampshire Lands, Concord, N.H.: 1991. $11.00, 107 pp*

Land trust representatives and government agency staffs will find this guide a welcome reference. It treats some subjects covered in other handbooks with the depth they require. The focus is on what to do with a conservation easement *after* you've gotten it—how to document, monitor, enforce, and fund it. Author Brenda Lind draws on her experience as land agent for the Trust for New Hampshire Lands, which has acquired nearly 40,000 acres of conservation easements. Twenty experts from public and private easement-holding organizations throughout the country served on the review panel, and it shows. A conservation easement is a "perpetual" responsibility, and those who hold it need all the guidance they can get.

Available from the Land Trust Alliance, 900 17th Street NW, Suite 410, Washington, D.C. 20006-2501, for $11 ($7.50 for Alliance Sponsor Members), plus $3 postage and handling. —*J.D.*

Available Now

• Proceedings of the 15th Annual Natural Areas Conference, "Ecosystem Management: Rare Species and Significant Habitats," held in April 1990, are now available. To order the 314-page book, containing 62 articles on biological resource scarcity, mail $24.95 plus $1.50 shipping charge to the New York State Museum, Publication Sales—3140 CEC, Albany, NY 12230.

• *Hazardous Materials on the Public Lands*, Committee to Evaluate the Hazardous Materials Management Program of the Bureau of Land Management; Board on Environmental Studies and Toxicology; Commission on Geosciences, Environment, and Resources, National Research Council, 1992. 128 pp. — The Committee found "serious inadequacies" in the Bureau's management of hazardous materials and wastes on the public lands under its jurisdiction. Write National Academy of Sciences, Board on Environmental Studies, 2101 Constitution Ave., NW, Washington, D.C. 20418

Letters to the Editor

Snail vs. Snail

Editor:

Regarding your article on snails in the Winter/Spring 1992 issue, page 22, the California Department of Fish and Game did not release the decollate snail anywhere at any time to my knowledge. However, it okayed tightly controlled releases of very small numbers in a few test plots to ascertain the snail's climatic tolerances. The research was funded by CalTrans, Citrus Research Board, California Association of Nurserymen, and University of California.The Fish and Game Commission, upon the advice of a Fish and Game biologist, Larry Eng, denied permission to release the decollate in any county where it did not already occur.

I can cite many good biology and field studies by Fish and Game biologists precirca 1975, but in my view political considerations increasingly seem to take precedence over scientific inputs. In part this may be due to "competition" between state and/or federal agencies. I see absolutely no logic in allowing feral horses and burros to damage the fragile desert ecosystem. Nor do I agree to predator trapping in largely nonagricultural regions. My wife and I live in a rural area south of Hemet. Coyotes and bobcats are needed to keep rabbits down. After trappers move through the area, coyote songs virtually cease, and it's not long before rabbits greatly increase, thereby greatly complicating our gardening.

To wrap up the snail thing: orchardists, landscape managers, homeowners who have used and continue to use the decollate to control the brown garden snail are satisfied with the results, even though some attitudinal changes were required to accept rational tradeoffs.

T.W. Fisher

T.W. Fisher is biological control specialist emeritus, University of California, Riverside.

What's Black and White and Read All Over?

Editor:

Regarding your photo quiz of the Winter/Spring 1992 issue, we are reasonably confident that those zebras are grazing on the coastal terraces of the Hearst Ranch in San Luis Obispo County.

I had the pleasure of observing nearly a dozen stallions standing amidst a mass of spring wildflowers and profiled against a sky purple with rain clouds in the late afternoon sunlight a few weeks ago. Be advised that I find your publication very informative and useful, and circulate same to my staff here in the south half of Fish and Game's Region 3.

A quick, allegedly true anecdote about those Hearst Ranch zebras. According to an acquaintance of mine on the California Highway Patrol in San Luis, one rainy night a few years ago they assisted a drunken motorist out of his car in the ditch alongside of U.S. Highway 1 below Hearst Castle. The very shaken inebriant was muttering away about never, never drinking and driving again, stating that he was so potted that he had swerved to avoid collision with what he thought was a zebra standing in the rain-shrouded roadway in front of him. According to my CHP officer friend, the officers agreed not to tell him he in all probability did see an errant zebra, if this would keep him off the bottle. . .

Thanks for a fine publication.

Bruce G. Elliott

Bruce Elliott is Region 3 supervisor of Fish and Game's Wildlife Management/Natural Heritage Division.

Conference Log

Continued from page 5.

and got a lot of rejections," he said. "Of the Asians, no one wanted to get involved. Blacks were working all the time. We got about 30 kids [to meet and brainstorm ideas for the creek]. And they became a channel to the adults." Then he learned that the culturally mixed neighbors had different ideas about what should happen on the creek. Eventually, agreement was reached on the first steps to be taken. Now, however, the project is snagged on inadequate funding.

Protecting rivers and riverside greenways brings economic benefits to communities, as well as enhancing their natural, cultural, and recreational resources, according to Ray Murray, chief of the division of planning grants and environmental quality, Western Region of the National Park Service. The Park Service's resource book, *Economic Impacts of Rivers, Trails, and Greenway Corridors*, is available from the Western Regional Office, 600 Harrison St., Suite 600, San Francisco, CA 94107-1372.

Upcoming Conferences

Urban Waterfronts 10, the annual fall conference of the Waterfront Center, will be held October 15-17 in the Hotel Washington in Washington, D.C. Participants will discuss the role of piers, amusement parks, water parks, and playgrounds; public accessibility, including disabled access; and waterfront interpretation and living. Registration costs $300 for members and $350 for nonmembers. For information, call the Waterfront Center at (202) 337-0356 or write to 1536 44th St., NW, Washington, D.C. 20007.

The first statewide conference of the California Science Teachers' Association will be held October 2-4 at the San Jose Convention Center. For information, call (916) 489-0921.

Mystery Photo

Here's a riddle: What is the name of this tidal zone dweller and how does it carve out a niche for itself? Provide us with a correct answer and win a free subscription to your favorite magazine, *Coast & Ocean*.

JOHN INASE

JOHN BLADES

Last issue's mystery solved:

Congratulations to the 13 readers who correctly located these zebras as residents of the hills surrounding Hearst Castle in San Simeon, San Luis Obispo County. Glad you all can read between the lines.

The Romberg Tiburon Centers
San Francisco State University
1600 Holloway Avenue
San Francisco, CA 94132

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