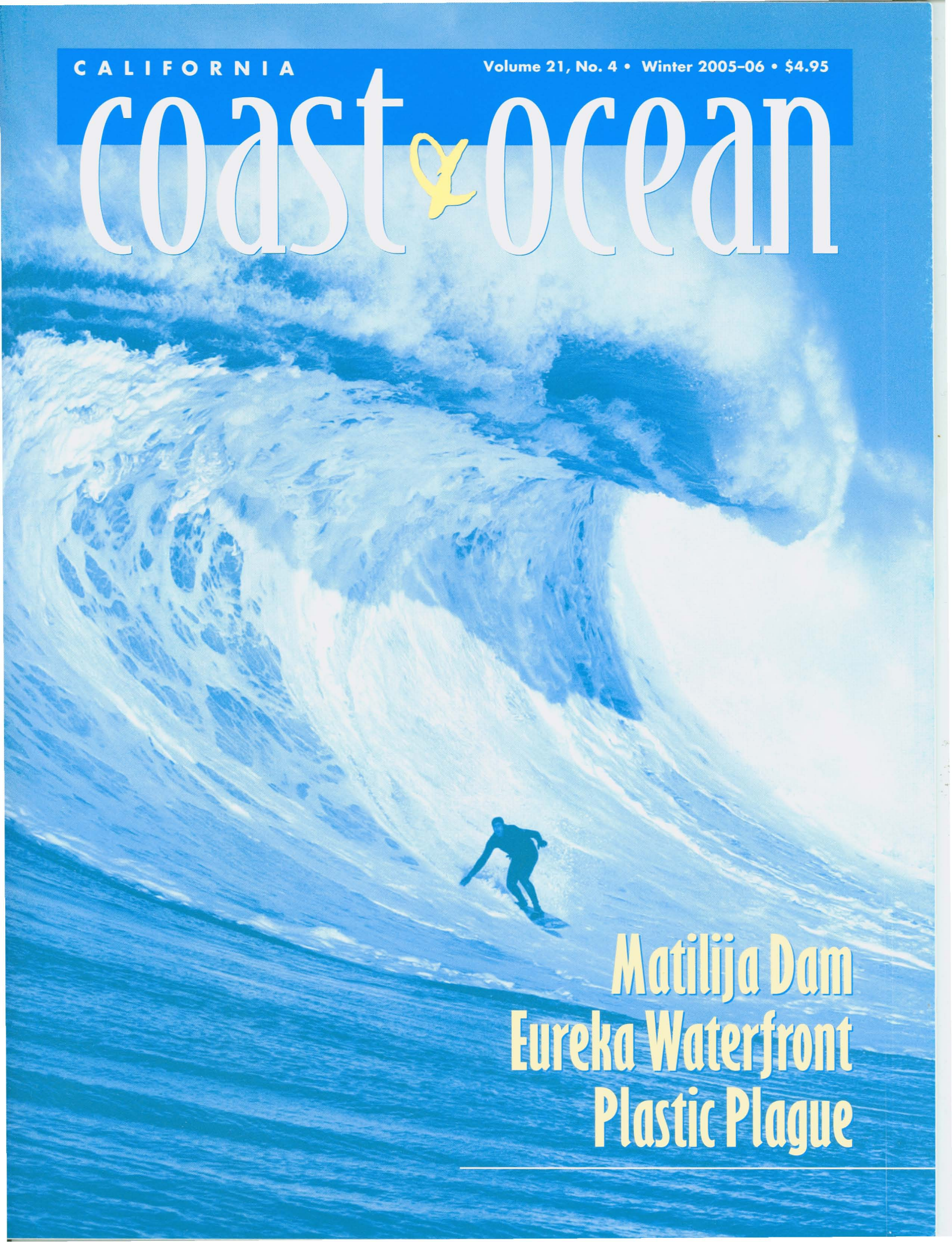
CALIFORNIA

coast & ocean

Volume 21, No. 4 • Winter 2005–06 • $4.95



Matilija Dam
Eureka Waterfront
Plastic Plague

NEW C&O WEB SITE

The new *Coast & Ocean* web site is up and running at **www.coastandocean.org**. It will be under construction for a while as we add features and tweak the design.

Our web edition includes most articles from the current print edition (some abridged), some color images, back issues, and other information.

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CALIFORNIA COAST & OCEAN
1330 Broadway, 11th Floor
Oakland, CA 94612

Subscriptions: (510) 286-0515;
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To pay by credit card ($2 handling charge), call Subscriptions or e-mail ghertz@scc.ca.gov.

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Cover photo: Dr. Benji Darrow at Maverick's surf break, January 4, 2006. Maverick's breaks over an ocean reef one-half mile off the coast of Pillar Point at Half Moon Bay. When a big swell slams into the reef, it rises and heaves towards the shore with the strength of an avalanche and forms waves that many believe to be the most challenging on the planet. Photo by Frank Quirarte (www.mavsurfer.com).

Back cover: Night flight in the Gray Lodge sanctuary, by Jessica Sanders

CALIFORNIA COAST & OCEAN

California Coast & Ocean is published by the Coastal Conservancy Association with a grant from the Coastal Conservancy.

The Coastal Conservancy is a state agency that works with the people of California to preserve, improve, and restore public access and natural resources along the coast and around San Francisco Bay.

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Articles appearing in *California Coast & Ocean* are indexed in *Environmental Periodicals Bibliography*, *Biology Digest*, and *Environment Abstracts*.

Printed on recycled paper with soy-based ink.

CALIFORNIA
coast & ocean
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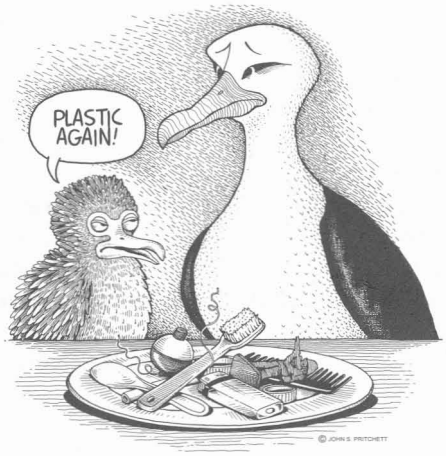


JOHN S. PRITCHETT

COASTAL VIEWPOINT

Not My Dog

My peaceful Sunday walk on the beach was interrupted by a small boy who came running at me, screaming, pursued by a small fuzzy dog. I snatched him up and he clung to me as the pooch ran round and around us, barking—no menace to me, but a terrible fright for this child with shiny black hair, perhaps six years old. Whose dog was this?

Some distance away, a teenaged couple was sauntering along the waterline. Neither of the pair seemed to have noticed the chase or heard the boy. After a bit, the little dog ran to join them. Meanwhile, from the opposite direction came a woman with a shawl over long dark hair and a girl who looked to be about ten. "My brother's scared of dogs," the girl said. I tried to explain that this dog probably just wanted to play. When the little boy calmed down I set him back on his feet.

The couple and their dog had meanwhile crossed the beach, heading toward the parking area. I raced in pursuit, called out, and they eventually stopped and turned. "Did you see what just happened?" I demanded. Her reply was: "Oh, he only chases after people who are scared of him." Something wasn't connecting. "That boy may be scared of dogs for the rest of his life," I said. "And now he may also be scared to run on the beach." She looked me up and down coldly. "I don't care," she said. "Who are you? The morality police?" They walked away.

I was angry. How could someone be so callous toward a child? Perhaps this was just a case of a teenager being oblivious to what was around her, then reacting defensively to a gray-haired stranger who chased her down with a reprimand. But as I thought about the incident in subsequent weeks, it settled into a context.

We live in a culture of exceedingly busy people proceeding on separate tracks, paying little attention to others they randomly encounter. On this urban beach, a lot of people run and walk preoccupied with purpose, be it fitness or sports training, iPods plugged into their ears even as the waves make soothing music a few feet away. So is it any wonder that a young person, walking with a friend, doesn't notice what her dog is doing?

My mother would have said: "That girl was badly brought up!" But maybe her parents had no time. People in the United States work longer hours than people in just about any other country in the world. We are driven. The myth is that we can have everything we want if we work hard enough and don't let our eyes wander from our goals. That requires a hard narrow focus and has led to the outsourcing of much that used to be an integral part of daily life. A parent on the way home from work might stop at the gym, then pick up a partially prepared dinner to pop into the microwave. There is no time to cook. Nor is there time for regular family dinners, when everyone has to hurry in and out on separate schedules. (At a camp in Marin County, middle-class children had to learn about passing the potatoes and waiting until everyone is served before taking a second helping.)

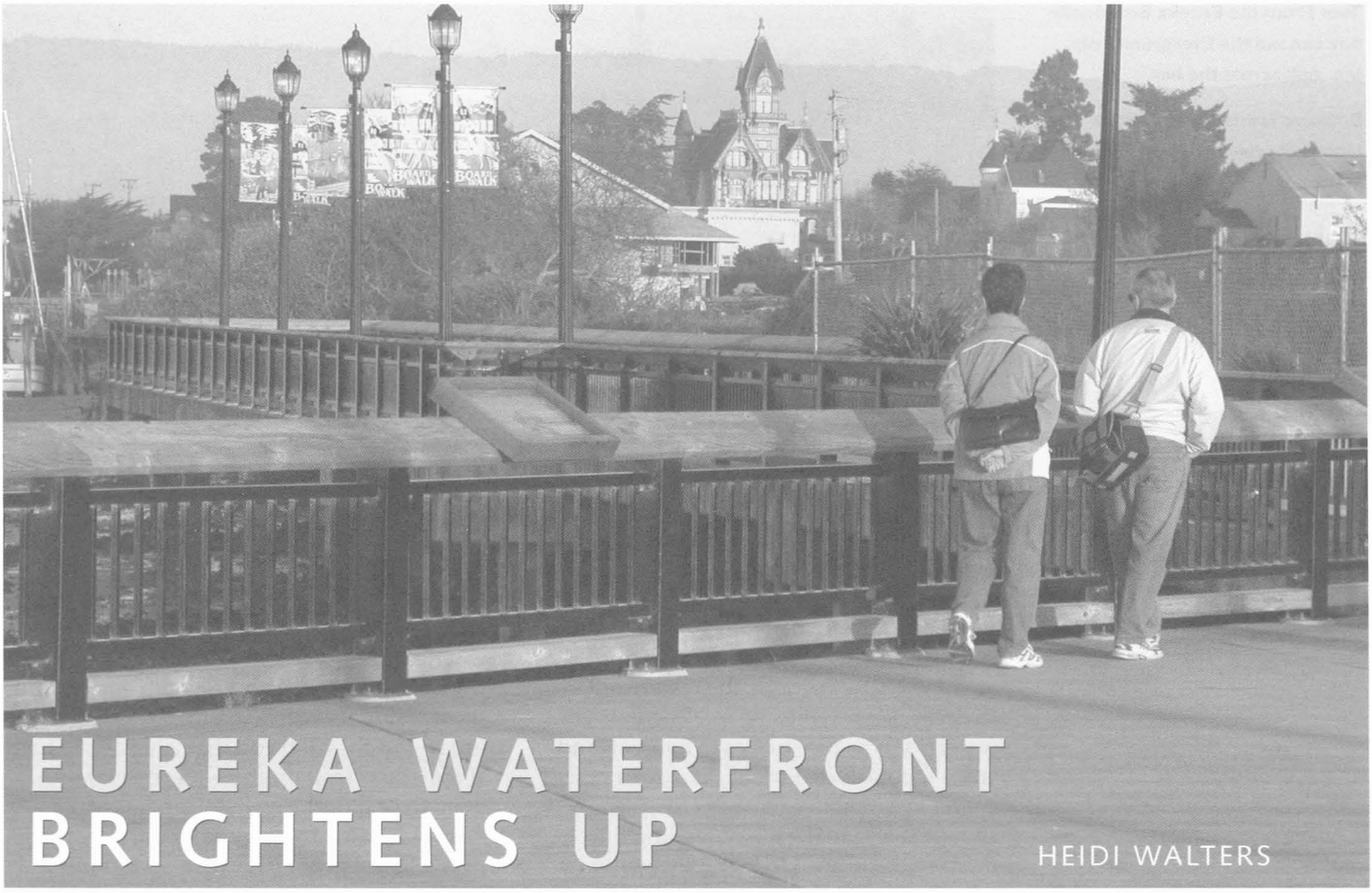
Having it all—house, dog, child, career, physical fitness—what does that mean? That remodeled kitchen with granite counters won't create a warm family feeling if nobody cooks.

The fragmentation of daily life is hard to avoid because it's inherent in the structure of today's society. The hunger for authentic experience that it creates, however, has sparked a countertrend, evidenced by interest in sustainable living, farmers' markets, green architecture, wildlife watching, eco-expeditions, or quests to track what we consume to its origins, to meet nature face to face. In this issue we feature an article by Michael Bowen, a city dweller who is a hunter. He tells why he hunts and why he hopes to take his son along, when he's old enough. He also writes that the hunting community and non-hunting conservationists need to seek common ground.

Finding common ground implies sharing, as opposed to possession or competition. And that usually means compromise. For each of us to get what we need, we may have to give up some of what we possess or desire. My daughter was approached on the beach by a man whose little daughter had been knocked over by a dog. He asked: "Do you agree that dogs need to be leashed here?" She thought about that, considered how she had loved letting her German shepherd run, way back when there were fewer people, fewer dogs, and few, if any, professional dog walkers; when we didn't know about the need to protect snowy plovers. She thought about her little boy and this man's little girl. "Yes," she said. He asked her to hold up a sign so he could photograph her with it. "Just signatures are not enough," he said, "we need faces."

Yes, faces. Let's look at each other. We might find that we like what we discover.

—Rasa Gustaitis



EUREKA WATERFRONT BRIGHTENS UP

HEIDI WALTERS

HEIDI WALTERS

Looking north from the Eureka Boardwalk toward the Carson Mansion

ON THE SOUTH END of the waterfront, near Eureka's biggest shopping mall and the string of fast-food joints that front on Highway 101, sits a big green warehouse. Inside, Ken Bates, owner of Cloudburst Fishing Company, is winding black, tarred twine onto a needle. He's rehanging a net for an anchovy fisherman. Part of the net is piled in the middle of the floor and another part is stretched end to end like a sagging tennis court net. It's a blustery Monday afternoon in February, and the shop rattles in the wind while eucalyptus leaves drop heavily onto the murky skylights.

Bates, 56, moved to Eureka from San Pedro in 1970. "My dad was a marine electrician technician, and my grandfather was a tuna fisherman," he says. He has fished since he was 15, for herring, salmon, lobster, crab—whatever the season and his schedule call for. He's also built about 40 fishing boats and, now and then, made a net for himself or other fishermen. "I love what I do," he says, adding that, of course, he ekes out a living, but that isn't why he combines fishing with craft. "A good fisherman needs to know how to build gear."

Then he tells a joke: A fisherman's wife has just given birth to a boy after several hours of labor during which the fisherman had fretted noisily about losing valuable fishing time. The doctor says, "I can tell the boy's going to be a fisherman too." "How can you tell that?" asks the fisherman. "Because he came out crying," says the doctor. Fishermen, says Bates, "are always crying."

It's just the nature of the business, he adds. But local fishermen—like fishermen everywhere—have had plenty to cry about. Over the past 30 years of the fishing industry's decline, Eureka's fleet lost the dominant place on the waterfront it had occupied for more than 100 years. Bates explains it this way: Native Americans fished these waters for thousands of years. The modern commercial fishing fleet got its start 150 years ago, when Eureka became a city, and it prospered as technology improved and fishermen were able to catch more and more fish. That created more demand from the public, and the fleet—like fleets everywhere—expanded. In the late 1970s, the fishing

Top: From the Eureka Boardwalk one can see the Evergreen Pulp, Inc. mill across the bay.

Bottom: The Humboldt State University rowing crew practices in the bay.

ARNO HOLSCHUH

industry overall began to crash as overfishing led to a depletion in certain stocks. Subsequent imposition of regulations aimed at recovery put a further squeeze on commercial fishermen. As the fisheries and associated businesses shrank, the waterfront began to decay. Meanwhile, people began to see waterfronts as nice places to live, eat, and enjoy themselves. Eureka, like other cities, began to cast about for ways to diversify its shoreline and make it pay, leading the clout-deficient fishermen to fear they would be edged out of the harbor completely by a fleet of shiny new shops.

"Tourists, visitor-serving things, non-water-dependent uses right on the waterfront—all those things affect the fishing fleets," Bates says. All it takes, he says, is for someone in one of those shops on a dandied-up waterfront, next to a "colorful" working fish dock, to catch a whiff from all that industry and exclaim, "God, the bait on those boats smells—let's get 'em outta here!" And the smaller the boats, the greater the effect. It puts them out of business.

"It's happened here in Eureka in the last 60 years," he says. "It used to be from the foot of I Street to Washington Street was all fish plants, fish unloading spots, and fishing boats tied up. So, the fishing fleet—at first we used to fight with the City." But now things are looking up, Bates says, because the City has finally worked the commercial fishing fleet prominently into its waterfront redevelopment plans.

"Now we have one of the most modern fish processing plants on the coast, and we have a great fuel dock, and we've got two relatively new marinas for yachts and fish boats," says Bates. Best of all is the Fisherman's Terminal, "a city block's worth of water frontage" set aside at the foot of C Street as a fishermen's work area. It's under construction now, four yellow cranes already in place. It will include a pier and new dock, where fishermen can land their catches more easily, as well as work buildings, a fish market, and a café. Tourists and local residents will be welcome in this area—but they'll be on the fishermen's turf. If they just stroll up the waterfront, however, they'll find less-fishy amusements.

It took Bates 18 years as a board member of the Humboldt Fishermen's Marketing Association to convince the City to include the fleet in its plans. Others in the fleet worked at it, too, for even longer. In fact, Bates says, a fellow board member recently discovered in an old file a letter written in 1955 from the association to the City, asking for a dedicated waterfront workspace for commercial fishermen.

"The fishermen have always been there," he says. "We were just forgotten."

Of course, there are still many battles to be fought, for now there are many contenders for space on the waterfront. Big-time developers, preservationists and open space advocates, the Wiyot Tribe, and the tourism industry are all jostling to have a hand in the transformation. As the Eureka waterfront begins to assume its role as the centerpiece of an area renowned for its natural beauty, it also is reasserting its place as the economic hub of Humboldt County.

HEIDI WALTERS

Views across the Bay

NANCY FLEMMING UNTIES her skiff from the F Street dock, at the heart of the quarter-mile boardwalk, completed in 2002, that runs along the waterfront and links it to the renovated Old Town through the new F

Street Plaza. The bright blue posts bearing colorful banners along the boardwalk recede as Flemming zips across the bay, headed for Indian Island, where she's lived for more than 20 years.

Looking back as the boat is about level with the Woodley Island Marina, between Eureka and Indian Island, you start to get a broader picture of the waterfront. And if you were one of those geese in that long, wavy line flying overhead, you'd be able to see how the waterfront fits into the larger setting of Humboldt Bay, and to understand the breadth of the debates over how to develop it.

Humboldt Bay, much of which is undeveloped, is encased by nature. From high up it resembles a pair of imperfect swim goggles. One eyepiece, to the northeast, is called Arcata Bay on the maps; sloughs, wildlife sanctuaries and the southern edge of Arcata huddle along its curve. A long thin connector waterway that the maps identify as Humboldt Bay links it to the other eyepiece, "South Bay," to the southwest. People just refer to the whole system collectively as Humboldt Bay.

Eureka is along the narrow strip, facing the Samoa Peninsula on the ocean side. This "North Spit" has been heavily used by industry and currently is the site of a pulp mill, a wood-chip-burning power plant, and the small communities of Manila and Samoa.

The South Bay is edged on the ocean side by the natural dunes of South Spit, which was until late 1997 the site of a notorious encampment of some 300 transients that kept most people away. Many of the transients were relocated, the spit was cleaned up, and now it is open for birding and other forms of recreation—it too has become a symbol of the transformation.

Eureka leaks southwest into residential areas. There are more sloughs in this direction, as well as the big shopping mall, the mothballed Humboldt Bay Nuclear Power Plant and PG&E's operating power plant, two side-by-side cemeteries (one for Catholics, one for everyone else), and two wildlife refuges.

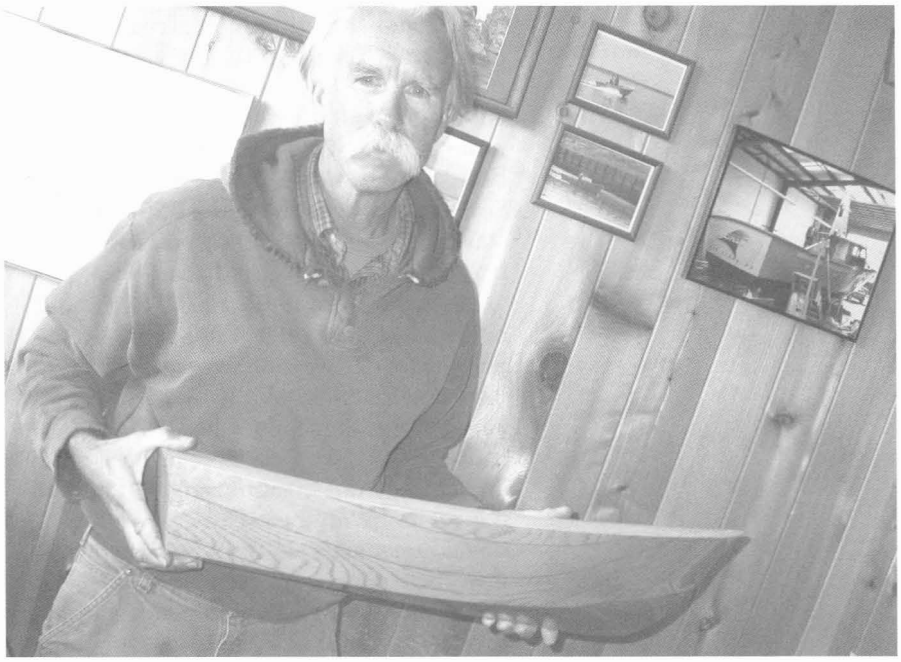
The bay is defined as much by nature as by industry—indeed, its shape has determined, to some extent, how human activity has aligned itself along it. "What distinguishes Eureka is its natural layout, with its inner reach, and the islands, and the moorings for our sports and commercial fishermen," says Flemming. "Then there's the deep outer reach, which is perfect for industrial uses and does not conflict with the inner reach. Access and diversity are the key words in everything. What I love about living here is when I'm going across the bay, I can watch the crab boats and I can watch the [Humboldt State University] rowing team, and the kayakers that look like Crayolas."

The boat reaches the island, and Flemming ties up to the dock in front of her renovated old captain's cottage. She walks around to the backyard to feed her flouncy French hens, and a deer leaps for the woods. You can hear the roar of the ocean back here, even though the Samoa Peninsula lies in between. An orange cat saunters up the wooden boardwalk. Gulls cry. More strings of noisy geese pass overhead, and great egrets and blue herons collect in the grove of trees in the field beyond.

Flemming is an artist, and her delicate paintings and some by other artists fill her cozy home. Bushy lavender flanks the cottage, beside which stands a giant old boat shed. She and her husband, Mark Staniland, a tugboat captain, travel by boat to and from the mainland and carry water back in jugs. Except for them and a couple of neighbors, the island is uninhabited and wild. Some of it now belongs, once again, to the Wiyot Tribe, for whom it is the traditional center of the world. Flemming has lived here since 1984, and you get the impression it's been a both happy and occasionally tense experience.

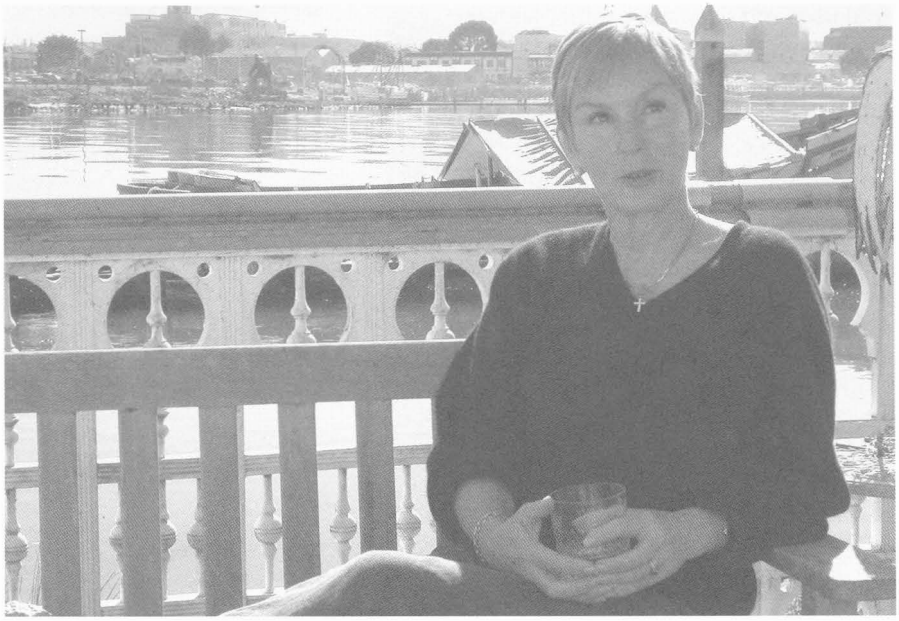
Indian Island has a tragic history. In 1860, during the tribe's annual World Renewal ceremony, a massacre took place there. The

Ken Bates holds a wooden scale model of a fishing boat he built.



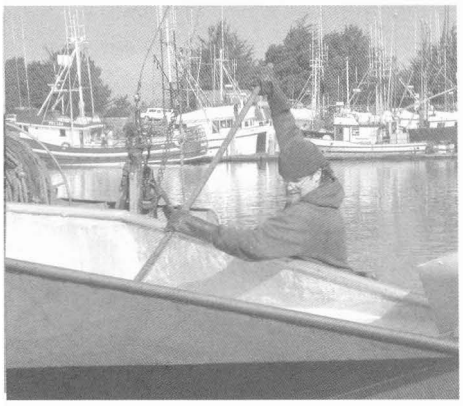
HEIDI WALTERS

PHOTOS THIS SPREAD: HEIDI WALTERS



Top: Nancy Flemming on the deck of her house

Bottom: Fisherman Mike Robnett sorts the day's catch.



descendants of the few Wiyot survivors managed to buy back 1.5 acres in 2000 for $106,000 (see *Coast & Ocean,* Spring 2000). In 2004 the City of Eureka returned 40 acres. The Tribe hopes to have the entire 275-acre island back eventually.

Nancy Flemming returns from her backyard to the front porch. Across the bay the entire Eureka waterfront is laid out for inspection. "In the 1850s, all of this was rafts and rafts of logs," she says, sweeping her arm north to south. There also were ships related to the timber industry. "There were mills, and [fishing] boats were lined up along the waterfront." It looked like that until the 1960s, and then the timber industry began its decline as resource depletion led to tougher environmental regulations on logging. That, in turn, curbed the shipping industry. Meanwhile, nature repeatedly wiped out the railroad in the mountains, and after another storm clobbered it in the mid-1990s, it wasn't repaired. Some dream of reviving the railroad and starting up a new shipping enterprise in the bay, but that dream languishes.

As mayor from 1990 to 2002, Flemming helped spur the waterfront's renaissance. She says the city began to turn away from its waterfront after Highway 101 was built landward in the 1920s. Before that, people traveled on horseback, by stagecoach, ship, and later by rail to this isolated, mountainous region. With the highway, "all the development started turning that way, like flowers to sunshine," Flemming says. "That's why the redevelopment agency formed. And in the '70s and '80s, young entrepreneurs came into Eureka. It was an exciting time." She was one of those young entrepreneurs, having arrived in Eureka in the 1980s, when she was in her early 20s and a young mother. For 17 years she ran the Gourmet Gallery Coffee Company.

New People, New Ideas

IN THE 1990S AND INTO the start of the 21st century, another wave of people began coming in: refugees from the crowded Bay Area, drawn to Humboldt County's natural beauty and Eureka's incredible inventory of Victorians and other old architectural beauties which, in a county that's been suffering from high unemployment for a long time now, were going for a fraction of what they would cost almost anywhere else on the California coast.

Tension developed as the City put a new jail in the middle of town, the grand old Eureka Inn closed, more sawmills in the county closed, and one of the two pulp mills closed, leaving the Humboldt Bay Municipal Water District with too much expensive water on its hands. New money-making schemes emerged and faltered: a plot to ship Mad River water in bags to thirsty southern California (residents fought that one off); a proposal to put a liquefied natural gas terminal along the bay was likewise rebuffed; and an eco-hostel developer briefly vied with a Hampton Inn developer for the same spot on the waterfront. Meanwhile, the Humboldt Bay Harbor and Recreation District struggled to keep the port dredged so that the fishing boats could get in and out without getting stuck in the mud, while others sought to halt dredging until the district came up with a better place than the Samoa Peninsula's beaches for dumping contaminated dredge spoils.

At the latest fights in city redevelopment meetings, over how to develop the former Union Pacific rail-switching yard, nearly 40 acres near the waterfront, quite often it's newer folks saying "preserve open space, build trails" and old-timers and their offspring saying "bring on the jobs." Rob Arkley and his wife Cherie, wealthy movers and shakers who have been investing in the waterfront and Old Town, hope to gain approval to partially clean up the contaminated railyard and build a complex with shops, residences, open space, and some chain retail stores—the biggest of which could be Home Depot. Their effort to get the zoning changed from public to com-

mercial has roused the preservationists and people who want to keep shopping local and keep out the big box stores.

But Eureka may well prove that there's no reason both preservation and economic interests can't get along. One of the enduring ideas is for a continuous trail from one end of the waterfront to the other, connecting sloughs to boardwalks to wildlife refuges while pulling more tourists into the city.

The nonprofit Redwood Community Action Agency drew up a Humboldt Bay Trails feasibility study in December 2001 with funding from the Coastal Conservancy. Mike Buettner, a founding member of the Humboldt Bay Trails Trust and a transplant from the San Francisco Bay Area, says different groups have pushed the trail idea for more than 20 years, but the City has been slow to follow through. Bits of trail have been developed: behind the Target store, at the north end of town, a little concrete path starts at the highway and ends just past the store's parking lot. Beyond lies a vast fenced private tract where the landowner will have to agree to pick up the trail. There's another bit of trail through the city's Halvorsen Park, followed by a construction zone, then the new boardwalk. Eventually, the trail will wind farther south until it meets the Elk River Wildlife Area.

"This [the trail] is a huge departure for Eureka," Buettner says. "The bay used to be the backyard of everything. It was a dumping ground. It used to be all about lumber, mills, docks. And so there is this perception in the community that the bay is there for one thing: to support the economy. And there isn't a City plan that says, 'Here's open land, here's open space.' I've been up and down the coast hundreds of times, and there's nothing like Humboldt Bay. [The other waterfront cities] are all developed, and they look the same. And you get up here and see this hasn't been touched. And new people say, 'Oh my god, you have this resource, you have this pristine bay.'"

PUBLIC INVESTMENT KICKED OFF REVIVAL

IN THE MID-'90S it was difficult to generate interest in what we were doing on the waterfront. It's become accepted now because of the huge public investment," Eureka's City Manager David Tyson said. "And because of the public investment, the private sector is now interested."

The Coastal Conservancy was an early catalyst and continued as a major contributor toward planning and realizing waterfront projects. Its involvement began in 1978, with planning grants to the City for the northern waterfront. In 2000, it provided $118,000 to the Redwood Community Action Agency for a Humboldt Bay Trails Feasibility Study; later, the agency also contributed toward planning for public access to the South Spit and for its management.

The quarter-mile waterfront boardwalk and plaza, completed in 2002 at a cost of over $8 million, was funded by $4.5 million from the Eureka Redevelopment Agency, $500,000 from the Department of Commerce, $500,000 from the Coastal Conservancy, a $1.5 million loan from the City's Water and Sewer funds, and a donation of $2 million from the Rob Arkley family. Arkley and his company, Security National Properties, are engaged in several waterfront development projects and proposals.

The $4.7-million C Street Fisherman's Terminal Dock and Work Area is being completed with $2,036,800 from the Redevelopment Agency, $1.5 million from the Coastal Conservancy, $500,000 from the Wildlife Conservation Board, $500,000 from the U.S. Department of Commerce, and $200,000 from the County's Headwaters Fund. The $11-million modernization of the city's small boat basin was funded by $3 million from the Redevelopment Agency, $3.9 million in federal grants, and $3.5 million in State grants and loans. The $4.5-million Boating Instructional Safety Center, a project of Humboldt State University, was funded by $4.25 million from the State Department of Boating and Waterways and $250,000 from the City for the site.

One of the first public improvement projects on the waterfront, the $3.3-million Adorni Center, a community center, was completed in the mid-1990s with funds from a local resident's bequest.

Years of planning are finally yielding the desired results. The long-term public investment has served as a catalyst for private development. Five projects are currently being planned or built along Eureka's previously blighted waterfront.

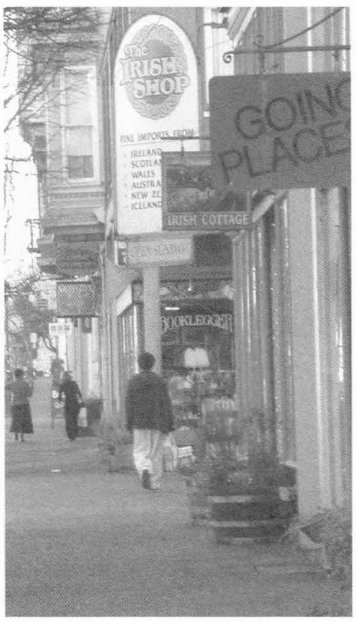
A Boost for Old Town

IN THE CITY'S OFFICES in downtown Eureka, senior planner Sidnie Olson says, "We are in an extremely exciting time right now. As a planner, I've worked for the City eight to nine years, and the entire time has been planning and permitting, planning and permitting. And now, within the next five years, we're going to see the physical changes happening." She talks about the long haul it's been, getting all the renewal projects in line.

The City first focused on Old Town, a couple of streets in from the waterfront, which in the 1990s was a typical waterfront downtown area—fallen on post-industrial hard times and neglected. The City restored and renovated many of the old buildings, and now they house shops, art galleries, restaurants, and coffee houses. The ornate, green-toned old Carson family mansion, bought in 1950 by the private Ingomar Club, still looms at the north end, a winding, cozily landscaped city street leading you to its manicured grounds. Toward the south are several blocks of quaint, renovated old buildings. Beyond that lies the industrial section of town.

Old Town looks pretty, but at night it tends to have a deserted feeling. Once the waterfront is redone, however, planners

Old Town



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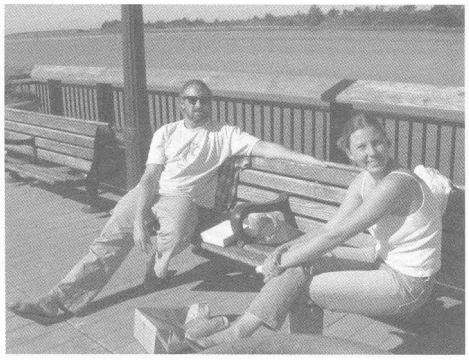


Top: Forest Service interns Bill Buckley and Heidi Klingel enjoy lunch on the boardwalk.

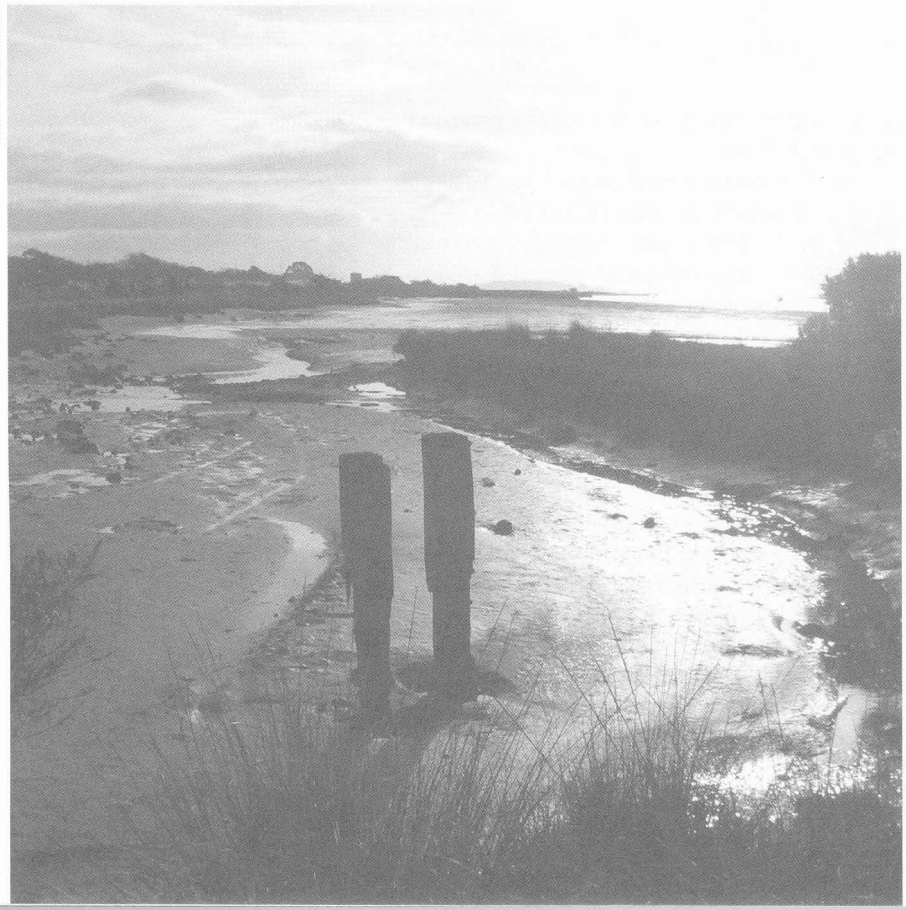
Bottom: PALCO Marsh

envision a 24-hour town where people live, work, and play—which in turn will boost Old Town's viability.

At the moment, the waterfront's developable land is a mix of completed new projects, half-built projects, vacant lots littered with weeds, old railcars, abandoned foundations, and trash heaps. A list of what's under way and what Olson says is coming promises a startling difference. A boating safety center and boathouse are under construction, and plans call for a spruce-up of Halvorsen Park, site of the annual Blues on the Bay festival and other City-sponsored events. Part of the park may be set aside for the Eureka–Humboldt Bay Hostel and Sustainable Living Center proposed by the Center for Environmental Economic Development. Next to the City's Wharfinger Building and Eureka Public Marina, completed in late 1999 and used for public events and meetings, could be the Hampton Suites Inn. And then there's the emerging C Street Plaza, with another pedestrian boardwalk that will lead into the new Fisherman's Terminal.

"You close your eyes and imagine what it's going to look like, and I see beautiful developments springing up, and contributing to the community—a place our kids can stay and get jobs," says Olson. "This is the frontier for us. This is our place to shine."

ARNO HOLSCHUH



You Can Almost Taste the Future

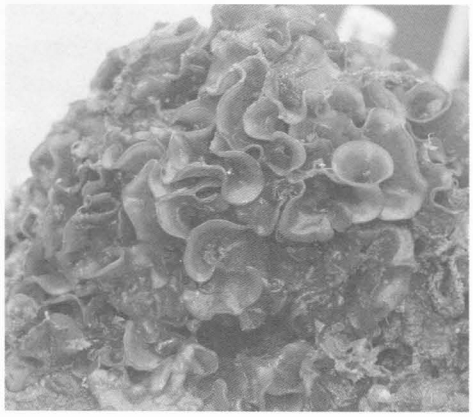
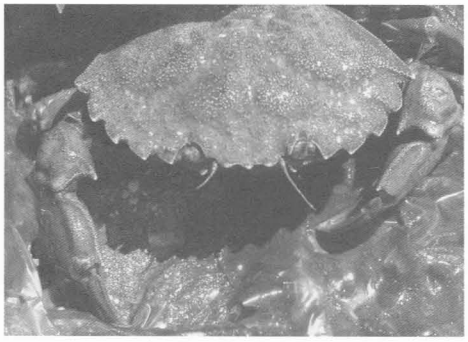
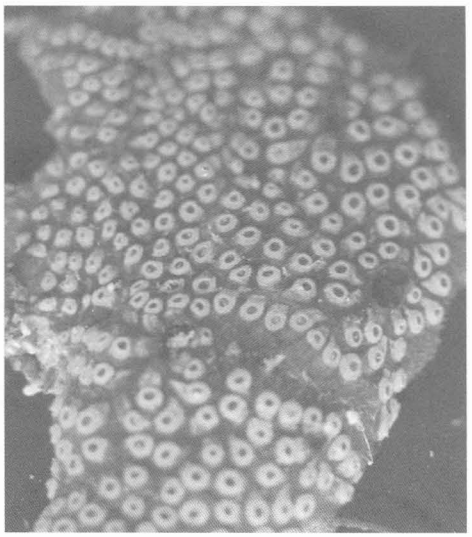
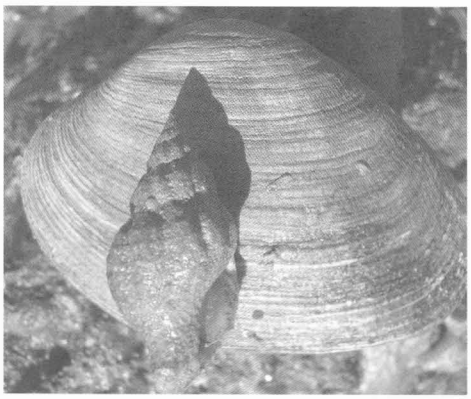
BACK ON THE F STREET PLAZA, lunchtime wanderers have ambled down to enjoy the rare sunshine on a pleasantly and shockingly hot February day.

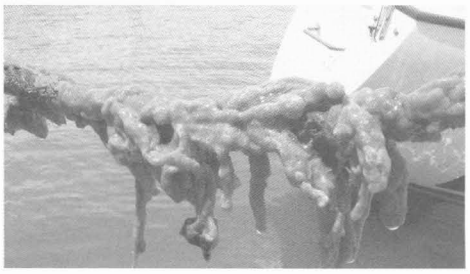
In the curve of a planter a man sits on a bench reading a newspaper, while at the harbor-side railing a couple watches a loaded crab boat motor past. Farther down the boardwalk a cluster of transients shoot the breeze. On a bench nearby, two Forest Service interns, Heidi Klingel and Bill Buckley, are just finishing the lunch they bought from a Mexican restaurant a couple of blocks inland in Old Town. "I like watching the boats," says Klingel. "It's pretty much my favorite place." Buckley says he likes the new projects he sees developing. "It's more welcoming, there's more stuff to do down here." A cop rides by on his bicycle, a slight smile on his face. A jogger trails him. Meanwhile, at the big green warehouse farther south, Ken Bates is getting ready to build a new fishing boat. The future is bright, and the Fisherman's Terminal was the key to that.

The trolling fleet is rebuilding its ranks—and the fishing is good, for the most part. "We have a really healthy winter crab fishery that never declined," says Bates. "The shrimp fishery is considered viable, as are those for flatfish, oysters, and more. And, generally speaking, in most of coastal California we have a healthy salmon fishery—except for up here." The number of salmon returning to the Klamath River has dropped so dramatically in the past three years that early this season officials were talking about a complete ban on ocean salmon fishing along the Oregon and California coast to protect the Klamath fish.

Across from Bates' workshop sits a tiny smokehouse that dates back to the 1930s. It looks like a kid's playhouse, its warped, rough brown planks capped by a peaked roof from which two rusted stovepipes curl like a steer's horns. Tacked to it is a faded hand-painted sign that says "salmon." It's idle at the moment, but a couple used it in the not-too-distant past. It looks like it could easily be used again, and it's picturesque. It seems emblematic of Eureka's embrace of its rich fishing past as it looks ahead to the future. Perhaps it will be there forever. ■

Heidi Walters is a staff writer for the North Coast Journal, *a prize-winning weekly community newspaper in Humboldt County.*



Keeping Out Marine Hitchhikers

How can you diminish biodiversity by adding species? Can addition equal subtraction? It can indeed, if the additions devour or displace what's already there.

HAL HUGHES

IN CALIFORNIA'S COASTAL and nearshore waters, areas known for exceptional species abundance and biodiversity are rapidly being turned into virtual monocultures by alien species from as far away as Asia. Most of these invasive organisms arrive in ballast water carried by ships, but many also ride in or are spread by attaching to hulls. The state is attempting to curtail further invasions, but some battles may already be lost.

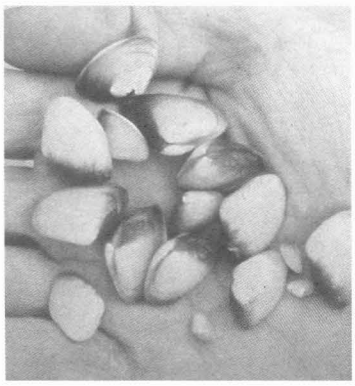
The first step, in 1999, was to adopt legislation that prohibits oceangoing vessels from dumping or taking in ballast water within state waters. "The rules [established] boil down to ships being required to discharge ballast water at least 200 nautical miles from shore," according to Andy Cohen, environmental scientist at the San Francisco Estuary Institute. Next, in 2003, the Legislature passed the Marine Invasive Species Act, which renewed the 1999 law and expanded the initial program to include shipping within California waters, and also required a study of "fouling species," organisms that attach to hulls.

Ballast water is seawater that vessels take on board as they leave port, to help maintain balance and trim. Some ships dump this water before entering a port, to reduce the depth of the vessel's draft. Before the return journey, they take in more water. These operations, which had often been performed in or near ports, are now prohibited in state waters.

Because seawater, especially along the coast, is a living soup of tiny plants and animals and their spores, eggs, and larvae, multitudes of organisms are transported

San Francisco Bay invaders, clockwise from top left: a large orange bryozoan colony (*Watersipora subtorquata*), photo by Luis A. Solóranzo; an adult male European green crab (*Carcinus maenas*), photo by Andrew N. Cohen; an Asian seasquirt colony (*Batrylloides diegensis*), photo by Luis A. Solóranzo; unidentified seasquirts of genus *Didemnum* on a rope in Sausalito, photo by Andrew N. Cohen; Manila clams (*Venerupis phillipinarum*) dug from beneath intertidal rocks, photo by Andrew N. Cohen; an Atlantic oyster drill (*Urosalpinx cinerea*) beside a hole it's begun drilling in the shell of an invasive Manila clam, photo by Gretchen Lambert

USGS



These Asian clams (*Corbula amurensis*) are commonly found at densities of 2,000 per square meter. They have wiped out native phytoplankton blooms in San Francisco Bay.

from port to port in ballast water, and this can have calamitous consequences for local ecosystems.

Non-indigenous species occur everywhere along the California coast, but the greatest numbers are found in large ports that handle international shipping. Well over 250 alien species have become established in San Francisco Bay, along with many others whose point of origin has not been determined, according to Cohen. In surveys he conducted in 2004 and 2005, he found that in some parts of the bay, nonindigenous species have completely taken over.

Ocean life has always been transported by travelers, but modern shipping has greatly increased the problem. Studies show that from 1850 to 1960 about one new species became established in San Francisco Bay every year. Since 1960 that rate has quadrupled.

Some imported species fail to survive, others fit into a new ecosystem with little effect. Some, however, explode in numbers, usually because the predators, competitors, and diseases that kept their populations in check where they came from are absent in their new habitat. Such highly successful invaders can alter entire ecosystems, devouring natives and driving them to extinction, disrupting food webs, or even changing environmental conditions on which natives rely for survival.

Mitten crabs from Asia and green crabs from Europe, clams from Asia and the East Coast, South American water hyacinth and Atlantic cordgrass are among the most damaging invaders in San Francisco Bay. The Asian clam *Corbula amurensis* has not only taken over huge parts of the bay bottom, it also seems to have altered the entire ecosystem. According to Cohen, since the Asian clam was first found in the North Bay in 1986, annual blooms of phytoplankton that were the basis of key food webs have ceased, and the zooplankton and tiny shrimp they supported have disappeared from most of the bay. The niche the plankton had occupied in the food web has since been dominated by a series of 15 Japanese zooplankton, which one after another have been devoured by the voracious filter-feeding Asian clams. "Over the last three years the pelagic fish that were supported by the native plankton have also gone into dramatic decline," said Cohen. Ecosystems are too complex for us to readily pin the blame for changes on a single species, he cautions, but these declines correspond almost exactly with the establishment of the Asian clam.

Cohen's 2004 and 2005 surveys, funded by the Coastal Conservancy, showed that invasives dramatically outnumbered natives in most areas. In sites near the mouth of the bay, 30 to 50 percent of the 80–110 species identified were aliens; near tributaries to the bay, only 20–30 species were found, and 70–80 percent were exotics; in parts of the South Bay, 90–100 percent of species identified were nonnatives.

It's difficult to determine what impact California's ballast-water regulations have had on this problem. Maurya Falkner, manager of the Marine Invasive Species Program at the State Lands Commission, believes that they have helped to slow the rate of new invasions. "Only about 30 percent of commercial ships discharge ballast," she said, "and about 80 percent of those have been compliant. There have been a few problem vessels, about five percent, mostly those coming up the coast from Mexico and South America. Some of them discharge ballast, but only 50 to 100 nautical miles offshore. Container ships retain their ballast water." Cohen is less sanguine in his view of the program's effectiveness, pointing out that statistics are based on reports from the ships rather than on inspections.

Theoretically, commercial vessels also have the option of eliminating invaders by treating ballast water onboard or ashore. However, Falkner said that no system for such treatment is yet available. The Lands Commission helped to install experimental systems in two Matson vessels, she said, "but we don't know much about those yet. There aren't even any performance standards in place."

An Edible Threat

AMONG ALARMING RECENT arrivals in California waters is the Asian kelp *Undaria pinnafitida,* best known by its Japanese name, *wakame.* First found in Los Angeles Harbor in March 2000, by August 2001 it had been spotted as far north as Monterey Bay. Wakame is harvested as food in Japan, and is also eaten here. How *Undaria* came to California waters is uncertain—it is a fouling species, but its spores could have arrived in ballast water, or it may have been introduced deliberately for harvesting. A major concern is that it might interfere with, or even hybridize with, giant kelp *(Macrocystis pyrifera),* potentially devastating the coastal kelp forests, which are among the richest marine ecosystems. Scientists fear that if *Undaria* becomes established it will be impossible to control, as a

PHOTOS THIS PAGE: STEVE LONHART/MBNMS

single adult releases millions of spores that can lie dormant on the sea floor until conditions are right for it to grow. In Monterey Bay, boaters, divers, and other volunteers have been working to find and remove new-grown algae before they can reproduce. It may still be possible to control *Undaria* there, Cohen said, but he doubts that it can be eradicated in California.

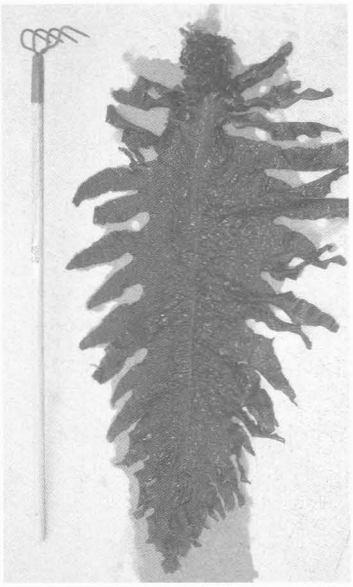
Controlling ballast water may be difficult, but it's a breeze compared to trying to eliminate fouling species—plants, algae, and animals that attach themselves to boat hulls and hard substrates, natural or manmade, such as rocks and piers. "Ballast water is a solvable problem," said Cohen. "Organisms contained in a tank of water can be killed, but fouling species are in open water." It's next to impossible to police all the boat hulls in state waters, but he thinks the worst offenders are the small number of boats that stay in one place for a long time, then move slowly to another.

Boaters have always had to scrape barnacles, kelps, and other fouling species from hulls. More recently, they have also been using anti-fouling paints—based on copper and, until it was outlawed, TBT—that are toxic to these species. These paints, however, also leach toxins into the water, harming other marine life. The Department of Boating and Waterways has been encouraging boaters to find alternatives, but nothing quite as effective as copper has been found, so avoiding these paints means that more fouling species survive to wreak further damage.

Exotic species also get into coastal waters from other sources, including imported fish and seaweeds that are released from aquaria. Aquaculture operations have been a source of imported parasites and diseases that can be devastating if they escape into coastal waters. Most native abalone species are now threatened by withering disease or by a South African parasite, both introduced from abalone culture operations.

The Coastal Conservancy is now working with the Department of Fish and Game to develop a comprehensive aquatic invasive species management plan, funded by $110,000 from the California Ocean Protection Council, that will coordinate and define the roles of multiple agencies in combating invasive species in all California waters, including freshwater. This plan will be completed by May, and then open to public input during the summer. If the plan is approved by the governor and hoped-for federal funds are obtained, it should provide a much better coordinated effort that will facilitate early detection of aquatic invaders, rapid response to species that are of urgent concern, and improved monitoring of species and control efforts. It's encouraging that so many people are working to deal with marine invaders and the problems they cause, but the challenges are nearly as vast and complex as the oceans themselves. ■

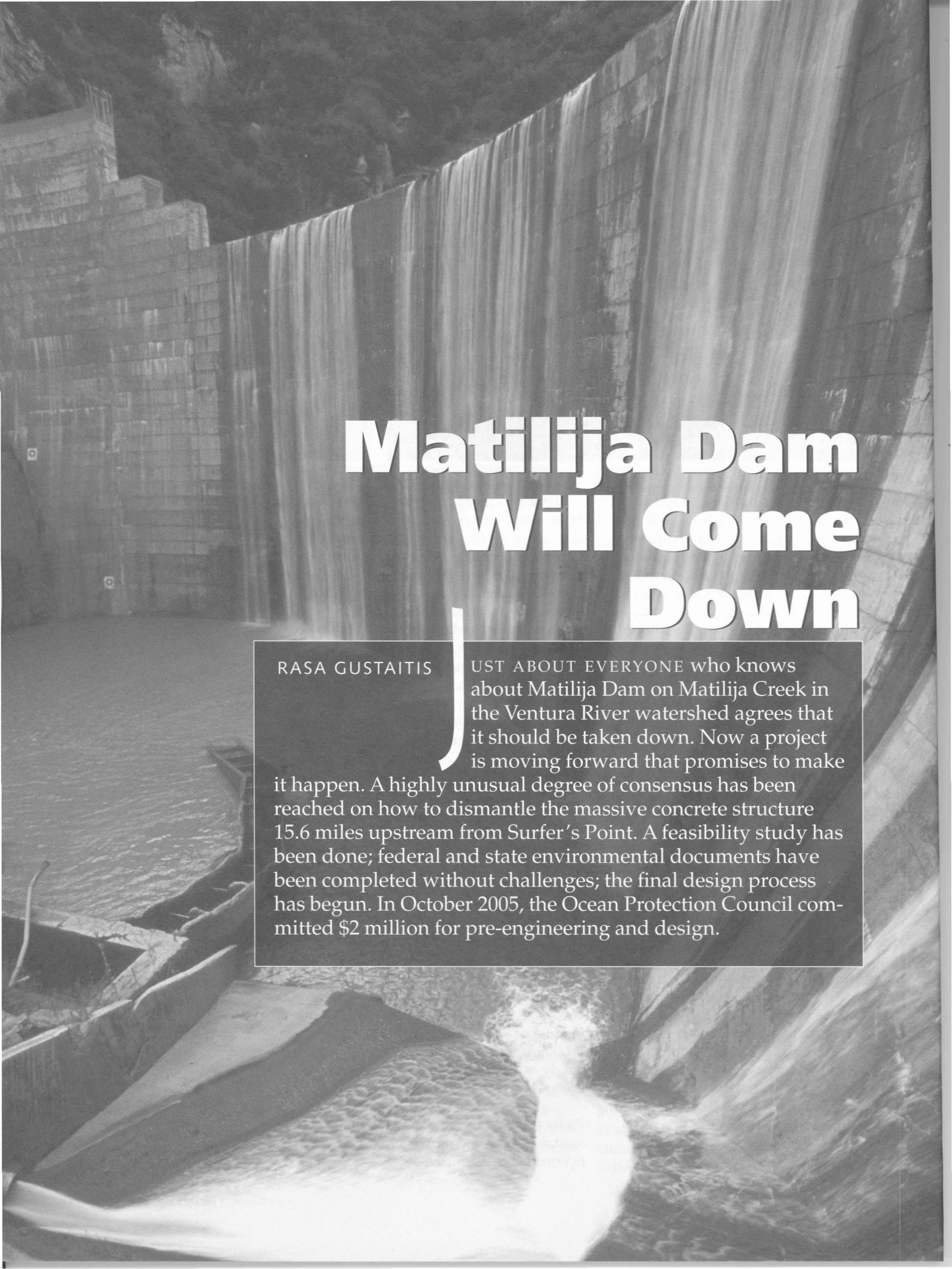
Please see our online edition, www.coastandocean.org, for links to more information on marine invasives.



Top left: A volunteer diver holds an adult *Undaria* removed from a pier in Monterey Bay.

Top right: Visitors from Japan helped collect *Undaria* as part of the City of Monterey and Monterey Bay National Marine Sanctuary management plan.

Above: A large adult *Undaria*, about two meters long, with a rake for comparison



Matilija Dam Will Come Down

RASA GUSTAITIS

JUST ABOUT EVERYONE who knows about Matilija Dam on Matilija Creek in the Ventura River watershed agrees that it should be taken down. Now a project is moving forward that promises to make it happen. A highly unusual degree of consensus has been reached on how to dismantle the massive concrete structure 15.6 miles upstream from Surfer's Point. A feasibility study has been done; federal and state environmental documents have been completed without challenges; the final design process has begun. In October 2005, the Ocean Protection Council committed $2 million for pre-engineering and design.

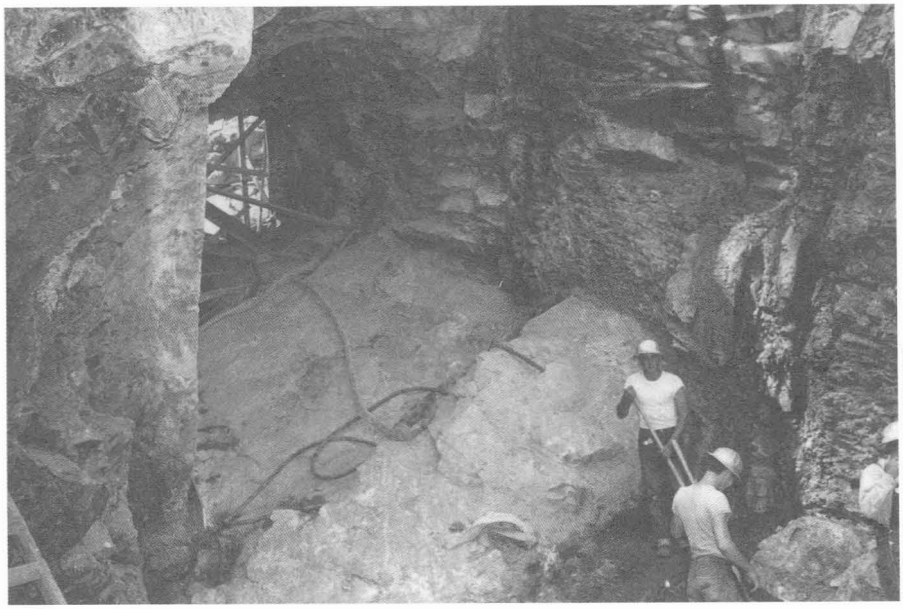
"A lot of environmental issues seem abstract—wetlands, for instance," said Paul Jenkin, coordinator of the Matilija Coalition, an alliance of community groups, businesses, and individuals committed to restoring the river system, starting with deconstruction of the dam. "But people get excited about a huge piece of concrete blocking the river, which could be removed."

In 1947, when the Ventura County Watershed Protection District (then the Flood Control District) built the dam at a favorite fishing spot on Matilija Creek, just above the point where it joins with North Fork Matilija to become the Ventura River, the builders knew it would not be useful for long. Sue Hughes, legislative analyst for the County, says a recently found memorandum from the District, written in the late 1940s, makes that clear. "When they pencilled it out—the cost of building the dam, the cost of supplying water—they knew it would only be 34 to 36 years before it filled with sediment. However, they concluded that the dam was the most cost-effective way to provide water for agricultural and residential use."

Now it's been years since the dam lost its flood control function, and its water storage capacity is barely worth mentioning. Designed to store 7,000 acre-feet, it holds less than 500. Current estimates show that its storage capacity will be zero by 2020. "Directly behind the dam we have a 140-foot-deep hole filled with two million cubic yards of mud," said Jenkin. "Stretching almost a mile upstream of that, the dam has trapped another four million cubic yards of sand, gravel, and cobble, sediment once destined to flow down the river to the beach."

What Matilija Dam continues to do to this day, however, is to kill life in the river, erode the riverbanks, and tear up the ocean shore. The dam has choked off passage to steelhead trying to reach their spawning grounds, and caused sediment-starved "hungry" water to carry away the wide beach that was once at Surfer's Point. "I grew up here. I have to tell you, the beaches here in the late '60s had hundreds of yards of sand," said Hughes.

Without the cushion of sand to protect it, the shoreline was subjected to such severe wave attacks that concrete barriers have been built to keep a waterside trail and parking lot from washing away. The dam may also be a potential safety hazard, because its concrete face has cracked. Although it is inspected annually and has been declared safe for the next 50 years, some people worry that an earthquake or other extreme event could prove otherwise.



COURTESY VENTURA COUNTY WPD

Workers building Matilija Dam, completed in 1947

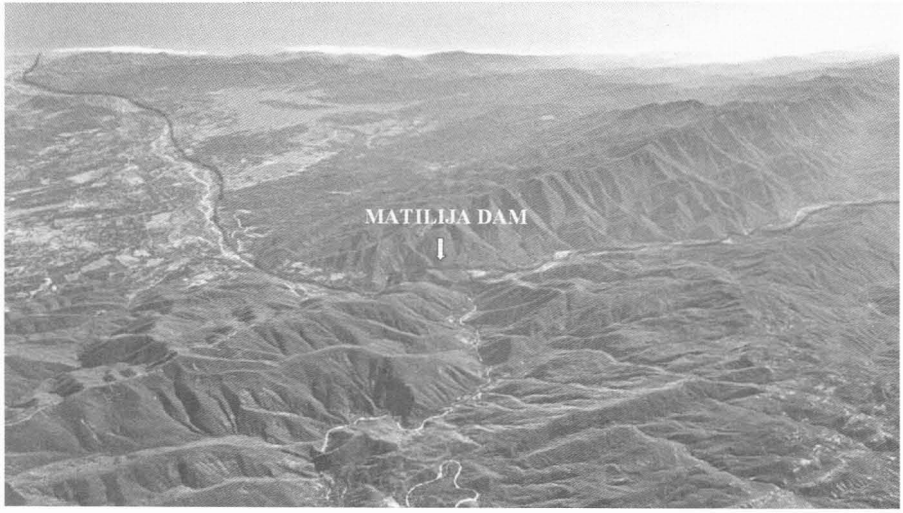
Today Matilija Dam stands as a monument to obsolete thinking, the kind that ignores the environmental effects of large projects. "It makes me think of fossil fuel use today," Jenkin says. "We know there will be long-term consequences, but we go for the short-term benefits."

The dam was designed to recharge groundwater in the Ojai Valley, but since 1956 Lake Casitas has served as the primary water supply for Ojai, as well as providing almost one-third of the City of Ventura's water. Almost half of Lake Casitas water originates from a diversion on the Ventura River located about two miles downstream from Matilija Dam.

When built, the dam was 200 feet (20 stories) high and 620 feet (about two football fields) wide, but as sediment accumulated behind it—including sand that would have nourished beaches from Surfer's Point to Point Mugu—and the concrete, under pressure, began to crack and lose strength, it was notched twice, reducing the height of the center section.

The movement to take the dam down began in the early '90s. Getting rid of it made sense to local residents who remembered the good fishing, to surfers who saw what had happened to one of the best surfing spots in the state, and to business people who saw economic benefits in a restored river that would attract recreation-minded visitors. In 1999, the County Board of Supervisors asked Watershed Protection District (WPD) staff to investigate options for removal. As the WPD launched a study, Hughes said, an important early decision

BENNETT BARTHELEMY



COURTESY VENTURA COUNTY WPD

In this aerial view of the Ventura River watershed, Matilija Creek flows in from the right to join the North Fork Matilija—which enters at bottom center—just below the dam. From there the Ventura River flows to the Pacific at Surfer's Point, and feeds Lake Casitas through the Robles Diversion, below the dam.

was to secure maximum participation, and "this commitment actually accelerated the process." The U.S. Army Corps of Engineers joined the WPD as a partner, opening the way for federal funding. Darrell Buxton, project manager for the Corps, said the project was "a tremendous opportunity for ecosystem restoration along the Ventura River system."

Goals were established: improve native habitat, restore sediment transport to the shore, improve recreational opportunities on the river, and "keep stakeholders 'whole,'" meaning that those now receiving water from the river would not get less, or poorer quality water, than they do under current conditions with the dam in place. Consensus was most difficult to achieve on this last point, as community members were most concerned about the water supply.

Several methods of taking down the dam were considered: remove it fully and either remove the sediment behind it mechanically or let it move downstream naturally; remove the dam incrementally and allow sediment to flow downriver gradually; do nothing; or—the alternative eventually chosen—take down the entire dam, stabilize sediments on the site, and use both mechanical and natural means to let it reach the ocean. Some of the fine sediments are to be slurried past the water intake of Lake Casitas to sites in the floodplain. From there, large storms will eventually carry them to the ocean.

Larger sediments (sand, gravel, cobble, boulders) will be stored above the dam site. A 100-foot channel will be excavated in the sediment behind the dam, mimicking pre-dam conditions. Larger storms will be expected to bring these stored sediments downriver. All measures necessary to protect the water-supply infrastructure and water quality will be taken throughout the project. In addition, two bridges will be modified, some levees will be upgraded, and one new levee will be installed to protect private property. Giant reed *(Arundo donax)* will be removed along the river, which will both improve habitat and increase river flow, because Arundo outcompetes native plants for water. The dam site will become a gateway for hikers into Matilija Canyon and the wilderness upstream.

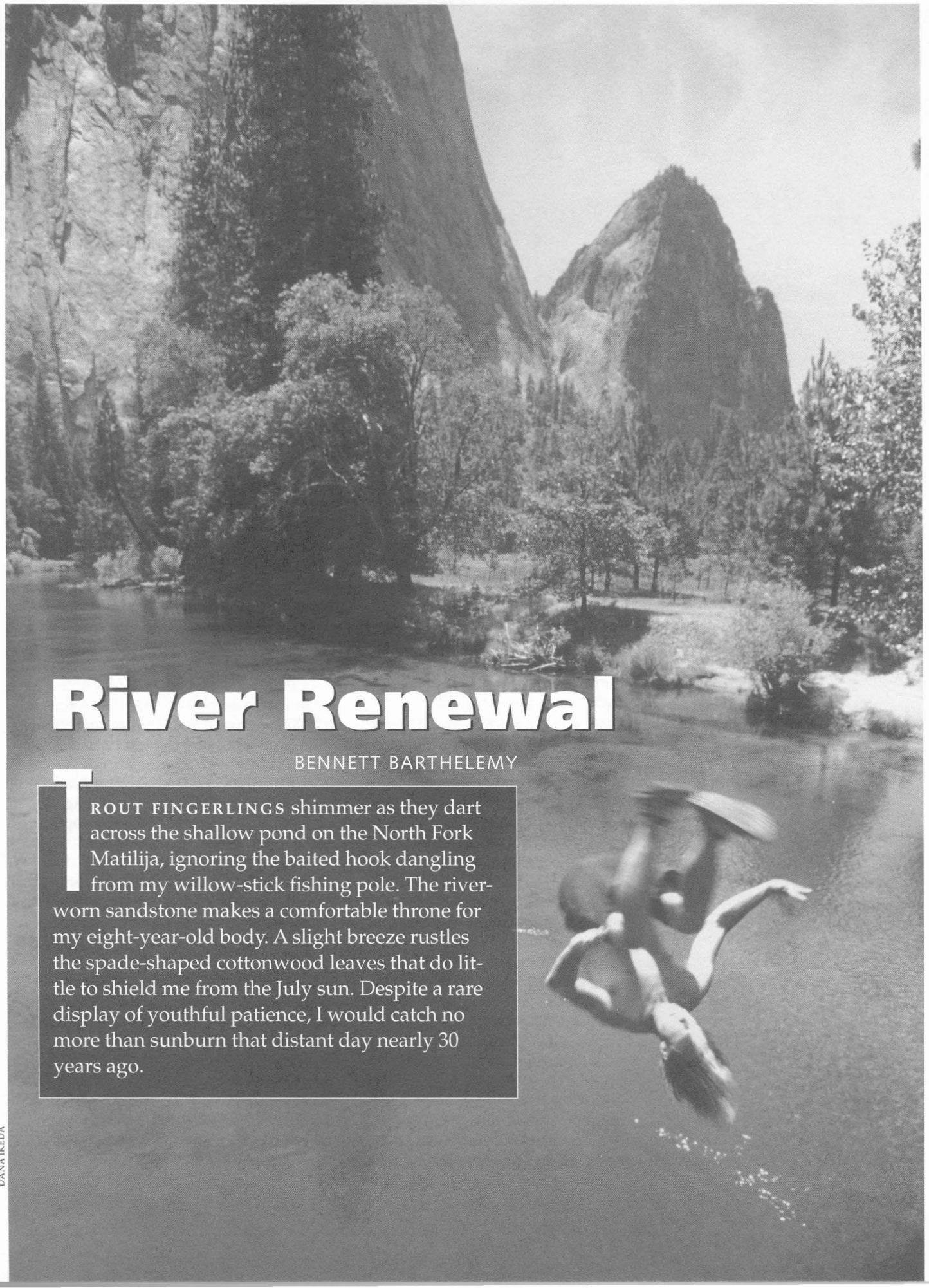
The Los Angeles District of the Corps and the WPD are proud of the speed with which the project has advanced and of the recognition it has received: It was chosen from among Corps projects worldwide (in the U.S. and 93 other countries) for the Corps' National Planning Team of the Year Award for 2004, and also received the Merit Award for Project Delivery Team of the Year for 2005. "If current momentum is maintained," said Hughes, "we will be under deconstruction in 2009, with three years to complete."

Much more money will be needed to get the job done, of course, including $8 million more to complete preparations. As a Corps project, it requires federal funding. The WPD Board of Supervisors has requested $2 million in the year 2007 federal budget, but what funds, if any, might be forthcoming from Washington is not certain. As of late March, the President's budget included $400,000 toward the dam's removal and the river's restoration. Project advocates hope Congress will provide support as well.

"It's a constant battle to keep the money coming, to keep the work going," said Jenkin. Nevertheless, the Corps and the WPD expect to be ready to begin deconstruction in 2009. To raise the $100 to $130 million needed for that work will be difficult, but not impossible. "I think we have extremely strong political support at the local level," Jenkin said. Buxton said the high level of support assures that the project will go ahead.

Word of the prospective dam removal has spread and visitors have come from as far away as Korea and Japan, where new dams are being built, but removal of some obsolete ones is also being considered. Paul Jenkin accepted an invitation to travel to Japan, where he visited rivers that had been killed by dams, but also kayaked on a living river. "It's amazing to see the contrast with a dead river," he said. "It's not easy to paint a picture of how dead most of our rivers have become, as many of the current generation have never experienced a living ecosystem."

Sue Hughes, meanwhile, has been taking groups of people up into the canyon to see how beautiful it is, and to imagine what great hikes and bicycle rides will be possible when the river again flows free from the mountains to the sea. ■



River Renewal

BENNETT BARTHELEMY

TROUT FINGERLINGS shimmer as they dart across the shallow pond on the North Fork Matilija, ignoring the baited hook dangling from my willow-stick fishing pole. The river-worn sandstone makes a comfortable throne for my eight-year-old body. A slight breeze rustles the spade-shaped cottonwood leaves that do little to shield me from the July sun. Despite a rare display of youthful patience, I would catch no more than sunburn that distant day nearly 30 years ago.

DANA IKEDA

PHOTOS THIS SPREAD: COURTESY VENTURA COUNTY WPD

Previous page: The author does a flip into the Merced River in Yosemite.
Above: Sediment behind Matilija Dam has reduced its holding capacity to less than 500 acre-feet.

After a little time, a river gets under your skin—into your blood, so to speak. A river is a circulatory system, purifying and flushing clean the body of land through which it flows. During the preceding spring I had just begun to grasp this. We had moved from Ventura to our newly purchased home on the North Fork Matilija, near the town of Ojai, in Los Padres National Forest. The house, itself a relic (built on land acquired under the Homestead Act in the 1880s), was perched atop a cliff that dropped to the creek. We drew our water near our property's northeast boundary, where a drainage fed by a spring nestled in a tight fold of the lower skirt of the high, chaparral-choked peak. To the west, Cow Creek drained the far corner of our property.

Just below my bedroom window, car-sized boulders shifted and crashed in the muddy torrent of the creek during the spring storms that spawned the memorable '78 floods in Ojai. The day before the storms, its sound had been almost inaudible, a musical tinkle.

Triple-digit summer heat waves were a blessing for a kid who loved being outside. When I wasn't fishing in the creek, I was down at the public pool below the dam. For several years, from 1978 on, my folks would deliver me for entire afternoons to this square sky-blue box with a low springboard, surrounded by a chain-link fence.

It didn't take long to realize that the real fun was not there but beyond, in the steep-walled canyon. After an hour or so at the pool, several of us would steal away to the sandstone boulders and chlorine-free water of the creek, fed by the rationings of Matilija Dam. After boulder-hopping for a quarter-mile we would reach the check dam, a spot popular with teenagers wanting to party. For us the attraction was the opportunity the concrete structure afforded for incredible jumps into a deep pool ringed with submerged boulders. Making these jumps required a hanging-ladder ascent to the top of the wall, some 30 feet above the water line. The especially bold would then hang toes over the edge of the monitoring tower, ten feet higher, and with a powerful broad jump clear the top of the check dam and hit the narrow landing zone just right—or else. (We heard that a high school kid had broken his back by missing the landing zone.) I eventually did that 40-foot jump too; however, being a cautious daredevil, I soon lost interest in the scene at the check dam. The real adventure, I found, was upstream from the pool, at the main dam.

Matilija Dam, out of sight up canyon, loomed only in our imaginations, as it was off-limits to us. No one I talked to had ever seen it. There was a rumor that kids trying to reach it had been arrested for trespassing. I *had* to go there. I persuaded another boy to come with me, and we headed upstream. When the dam finally came into view several hundred yards away, the sheer vertical wall of stained gray concrete seemed a thousand feet high—it was on a scale I could not fathom.

"Turn around now. You will be arrested," a booming voice warned. Amplified through a bullhorn from a guardhouse and echoing through the canyon, it could have been the voice of God. We immediately obeyed, trying desperately to stay out of the line of sight of whomever that voice belonged to and half expecting a sheriff's helicopter to come roaring after us.

IT WOULD BE ANOTHER TEN YEARS before I returned to Matilija Dam, along with several new friends from high school. This time we hiked in from above, threading our way through the manzanita and pungent white sage. Seeking cool, liquid relief on a scorching day, we stood at the top, on an eight-foot catwalk that was a threshold between two worlds. Just over my shoulder was 200 feet of air down to the creek and my past; in front of me was a watery unknown. Though the distance to the surface of the reservoir water was just 25 feet, we could not see into the murky depths.

My friends all jumped as I stood back, unsure. When I finally stepped off I felt horror the whole way down, imagining myself hitting some rusty rebar or culvert, or planting myself in the silty quicksand rumored to be on this side of the dam.

The thrill of visiting Matilija Dam was gone. Now it just seemed stagnant, ready for a release—not unlike myself. For the next several years I hungrily followed a path that led me far away from the water, questing for dry, vertical stone— to the world of technical rock climbing.

I DIDN'T REALLY THINK of rivers and dams again until I was in my late twenties, when I worked as an outdoor educator, first as a climbing guide for a couple of companies, then as a guide for kids on canoe trips down the mighty lower Colorado River. I read Edward Abbey to them, talked about Colorado River politics and the many dams above us as we floated on the unnaturally cold, harnessed watercourse. At trip's end we hauled the boats out in Martinez, Arizona. Within a few miles of there the water is quickly siphoned off to myriad farms and becomes a culvert-guided trickle that barely makes it to Mexico and the Gulf of California, despite a treaty that promises that a large percentage of fresh water from the annual flows will reach water-starved Mexico. When Spanish explorers arrived in the early 1500s, the mouth of the Colorado was so huge that they believed it was the fabled Straits of Anian that led to the Atlantic. The sea captain Juan de Iturbe in 1616 was convinced that California was an island, a belief that persisted into the late 1700s. I enjoyed sending the kids home with images they would have difficulty filing neatly away—images of a time when the river was wide and free, its water was clear and warmer than it is now, and no Middle Eastern tamarisk trees were constricting its flow.

While visiting my folks three years ago, I picked up the *Ojai Valley News* and was nearly bowled over by what I found. Well over a dozen articles in the small local paper were dedicated to issues surrounding the Ventura River, which emerges from the confluence of Matilija Creek and North Fork Matilija. I learned of plans to build a multi-million-dollar fish ladder two miles below the dam, and to spend more millions on eventually removing the Matilija Dam altogether. I learned that steelhead hadn't been seen in the river in decades because a major spawning ground behind the dam had been inaccessible since 1947, when the dam was built—small wonder I'd never found the fishing lucrative. Local organizations—the Ojai Land Conservancy and the Matilija Coalition among them—were working on several fronts for the river's restoration.

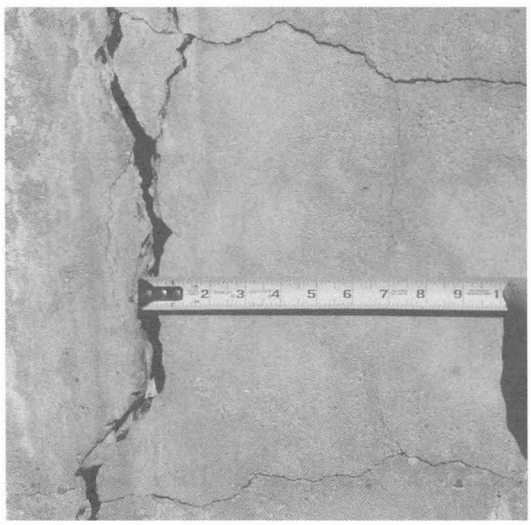
Ojai being a small town, it didn't take me long to garner a variety of opinions regarding the river, the fish ladder, and the dam removal project.

Bud Rowe, who grew up in Matilija Canyon, his family supported by orange groves, said: "You can go to the store and buy a lot of fish for $200 million. Don't get me wrong, I consider myself a sportsman, but it is just not in the books that the fish will come back in a sustained yield if you remove the dam." Rowe remembers swimming in the river and fishing for native trout before the dam was built. "Hanging Rock [just behind the dam] was the best swimming hole in the country," he declared. That spot is now under water and silt. "The dam was a boon for Ojai and especially to the ranchers," he said. "Ojai, in the summers, would often have to deal with water shortages."

Paul Jenkin, coordinator of the Matilija Coalition, has been working for a decade for the dam's removal. His interest in the project began with concern about one of the best local surf spots, Surfer's Point, at the mouth of the Ventura River, where the beach had disappeared because the dam held back sediment. The dam's removal would restore the flow of sediment, benefiting both surfers and fish.

Many complex issues surround the dam removal project, I found as I continued to talk with people involved. But it was exciting to hear so many people discussing it.

Today I live in Humboldt County, where many powerful rivers flow and where dams and water diversions have led to massive die-offs of steelhead and salmon. I often drive up into the Trinity River watershed to go climbing in the Trinity Alps Wilderness, where three major rivers begin their journeys. In summer we swim and jump from boulders into pools on the undammed South Fork of the Trinity. We watch fat coho



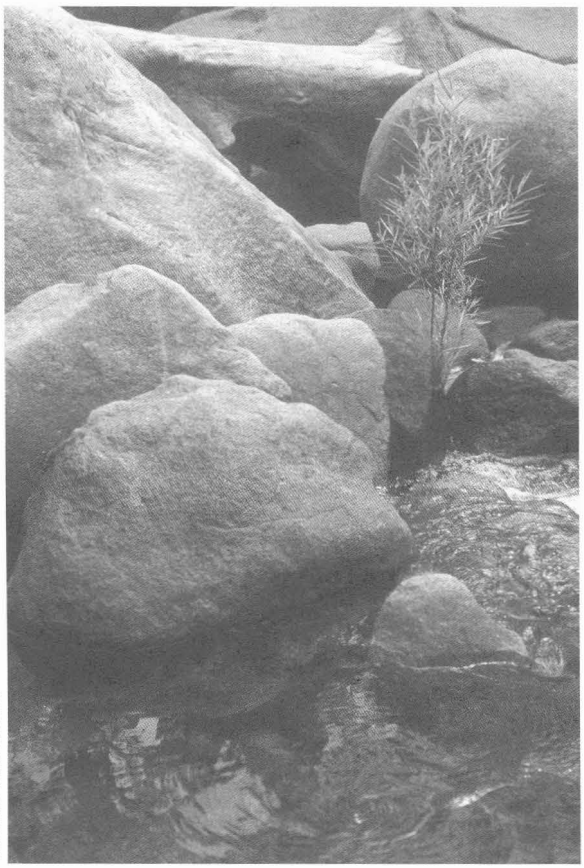
Concrete in the dam face has lost its strength and cracked. Yearly inspections indicate it is safe now, but a danger in the long term.

salmon and steelhead fanning their tails over gravel bars in the shallows as they spawn. Just up the coast, less than an hour's drive away, the Yurok people now face the effects of dams upstream of their homes on the wild and scenic Klamath River. They still live much as they have for millennia, the health of the river intertwined with the health of their culture.

In the terrain of my childhood, the Chumash had a relationship with their rivers much like that which the Yurok, Karuk, and Hupa have today with the Klamath and Trinity Rivers. The Ventura River and Matilija Creek provided steelhead and other trout for thousands of years to many prosperous villages between Matilija Canyon and the estuary. After the dam's completion, fish died behind it as the stagnant water steadily rose in temperature. The same has happened on the Klamath River, where shallower water and lower flows have caused massive die-offs.

Just about every year now I go home to help my parents meet the tough summer fire-clearance requirements. This year, while trimming the ever-encroaching laurel sumac and invasive Scotch broom down by the creek, two shimmers caught my eye beneath a small cascade. Two pudgy trout plumbed the edges of the pool, chasing stonefly nymphs. I set the handsaw down and had to smile. A recent newspaper article had mentioned that a couple of trout had been seen using the new fish ladder, and that steelhead had been seen again in a creek just north, in Santa Barbara County.

On the North Fork of Matilija Creek



BENNETT BARTHELEMY

WHEN I STARTED thinking critically about the flow of rivers and my connection to place, it made perfect sense to call Julie Tumamait-Stenslie, a longtime friend of my parents. I grew up on Julie's ancestral land, and my parents still live there. Julie's great-great-grandmother is from a village near our home on North Fork Matilija, very near the new fish ladder. I had been thinking of the connections and ties to the land I developed while hiking, running, mountain biking, and climbing throughout the hills above Ojai and Ventura. Then I thought of Julie's family and the experience of their many generations.

When her father passed away in 1992, Julie was ceremonially presented with a sacred pipe, although she was still a good way from being an elder. Today she fills many roles, including historian, storyteller, and consultant. She has shared tales of the Chumash culture with thousands of children. She is often called on to offer prayers at public events. When condors were released in Los Padres National Forest not long ago, Julie was there to wish them strong wings.

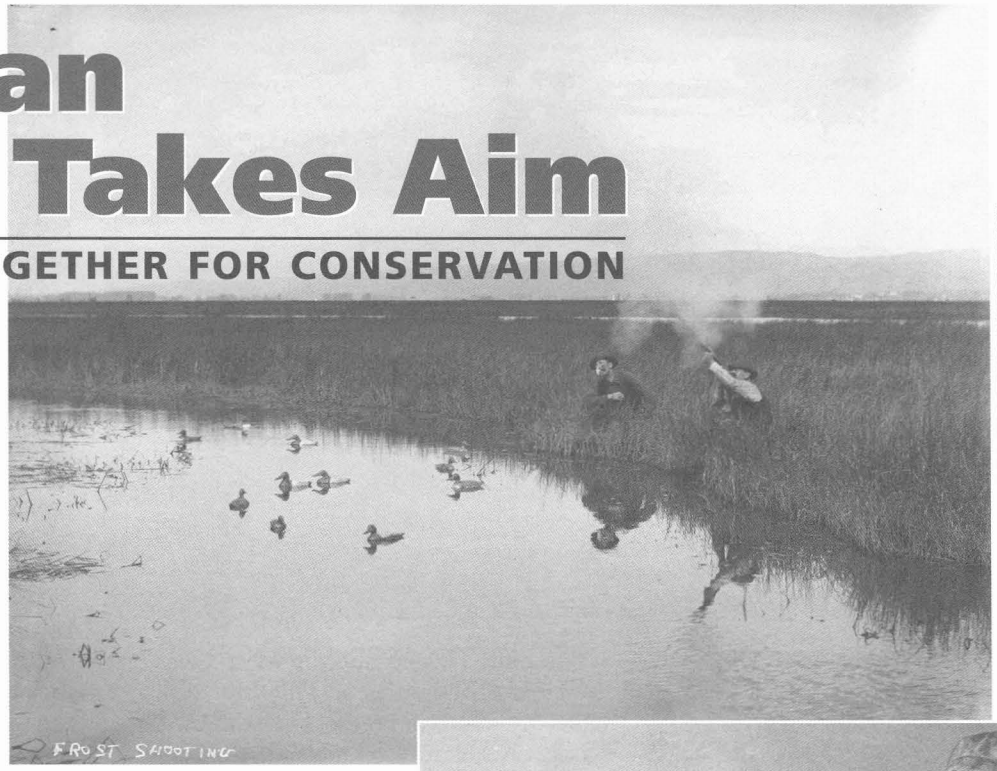
She had recently done a full-moon ceremony in Matilija Canyon just upstream from the dam, where natural hot springs blend with the river's cool waters. This spot, once extremely important to the Chumash, is now on private land. "These places need to hear the ancient languages again," Julie said. "They need to be healed. The steelhead, just like people, need to keep going on their natural path. Since the dam has been there they can't do that." She was not sure whether the new fish ladder would do much good, but she definitely favors removing the dam. Rain, fires, and landslides have all piled silt behind it. "The water, too, needs to run its natural path," she said. Nevertheless, Julie is concerned that the release of all that silt might harm those downriver.

As I write, cooled by the shared moisture of the sea and rivers of Humboldt County, I'm thinking that the more I flow outward like the river and experience new places and create distance from the place of my birth, the more I understand and resonate with the valley and rivers that were my first home. It seems that all paths really do lead to the center, even as all things move in a circle like seasons and planets—as water flows from natural spring to river to sea, turns to rain on mountains, and returns to natural spring. I'm beginning to understand how people, like steelhead, need to follow their natural paths to maintain their common planetary connection. ■

Bennett Barthelemy's last article for Coast & Ocean *was "Our Vertical Coast" in the Spring & Summer 2005 issue.*

An Urban Hunter Takes Aim

WE MUST WORK TOGETHER FOR CONSERVATION



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GROWING UP POOR on a ranch in the Owens Valley meant that my grandfather was expected to hunt to put meat on the table. Deer hunting was a timeworn rite of passage for a young man. Grandfather invested in a Savage 30-30 rifle, ventured to the high country behind Bishop with his friends, and shot his first buck, a dandy "five-pointer." According to Grandmother, the image of the buck's gray lifeless eyes set against the stark and sunlit gray granite outcroppings of the High Sierra did not sit well with him. He quietly cleaned the gun and put it away, never to fire another shot.

Hunting isn't for everyone, and it hardly runs in my family. Nonetheless, I developed a late-blooming love of the sport. I enjoy armed hikes through field and marsh as much as backpacking or casting a fly to rising trout. A love of the outdoors and its inhabitants steered me toward all these pastimes, hunting included, and toward the inevitable conclusion that our habitat is so widely altered, and increasingly threatened by ignorance and destruction, that only hunters and conservationists working together can save what little is left of wild nature.

When my inner Elmer Fudd prevents me from bringing home meat, I bring home the memory of a marsh coming to life at dawn, and that's equally satisfying. I hope that when my son gets a bit older I can pass these joys on to him. He inherited his father's adventurous palate, so I'll bet one day he'll join me for the supreme delight of a slightly under-roasted, thus seemingly bloody, wild duck paired with a fine bottle of Pinot Noir. Mom can join us for dessert when she reenters the dining room.

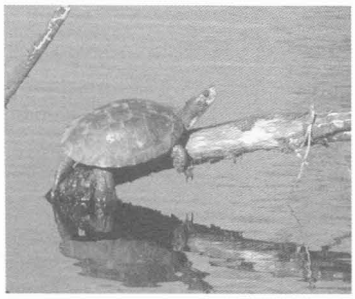
No, hunting isn't for everyone, and many would say it's for no one. Fellow conservationists or, more aptly, environmentalists, are confused when I say that I enjoy shooting and eating wildlife almost as much as I enjoy working to protect its habitats and species. Although many of my co-workers at the Coastal Conservancy collaborate with hunter-based organizations like Ducks Unlimited, it's a stretch to say that they fully accept that management and protection of nonhuman species demands harvest—that ducks, deer, or red foxes need to be shot, or in some other way killed in some wildlife reserves so as to protect their overall populations. From the other barrel, fellow hunters, whose introduction to the sport was typically familial, are even more surprised to learn that my father did not, in my tender youth, part the proverbial curtain, open the gun case, or otherwise expose me to the wonder and lore of hunting, the subject of much legend and purple prose. In fact, my father never mentioned hunting to me. If I'm rash enough to reveal this, my fellow hunters grow downright worried, as if a secret agent from the SPCA had infiltrated their ranks.

MICHAEL BOWEN

Top: Two hunters with duck decoys shooting from a marsh, c. 1860s

Above: Edmund G. Brown, Wallace Lynn, and Earl Warren with geese shot on Lynn's ranch near Colusa, c. 1942–47

LORI DIETER



JESSICA SANDERS

Top: Snow geese, northern shovelers, and other water fowl on a seasonal pond at Gray Lodge Wildlife Area near Gridley in Butte County

Above: Male western pond turtle (*Clemmys marmorata*) at Gray Lodge, which is managed by the Department of Fish and Game for wildlife viewing and seasonal hunting and fishing

Although I began hunting when I was well into my twenties, and have lived in cities my whole adult life, I've stumbled along, caused no accidents and, thanks largely to more proficient and patient friends, managed to put a modest amount of wild game on the table. To me the sporting life is a joy and an excuse to appreciate the outdoors in solitude or with close friends. Besides, I like to think I'm doing my part for wildlife population management.

Perhaps people like me—outsiders in certain respects among both hunters and environmentalists—can provide a bridge between the two camps, which are becoming ever more polarized to the detriment of their particular and common interest in preserving shrinking habitat and protecting wildlife. After all, when working together, these groups achieve stunning results. From the many wetlands enhancement projects to the decisive defeat of the Bush Administration's ill-conceived efforts to sell "surplus" national forest to the highest bidder, this alliance is a natural for habitat protection that will benefit our nation and world for generations to come.

Unfortunately, these alliances may be the exception not the rule, as both communities appear to be dominated now by people with extreme and limited views. On one side, groups like People for the Ethical Treatment of Animals (PETA)—fervent advocates for dogs and cats—score victories at the expense of ecosystems. Dogs (with their walkers) and feral cats (with their feeders) have gained ground in parks and natural areas, killing off songbirds, lizards, small mammals, and native plants. Meanwhile, major environmental organizations eschew the "bait and bullet" crowd, perhaps in an effort not to antagonize an urban audience resistant to hunting. Many remain locked into gloom-and-doom messages that increase people's anxieties but fail to reveal possible pathways toward a positive future.

On the other side, hunters have seemingly hitched their wagons to the National Rifle Association's Second Amendment struggles. The rhetoric of the NRA and its opposition to all proposals to restrict firearms permeates much of the dialogue within the hunting community, diverting hunters from seeking common ground with urban people who don't hunt, or even oppose hunting, but care about the natural environment.

The survival of hunting, and the future of conservation benefits achieved by the hunting community, depends, in my opinion, on the ability of hunters to convey an appealing message in California, where youth homicide gun deaths, mostly in urban areas, totaled 794 in 2003. Conversely, groups like the Sierra Club, Natural Resources Defense Council, the Wilderness Society, and others must recognize that they need help honing a message with some appeal to middle America; appealing to hunters would be a bridge to previously unreachable constituents.

The entire conservation community—hunters and nonhunters alike—is losing the public relations battle, indeed the whole war, against the real threat to wildlife: habitat destruction. Neither contingent appears able to develop a message extending much beyond its own base.

Urban and suburban residents, particularly those with environmental leanings, have much to learn about the historic and current contribution of the hunting community to conservation. Hunters, for their part, have much to learn about interacting with their fellow citizens in constructive ways that emphasize conservation, rather than the Second Amendment. Both must demand that government guarantee and deliver adequate protection of natural resources, before it is too late.

"Hunting is inhumane," anti-hunters argue, over factory-farmed chicken.

"It's my right to own any gun I want," hunters blast back.

Yet there are broad areas of common interest where pitched battle against a common enemy could be waged.

COMMON GROUND

ALDO LEOPOLD, known as the father of wildlife ecology and quoted frequently in environmental publications, was an avid hunter who once said that his first love was hunting with his dog. Many early members of the Audubon Society, too, forged their commitment to birding because of what they experienced while hunting; in fact, the society's founder was George Bird Grinell, editor of *Forest and Stream*, a hunting magazine.

The move to protect Yellowstone and Glacier National Parks in perpetuity was led by hunters disgusted with the market hunting they witnessed in those areas. Many of the current wildlife refuges—such as Gray Lodge in the Sacramento Valley, Joyce Island in the Delta, and the Imperial Refuge in the Sonoran desert, where hunters and birders alike may still enjoy their sport on public land—were once private duck hunting clubs. They were purchased by the State with hunting license revenue, beginning with Los Banos in 1929, and Gray Lodge in 1931.

Today, perhaps no entity is more active or generous in its commitment to wetland restoration than Ducks Unlimited (DU), an organization that raises millions of dollars from its membership each year to protect, conserve, and restore habitat for migratory waterfowl and countless other species. Despite my deep involvement in the conservation community, it was only through DU's magazine that I learned why the pintail population has plummeted: conversion of the northern Great Plains to agribusiness enterprises. DU spends millions every year to preserve duck habitat so that its members may continue to enjoy shooting some of these ducks. But the benefits of the organization's work go far beyond ducks.

Before Hurricane Katrina, coastal Louisiana was losing 25 square miles of wetland per year—that's equivalent to more than a football field every 38 minutes. After disaster struck, DU leapt into the receding floodwaters, committing $18 million to wetlands restoration there. It remains one of the leading forces bringing money to the table and looking for ways to stem the tide of devastation there by restoring wetlands, the natural buffers against hurricanes. After all, as in Thailand, where wetland destruction exacerbated tsunami flooding, in Louisiana the loss of coastal wetlands removed a buffer against the ravages of storm-driven waters.

Here on the West Coast, DU, the California Waterfowl Association, and others are helping to orchestrate funds and support for some of the most important wetland preservation and restoration projects. Among these is the restoration of thousands of acres on San Francisco Bay. Yet among the projects described in Audubon's 2005 Annual Report, in 27 states only one partnership with conservationist hunters is mentioned—a 1,700-acre wetland restoration project in Arkansas with Ducks Unlimited.

ROAST DUCK, OR HOW I LEARNED TO LOVE THE GUN

I MIGHT NEVER HAVE taken up hunting if there hadn't been an opportunity to try it close to home. About 15 years ago, when a friend asked me to join him on a trip to Grizzly Island, a refuge on San Pablo Bay, the fact that it was no more than about an hour's drive from Berkeley prompted me to accept. Steve was a model sportsman and a great teacher. Rather than frightening me away with the typical foray at dawn, we took a leisurely drive at noon. We arrived well in time for a casual walk out past some ponds to a larger pond, waded out to a cattail-choked island, and sat down in solitude to watch the egrets, harriers, and countless other species frolic in the open space. Close to sunset, when the prospect of getting skunked seemed highly probable, Steve cautioned me to lower my profile, remain still, and await the passing of a small flock of pintails flying low enough to shoot. At his signal, we rose, aimed, and fired. Four shots rang out in quick sequence, and two beautiful drakes dropped in the water nearby. In retrospect, I'm pretty sure I missed, but Steve over-generously congratulated me on my first duck, and sent me home with a meal-in-the-making that still lives on in my memory.

I can't say that the act of killing was repugnant to me, which remains a bit of a mystery. Pulling wings off flies has never appealed to me. On the other hand, as a child I was always unfazed by the act of feeding a mouse to my pet boa constrictor. I don't view hunting as inconsistent with population management and habitat protection, and in fact believe it is downright necessary sometimes. My curiosity was aroused by my outing with Steve, and although I lived in a major metropolitan

area, I was blessed to have 30 hunting clubs two to three hours away, and wildlife refuges like Grizzly Island close to home.

There is also the Black Point Pheasant Club, on the northern edge of San Pablo Bay, the last pheasant hunting club in the Bay Area. Here we don't shoot wild ducks; we aim at imported and farm-raised Chinese ring-necked pheasants, the hunting equivalent of fishing for hatchery-raised rainbow trout. We have a blast, and we dine on smoked pheasant appetizers for weeks after. This is a public club, one where anyone willing to pay the admission price is welcome.

The Sutsos family has been running the club since 1964 on about 1,000 acres east of the Black Point turnoff from Highway 101. The land they lease consists of the 648-acre property known as the Dickson Ranch, plus some adjacent fields. It is an expanse of pasture separated from the bay by levees, along with some barns and a clubhouse with views of downtown San Francisco in the distance. The pasture was created near the end of the 19th century when entrepreneurial farmers diked, ditched, and drained the wetlands.

Mike Sutsos is in charge now. His father trained hunting dogs, including Bing Crosby's, and Mike has continued the tradition, raising and training some of the best field dogs I've ever seen. Hundreds of hunters have walked his fields, shot a few pheasants, and enjoyed the easy camaraderie of the clubhouse.

Now, however, the Black Point Pheasant Club's days are numbered.

DOGS VERSUS BOGS

THE LANDSCAPE HAS been changing rapidly, and in recent years land prices have spiraled upward. From the north, vineyards have been spreading across oak-studded grasslands at accelerating speed; from the south and west, suburban development has been pressing.

And now Sutsos is being squeezed from the bay side. The land he leases has been sold—not to a developer or viticulturist but to the Sonoma Land Trust, which plans to restore it to wetlands as part of the huge Sears Point Restoration Project, which has both environmentalists and duck hunters excited. Two years ago, a major casino had been proposed there. Now it is to be protected forever for birds, wildlife, and people's enjoyment.

Not surprisingly, Mike Sutsos does not share the enthusiasm. "We've been here 40 years," he said. "This is all we know how to do." Exasperated, and venting at conservationists generally, he exclaimed, "What do they want more marsh for? It's just mud and mosquitoes out there!"

Sutsos's predicament is somewhat similar to that of a homeowner or small businessman whose property is condemned to make way for a large urban renewal project. Some of his supporters, including at least one leading conservationist, are irate. "What you have here is a classic example of the environmental community steamrolling their pet project through, and Mike Sutsos and his family are the unfortunate victims," said Huey Johnson, who was California's Secretary of Resources under Governor Jerry Brown, and who likes to hunt at the club.

John Brosnan, baylands project manager for the Sonoma Land Trust, said, "hunting and conservation are compatible; at our restoration sites in the North Bay we're proving it." Although almost all of the acreage the land trust protects in the region is under agricultural or conservation easements, hunting is permitted in some places. "There is plenty of waterfowl hunting opportunity minutes from the Dickson Ranch, pheasant hunting options as close as Fairfield, and waterfowl hunting may be possible at the restoration site as well."

Brosnan made clear, however, that this hunting club—dedicated to upland game bird hunting—cannot stay where it is. "It's all about tradeoffs," he explained. "We have the chance to connect up 4,000 contiguous acres of historic wetland habitat [on San Francisco Bay] where we've lost 80 percent, and we have the scientific and social consensus to do it. We as the landowners are moving forward. We're trying to figure out relocation for Sutsos, and we're not even asking them to pay the $500,000 to $1 million cleanup costs associated with all the lead shot that has accumulated out there over the years, costs presently estimated as up to $1 million." With the help of the Department of Fish and Game, "we do hope that in the next couple of years—prior to restoration—we can help them relocate," Brosnan said.

Black Point was for many an escape from day-to-day worries. Now, for me, it is a microcosm of land use conflicts I face each day in conservation work. The land trust has granted the club another one-year

extension, giving it two more full seasons to continue operations, as a search for a relocation site proceeds.

There are no easy answers to conflicts like these. It's a bit like the predicament fishermen face now. Accustomed uses of natural resources—be it historic salt marsh or rockfish habitat—can no longer be sustained, in light of a broader good. At the same time, when people's livelihood is at stake in a restoration effort, conservationists need to take that into account.

NO COMMON GROUND AT THE COMMONWEALTH

ABOUT FOUR YEARS ago, I attended a meeting at the Commonwealth Club in San Francisco titled "Hunting in the 21st Century: Its Economics, Politics, and Culture."

Rhetoric clashed with reality as the hunters in the room struggled to come to grips with dismaying facts: their ranks were shrinking, opposition from the animal rights movement was gaining strength, and urban residents had become increasingly disdainful of the messages of the NRA. My hope that the meeting would lead toward reconciliation with the urbanized population was soon dispelled.

The keynote speaker was James Swan, a psychologist, sometime actor, documentary producer, and author of *The Sacred Art of Hunting*. He was flanked by Robert Treanor, director of the California Department of Fish and Game under Governor Gray Davis, Huey Johnson, Bill Gaines of the California Waterfowl Association, and a representative of the Rocky Mountain Elk Foundation.

Swan began with a curious defense of hunting, "the taproot of civilization," and with blunderbuss broadside attacks on environmentalists. "Hunters are an endangered species," he declared, segueing disjointedly into an argument that eating meat had enlarged the brains of our species, which had promoted tool invention, which improved hunting, which spurred the development of civilization. If the logic sounds strained, it's because it was. Harkening back to the 1950s glory days when Davy Crockett was every kid's hero, he lamented a lack of hunting heroes in today's popular culture, mentioning that only three contemporary films he knew of portrayed hunters in a positive light. But he added a bright note: Madonna had taken up the sport.

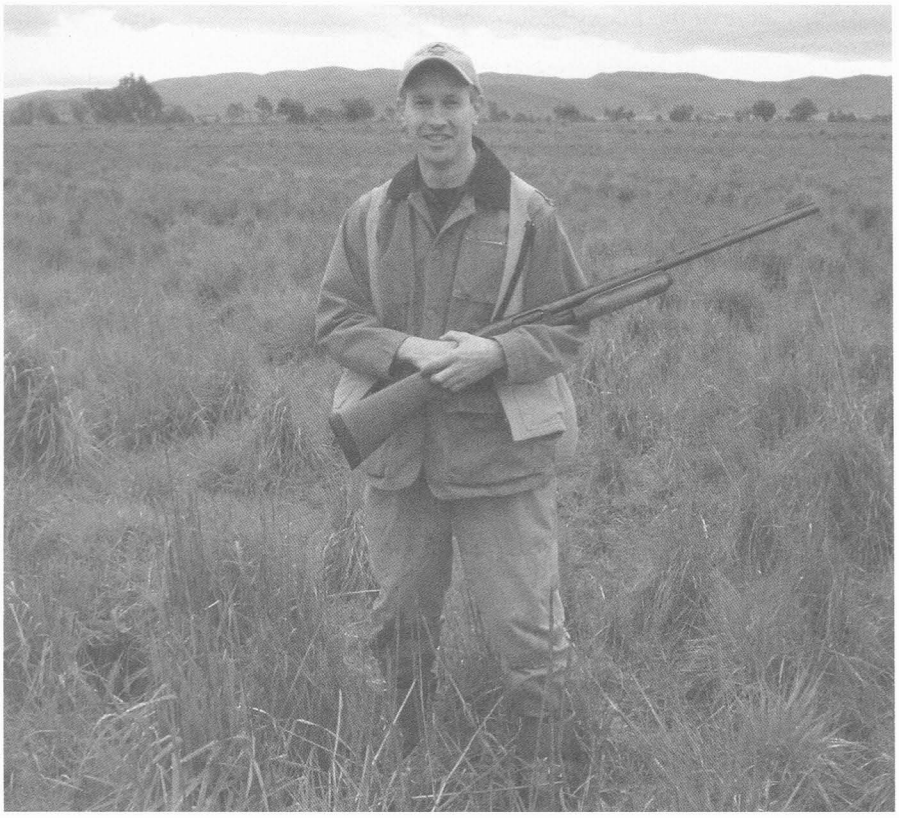
Swan did, however, identify two important issues. First, hunting has historically been a part of the American way of life, and second, wildlife management is important, isn't for the fainthearted, and is distasteful to some.

In contrast with Swan, Johnson spoke in temperate tones as he provided a thoughtful analysis of the future of hunting. An ardent hunter and fisherman since age eight, he saw that the sport had declined principally because hunters' gaze had shifted from the target and because of a failure to recognize the impact of demographic shifts. "Hunters aren't adapting to urbanization," he said. "If we wish to save this legacy, we must react to the changes around us."

Johnson made the case that the critical focus of the NRA—protecting the rights of

LORI DIETER

Riparian habitat reflected in a seasonal pond at Gray Lodge



COURTESY MICHAEL BOWEN

Michael Bowen on a recent hunting trip at Suisun Marsh Hunting Preserve

those who wish to bear weapons of near mass destruction—was losing the battle for hunters in the cities, where the votes are. In Johnson's view, the animal rights movement has polarized the discussion about hunting by going to urban audiences and depicting hunters as brutal trophy collectors rather than the simple sportsmen, habitat stewards, and conservationists they tend to be. Then he argued for conciliation: "Animal rights groups don't want animals to suffer, nor do we, so there is a commonality."

Lastly, Johnson spoke of a need for education about resource management. Children should be taught about the need for people to maintain sustainable wildlife population levels, rather than being left to assume that population dynamics just work themselves out. He did not mention examples, but his point is illustrated by the current debate over controlling wild pig populations that are tearing up native plants and frightening people, and sea lions whose growing populations' territorial needs conflict with the growing human population's desire for access to beaches and docks.

Bolstering Johnson's case that hunting is in decline, Treanor noted that license sales are dropping and consequently cutting off revenue for resource management. He suggested that the rise of extremism in both the hunting and nonhunting conservationist communities may be a symptom of a loss of connection to the land. "We'll change for the worse if we lose that connection," he argued. "Now that society is more urban, and children are growing up where the only wildlife they see is in zoos or on Disney, the outlook for a broadly held and realistic understanding of wildlife management is becoming more elusive."

The discussion in that room did not resolve the problem, but it summed up the current predicament pretty well—as did the audience: all hunters, with nary an environmentalist ally in sight.

CONTINUED SEARCH FOR COMMON GROUND

I LIVE FOUR MILES from Oakland Airport, built on wetlands where hunters used to shoot canvasbacks and sprig. The larger populations of those birds have since been diminished by agribusiness farms in the Great Plains states and by things like jet runways here and elsewhere.

I also live half a mile from Oakland's Highland General Hospital. Before the Iraq War, the Army sent its surgeons to Highland for practical training, for there was a ready supply of gunshot victims, young and old, some of them cut down with the sort of semi-automatic weapons the NRA defends so fervently.

My two-year-old recognizes, and frequently goes to sleep to, the distant sound of ambulances arriving at the hospital. He will grow up in a household that keeps firearms and that maintains a spirited dislike of the NRA, its cynical rhetoric, and much of what it stands for. On the other hand, one day I will offer him the chance, if he wishes, to join me at dawn in the marsh and await the flight of mallards overhead. And though Black Point may be gone, I believe there will be similar opportunities a bit more distant. If the extra driving gets me down, I'll try to stay focused on the extra ducks, geese, and countless other species benefiting from substantially increased wetlands, and try to instill in my son the notion that he deserves a world of improving, not declining, natural resources—a goal that will require his full and unsentimental attention. ■

Michael Bowen, project manager with the Coastal Conservancy, has worked extensively to remove barriers to fish passage in streams.

BILL MACDONALD

THE OCEANS' PLASTIC PLAGUE

EILEEN ECKLUND

A huge mass of debris, mostly plastics, piled up behind a boom in Ballona Creek after a rain in February.

FAR OUT IN THE Pacific Ocean, about halfway between California and Hawaii, air and ocean move together in a huge clockwise spiral known as the North Pacific subtropical gyre. A phenomenon caused by the heating and subsequent cooling of air as it moves from the equator toward the polar regions, the gyre (one of five major subtropical gyres in the world) has been avoided by sailors for centuries because there is very little wind within it. It contains one of the regions known as "horse latitudes," reputedly named by Spanish sailors who were frequently becalmed there and forced to throw their livestock overboard. Gyres are also known for having few fish, particularly top predators, because of their low levels of nutrients—they are sometimes referred to as "ocean deserts."

One thing the North Pacific subtropical gyre has plenty of, though, is plastic. Plastic debris swirls with the current for miles and miles, brought here from around the Pacific Rim. In 1999, researchers from the Long Beach–based Algalita Marine Research Foundation discovered six pounds of plastic for every pound of zooplankton floating in the surface waters of the gyre. This included not only such ubiquitous debris as plastic bottles and bags, but also hundreds of tiny plastic fragments floating in what Algalita founder Charles Moore describes as a "plastic-plankton soup." Plastics don't biodegrade, but in the ocean they do break down from exposure to sunlight and wave action into "microplastic debris"—what one scientist describes as "plastic powder."

Many people understand the damage that larger pieces of plastic trash can do to ocean life, having seen countless pictures of turtles trapped in abandoned fishing nets, fish maimed by six-pack rings, and birds asphyxiated by plastic bags. But in the long run, it may be small bits of plastic that do the most harm. Seabirds often mistake

PLASTIC BY THE NUMBERS

HAVE YOU EVER WONDERED where the plastic container you threw in the recycling bin actually ended up? And do those plastic shopping bags you dutifully haul back to the supermarket bin get recycled, or thrown into a dumpster? Unfortunately, there are no easy answers: it depends on where you live, the current markets for plastics recycling, and other factors. The state of recycling in the United States is confusing, vague, and far from transparent to users. That's one of the reasons, experts say, that recycling rates remain so low: people get frustrated and just give up.

Many people believe that any plastic container with a "chasing arrows" symbol on it is recyclable, but the symbol is meaningless. Only the number inside the arrows, which indicates the type of plastic resin that was used to make the container, will tell you whether it's recyclable or not. Currently only the resins numbered 1 (PET or PETE) and 2 (HDPE) are recycled to any great extent; for various reasons, it's not cost-effective for most communities to collect the other types for recycling. Some municipalities do recycle other numbered plastics, though, so check with yours before tossing that container in the trash—most provide a list of the items they will and won't accept.

Even for PET the U.S. recycling rate is only around 23 percent, even though demand for both PET and HDPE is very high—much greater than the supply. Around the country, communities—and plastics recyclers—would like to see plastic recycling rates, especially for PET and HDPE, grow significantly, and are experimenting with different types of curbside recycling strategies. But because single-use containers make it so easy to consume on the go, a lot of plastic gets tossed away from home—in parks, sports arenas, cars, at the office, on the street—where there's little opportunity to recycle. More recycling bins in public places would help, activists say, and so would financial incentives. The Container Recycling Institute's Pat Franklin is among those who would like to see bottle bills—which require a minimum refundable deposit on beverage containers—adopted nationwide.

There are legitimate environmental concerns about recycling plastic. It isn't truly recyclable in the way that nonsynthetic materials are. Plastic bottles can't be recycled over and over again into new plastic bottles (although some plastic bottles contain a percentage of recycled plastic). Instead, most are converted into other products, such as carpets and other fibers, or plastic "lumber," most of which can't be recycled again. Some of the plastic collected for recycling in developed countries ends up being shipped all the way to developing nations that have strong markets for recycled plastics but less environmental regulation and enforcement. And there's some evidence that when people think products are being recycled, they use more of them—after all, why not buy that single-serving plastic water bottle if it can be recycled? It's better, environmentalists say, to reduce the amount of plastic we buy—by using cloth bags for groceries, for example, and carrying reusable coffee cups and water bottles—and reuse plastic items as much as possible before discarding them.

But while reducing and reusing may be the most effective ways to cut the amount of waste plastic, it's nearly impossible to avoid using plastic altogether, and recycling is a better option than throwing it out. Biodegradable plastics—even edible substitutes for plastics—are being introduced on a small scale. Some day, recycling technologies that "close the materials loop" (see p. 30) may solve the problem of the plastic plague, but for now, here are a few things you can do to reduce the amount of plastic waste you generate:

1. Buy reusable cloth bags and take them with you every time you shop. To help yourself remember to bring them along, leave them in the car or by the door. You can also buy lightweight cloth bags for individual produce items, or reuse thicker plastic ones.
2. Buy in bulk, or in the largest size you can, and avoid single-serving products.
3. Carry a metal or durable plastic water bottle with you, and a reusable coffee cup.
4. Buy biodegradable products, such as cornstarch packing peanuts, as much as possible.
5. Check to see if a product is recyclable before throwing it away. Even if your curbside recycling program doesn't take it, you may be able to find a local recycler that will, through Earth 911 (see box p. 31) or another organization.

—EE

Looking downstream across plastic debris caught behind the boom in Ballona Creek

BILL MACDONALD

OCEAN CONSERVANCY

Top: Volunteers cleaned up a Maryland wetland on International Coastal Cleanup Day, 2004.

Bottom: Marine pollution and trash pile up on T'au Island, American Samoa, where trash disposal and recycling are inadequate.

smaller plastic bits for food and eat them, or feed them to their chicks. The plastic takes up space in the chicks' stomachs and can cause them to starve to death. A 1994–95 study of 251 dead or injured albatross chicks on Midway Atoll, near the northwestern end of the Hawaiian archipelago, found only six that did not contain plastic.

Microplastic debris is small enough to be ingested by a wide variety of marine life, including barnacles, lugworms, and zooplankton, a key link in the food chain. Japanese researchers recently found that these tiny fragments floating through the ocean act as sponges for toxic chemicals that are not water-soluble, such as PCBs, DDE, and PAHs—known or suspected carcinogens and endocrine disruptors (substances that may have adverse affects on the developmental and reproductive systems). Very little research has been done on what effects, if any, microplastic debris has on marine organisms, but its potential for introducing endocrine disruptors and other toxins into the food chain—which ultimately includes humans—is disturbing.

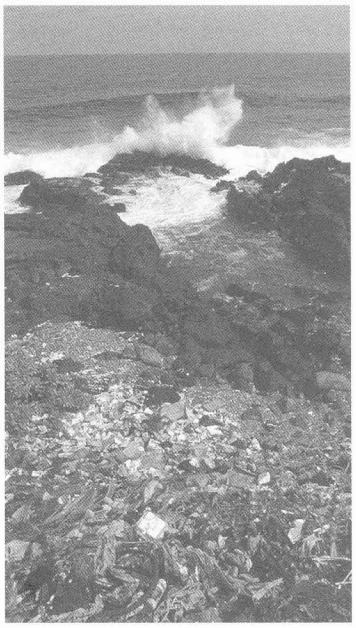
More and More and More

EACH YEAR, MORE THAN 50 million tons of plastic resin (the raw material used to make plastic products) are produced in North America alone; a record high of 57.5 million tons was produced in 2004, according to the American Plastics Council. The U.S. Environmental Protection Agency reports that in 2003, of the 26.7 million tons of plastic that made it into the municipal waste stream, less than four percent (1.4 million tons) was recycled.

The amount is growing all the time, in part because of a phenomenal increase in plastic packaging, particularly disposable single-use containers. "People are consuming more of everything, they're consuming more stuff on the go, and for many of those products, plastic has become the packaging of choice because it's lightweight and durable," says Pat Franklin, executive director of the Container Recycling Institute. For example, about 3.3 billion small (less than two liters) units of non-sparkling water—a product that essentially didn't exist before the 1990s—were sold in the United States in 1997 (the first year for which figures are available), mostly in plastic bottles. By 2003, more than six times that much was sold and now, Franklin estimates, around 25 billion plastic bottles of water are purchased in this country in a year. That's an eight-fold increase in less than ten years.

Online purchases are another growing source of plastic waste. Businesses that ship products directly to customers, rather than in bulk to stores, use more protective material and filler, according to Fritz Yambrach, professor of packaging science at the Rochester Institute of Technology.

An unknown, but significant, amount of the plastic produced never makes it to the



RYAN BINNS, MARINE PHOTOBANK

landfill or the recycling plant, landing as trash along roadways, in parks, on beaches, and in the ocean. A sizeable amount never even makes it into products: Algalita's Moore estimates that fully ten percent of the microplastic loose in the environment comes from the tiny pellets used to make plastic goods. Commonly called "nurdles" (legend has it they were named years ago by southern California lifeguards), these pellets are the most common contaminant found on Orange County beaches, Moore says. In three days of testing in 2005, Algalita collected 236 million pellets from the Los Angeles and San Gabriel rivers. Algalita has been working with some plastics manufacturers in southern California to identify where they're losing pellets and what they can do to stop the loss.

Nesting amid trash on Midway Atoll, this confused albatross thinks a plastic ball is an egg.

STEVEN SIEGEL, MARINE PHOTOBANK

Sixty to 80 percent of all marine debris—any manmade, solid material that ends up in coastal waters, estuaries, and oceans—worldwide is plastic. Some comes from spills at sea: containers falling off cargo ships, waste thrown overboard from passenger and commercial ships, and gear lost from fishing boats. Plastic pellets can come from containers lost at sea, but many are lost during transport on land or at industrial facilities and make their way into streams and waterways. According to the EPA, 80 percent of marine debris is from land-based sources, including landfills along the coast, urban runoff and stormwater overflows, and beach litter.

Moore, a third-generation Long Beach resident, has been sailing the Pacific since childhood, when his father, an industrial chemist and avid sailor, took him and his siblings on voyages to remote locations. Moore did volunteer water monitoring before founding the Algalita Marine Research Foundation in 1994 to expand his efforts into ocean monitoring, research, and restoration. Over the years he had seen plastic debris in the ocean proliferate, but nothing prepared him for what he and the crew of his research vessel, the *Alguita*, encountered in 1997 on their way back from a Los Angeles–to-Hawaii sail race, when they decided to cross the North Pacific subtropical gyre. The plastic garbage patch they found there went on without a break for the week it took them to cross. "I knew I had to go back and quantify it," he says.

In 1999, his surveys in the gyre led him to the conclusion that plastic outweighed the zooplankton by six to one in its surface waters. After he presented the results of his study at a meeting of the American Cetacean Society in 2000, independent filmmaker Bill Macdonald, who was in the audience, approached him with a proposal to make a documentary on the subject. *Our Synthetic Sea* drew worldwide attention to the problem. "The study was explosive," Moore says, "and the video brought it to the attention of John Q. Public."

You Can't Vacuum the Ocean

THERE ARE PILOT PROGRAMS that have successfully removed large quantities of derelict fishing gear—a particular threat to marine life and habitats—from the ocean (see *Coast & Ocean*, Autumn 2005). But cleaning out all the plastic simply isn't

possible, especially when it comes to microplastics. Moore points out that plastic is thoroughly mixed into the water column, not just floating on the surface, so even if it were physically possible to vacuum 1.3 billion cubic kilometers of water, you'd end up vacuuming out all the plankton as well.

Hauling trash out as it accumulates on beaches is one approach. In 2004, people from 88 countries around the world took part in International Coastal Cleanup Day. The first coastal cleanup day in this country took place in Oregon in 1984. In California, the Coastal Commission has organized an annual coastal cleanup day every year since 1985. It is now the largest volunteer event in the state and reaches up into the watersheds, capturing trash before it can reach the coast. In 2005, 48,250 volunteers picked up a total of 971,047 pounds of debris along 2,029 linear miles of shoreline. "We know we're getting a lot of stuff from Asia and Hawaii—areas around the Pacific Rim," says Eben Schwartz, outreach manager for the Coastal Commission. "But probably about 80 percent of it comes from inland areas."

"What beach cleanups do very well is raise awareness," Moore says. "But you can go out four days later and the tide will have deposited more trash. What we have now is a geometric increase in the amount of plastic; it's just not realistic to think you can clean it all up. Do no more harm: stop putting it in."

That's the approach southern California is trying to get a handle on. As early as the 1980s, Los Angeles County, spurred by the amount of trash washing up on area beaches, installed booms on the Los Angeles River and Ballona Creek to capture some of the debris before it reaches the coast. More recently, following a lawsuit by environmental groups, county and city governments within Los Angeles County were ordered by the Los Angeles Regional Water Quality Control Board to completely eliminate all trash runoff into the watershed by the end of 2012.

That requirement has forced local governments in the county to reassess municipal waste and water policies and practices (for example, how much trash escapes during city trash collection?) and spurred installation of improved storm drain screens and catch basins, as well as development of better screen technologies and designs. It has also led to new permitting systems for municipal and manufacturer

WHAT PLASTIC IS AND HOW IT'S MADE

PLASTICS ARE AMONG the most widely used manufacturing materials on the planet, and we all use them in so many ways every day that we rarely stop to think about what they are, how they're made, and where they come from. They tend to exist just below our normal threshold of awareness, except when supermarket cashiers ask us to decide between "paper or plastic." This may account for their rarely being included in discussions about gasoline prices or the coming crisis of "peak oil," the prediction that productivity of world oil reserves soon will be depleted at a rate faster than can be balanced by discovery of new reserves. Not many people realize that nearly all the plastic products we use come from petroleum.

Crude oil—petroleum as it comes from the earth—is a complex blend of chemicals made up mostly of hydrocarbons, organic molecules containing hydrogen and carbon that occur in a variety of forms: short or long chains, chains with branches, or rings of atoms. To be of use as fuel or other materials, the many kinds of hydrocarbons must be separated; this is primarily done by distillation, a process reliant on the fact that the various hydrocarbons all have their own boiling points. Petroleum is heated to a gaseous state and released into a distillation tower equipped with trays at calculated intervals. As the vapors rise and cool, each type of hydrocarbon, as it reaches the temperature at which it again condenses into a liquid, accumulates in the tray at that level. These petroleum "fractions"—gasoline, kerosene, naphtha, various oils, tars, waxes, and other chemicals—are then subjected to other refining methods to remove impurities.

In the 1920s it was discovered that hydrocarbon molecules are polymers, that is, large molecules made up of combinations of smaller molecules (monomers). Understanding the structures of polymers enabled chemists to find ways to manipulate and combine monomers into new configurations, which led to the birth of the synthetic plastics industry.

Fractions of petroleum such as propane and ethane can be "cracked," by heating or mixing with chemical catalysts, into smaller molecules like propylene and ethylene, then recombined into new polymers such as polyethylene and polypropylene—long molecules that can be tailored to have particular desired properties: in short, plastics.

The word "plastic" is derived from the Greek *plastikos,* meaning "formed" or "capable of being shaped into various forms." The ease with which synthetic plastics can be extruded or molded, shaped and reshaped into an endless variety of forms, is what makes them so useful for manufacturing.

The two main types of synthetic plastics are thermosets and thermoplastics. The former are hardened by heat and cannot usually be reshaped or recycled; the latter are softened by heat, so they can be reshaped or recycled again and again. Thermosets are especially suited for making things like auto parts, rigid cases and housings, protective shields, electrical plugs and switches, shoe heels, and toilet seats. Thermoplastics are used for a vast range of products, from disposable coffee cups to medical implants to sealed food packaging to imitation leather to squeeze bottles to garbage bags to skateboard wheels.

A significant, though little noted, effect of the petroleum shortages caused by last fall's Gulf Coast hurricanes was the rise in the cost of plastics, especially of packaging materials. A wide range of businesses have had to reconsider the costs of what for years had been the cheapest packaging option. What will we do if petroleum shortages cause plastic prices to spiral out of control?

—HMH

OCEAN CONSERVANCY

A boy drags plastic debris off a beach in Thailand for International Coastal Cleanup Day, 2004.

facilities, greater enforcement efforts against illegal discharges, and the targeting of trash "hot spots." Under the water board's plan, government agencies are also required to undertake public education and outreach to cut down on litter and encourage people to reduce, reuse, and recycle.

In Orange County, the Earth Resource Foundation in 2004 launched a "Campaign Against the Plastic Plague," with the goal of eliminating single-use throwaway plastic containers, particularly plastic bags. Students in 16 high schools have formed Earth Resource youth clubs to tackle environmental projects that include cleaning up their campus. The Newport Harbor High club got its school to eliminate polystyrene foam (often referred to as styrofoam) from the food service; now students are working to convince nearby cities to ban polystyrene. "We're teaching environmental responsibility where you live, work, and play," says Lindsey Payne, the group's campaign coordinator.

"The public is way, way out in front of the government on this one," Moore says. "If the people lead, the leaders will follow, but we've got a lot of leading to do."

On another front in the growing citizens' war against plastic is Californians Against Waste, an environmental research and advocacy group that spearheaded the passage of California's bottle bill, which imposed a deposit fee on beverage containers and has reclaimed nearly 200 billion containers since its passage in 1986. "We're encouraging manufacturers to play a greater role to reduce waste from plastic bags and containers," says executive director Mark Murray. The group is asking manufacturers and retailers to commit to cutting plastic waste in half by reducing the amount of plastic produced and by recycling.

Monetary incentives are also being tried, and some have proven effective in reducing use and encouraging recycling. Ireland levied a 15-cent tax on plastic bags in 2002 and within the first five months saw their use cut by 90 percent as people switched to reusable bags. In California, a statewide fee on plastic bags and disposable cups was proposed in 2003, but the bill, by Assemblyman Paul Koretz, never made it out of committee. In San Francisco, the Department of the Environment in 2002 proposed a 17-cent-per-bag fee, to be paid by shoppers, but when that met with strong objections, the city signed an agreement with several large supermarket chains to reduce the number of all grocery bags distributed by 10 million a year by the end of 2006. If this target isn't reached, the city will reconsider the bag fee.

Some governments have banned plastic bags or expanded polystyrene containers altogether. The Cities of Malibu and San Juan Capistrano, and also Ventura County, have all passed some form of polystyrene ban to help them comply with the zero-trash mandate for their watersheds. San Juan Capistrano also started a curbside plastic bag recycling program and has now collected more than one million bags. Plastic bags of certain types have been banned in South Africa, Rwanda, and in parts of India and Bangladesh, where they were clogging gutters and drains and contributing to severe flooding.

Moore believes that industry ultimately holds the key to solving the plastics problem, by designing products that can be recycled back into the same products over and over again—so-called "closed-loop" recycling. "I deal directly with industry, and I tell them that they have to design for recycling, to create new pathways back into production" for the materials they produce.

The European Union, Japan, Korea, and Canada have adopted or are in the process of adopting laws that require manufacturers to take back or pay for the disposal of some types of products and product packaging. In Maine, a new law took effect in January that requires manufacturers to pay for recycling old TVs and computer monitors, and a number of other states are considering similar legislation.

In California, a 2003 law requires consumers to pay a recycling fee when they purchase a TV or monitor. This, however, puts the burden on consumers and retailers, rather than where it belongs, says Barbara Kyle of the Computer Takeback Campaign. "We want producers on the hook for costs, to give them incentives to design their products better and make them less toxic," she says.

Looking at the Big Picture

AS HAS HAPPENED MANY times before, the cumulative impact of citizens and local governments seems to be building toward

STEVEN SIEGEL, MARINE PHOTOBANK

Midway Atoll is one of the largest albatross rookeries in the world. Many of the birds now must nest in piles of plastic debris.

more comprehensive approaches. In September 2005, the Coastal Commission, the Algalita Foundation, and the State Water Resources Control Board held a conference that brought together representatives from government agencies, academic and research institutions, environmental protection groups, and the plastics industry to share information and discuss the range of possible solutions to the plastics plague.

An action plan is being developed, to be presented by the Coastal Commission at a meeting of the Ocean Protection Council in April. (After its presentation, the plan will be online at www.plasticdebris.org.) "Our goal is to keep the action plan and the dialogue about marine debris moving forward toward implementation," says Miriam Gordon, the Commission's plastic debris project coordinator. "The Commission is in the process of determining the next steps."

For Moore, the next step is to head back out on the ocean: he's planning another trip around the entire North Pacific gyre in 2007–2008. He and his crew will spend 11 months tracking, collecting, and tagging trash so they can follow its progress as it makes its way around the gyre (in general, he says, it takes a piece of trash about six years to make the entire trip around its edge). He's also planning studies to find out what pollutants are in the plastics, as well as to see if very tiny bits of plastic are being consumed by marine organisms. "Pieces smaller than one millimeter just disappear from the system, and they shouldn't," he says. "I want to know where they go." ■

SOME ORGANIZATIONS AND RESOURCES

Algalita Marine Research Foundation: (562) 598-4889, www.algalita.org

Californians Against Waste: (916) 443-5422, www.cawrecycles.org

California Coastal Commission Coastal Cleanup Day and Adopt-A-Beach program: (800) COAST-4U, www.coastal.ca.gov/publiced/ccd/ccd.html. This year's event is on September 17.

Container Recycling Institute: (202) 263-0999, www.container-recycling.org

Earth Resource Foundation: (949) 645-5163, www.earthresource.org

Earth 911: 1-800-CLEANUP, earth911.org. Nationwide information network where you can find the nearest recycling/reuse facilities for a wide range of household and construction products, check current water quality at area beaches, and get information about local events and programs.

National Green Pages: www.coopamerica.org/pubs/greenpages. Shop for environmentally friendly products at this website.

Plastic Debris Rivers to Sea Project: www.plasticdebris.org. Information about California's action plan to reduce marine debris will be available here.

StopWaste.org: A website created by Alameda County with information on where, what, and how to recycle, plus information on buying environmentally friendly products.

California's Crayfishes

WILLIAM J. POLY

WILLIAM J. POLY

A native California crayfish (*Pacifastacus* sp.)

ON A CHILLY AUTUMN night in 1999, while James Wetzel and I were flipping over rocks at an old boat ramp on a bank of the Mississippi River in Illinois, we found an unusual creature.

"What species is that?"

"Hmmm . . . doesn't look like anything I've seen before. How about you?"

"No, it looks different to me too."

And so began our quest to identify the single crayfish we collected that night, plus others we caught in subsequent weeks. As it turned out, they were golden crayfish (*Orconectes luteus*), a species already known, but not from Illinois. While still trying to identify the golden crayfish, we found another species in the nearby Ohio River—and this one was new! We've called it the leopard crayfish because of the leopard-like spots on its body. Just last year we "described" it, meaning we formally gave it a scientific name (*O. pardalotus*) and specified its characteristics.

North America, with about 370 species north of Mexico, has a greater diversity of crayfishes (or "crawdads") than any other continent. In the late 1990s, I thought that most of the necessary work on identification and distribution of North American crayfishes had been completed. However, further study by my colleagues and me, along with a few other crayfish biologists, has revealed that a considerable amount of work remains to be done. What makes this even more surprising is that most crayfishes are relatively large—about two to eight inches long—and conspicuous freshwater invertebrates. They are food for fishes, snakes, turtles, and mammals. And yes, even many humans love to eat crayfishes, especially along the Gulf Coast.

You might be wondering what all this has to do with California and the Pacific Coast. California, a few other western states, and one Canadian province are home to a genus of crayfishes called *Pacifastacus*, which contains five species. The name *Pacifastacus* is formed from "Pacific" and "astacus," a Latin word for lobsters or crabs and also the formal scientific name for a genus of European crayfish (*Astacus*). The *Pacifastacus* crayfishes are native to no other region on Earth and contribute to the uniqueness of North America's Pacific Coast animal life.

The first crayfish discovered in California, in the mid-1800s, was named *Cambarus gambelii* in 1852 by Charles Girard, a French-born zoologist working in the United States (that crayfish's name later became *Pacifastacus gambelii*). In the same year, James Dwight Dana, a U.S. geologist and zoologist, named a new species from Washington that we now call *Pacifastacus leniusculus*. In 1857 William Stimpson, naturalist for the North Pacific Exploring Expedition (1853–56), which Congress commissioned to survey the waters and coasts from Asia to California, described two more California species, *Pacifastacus nigrescens* and *P. klamathensis*. Then nearly 60 years passed until in 1914 Walter Faxon described another California crayfish, *P. fortis*. Since then, no other new species of crayfishes have been found here. Two of those mentioned above have been seen only in California, and both, *P. nigrescens* and *P. fortis*, are listed as endangered species. *Pacifastacus nigrescens* has not been found for many years and has been considered extinct, whereas *P. fortis* lives in a single county in California.

In 1959, in the journal *California Fish and Game*, Jay Arthur Riegel published an inventory of California's crayfishes, the results of a study he completed as a graduate student at the University of California, Davis. Seven species of crayfishes have been found in California's streams, rivers, and lakes. Of these, four are native (all *Pacifastacus*), and three are introduced from other states (one *Pacifastacus*, one *Orconectes*, one *Procambarus*). On the West

Coast more generally, introduced (nonindigenous) species include *Orconectes neglectus*, now found in southwestern Oregon, but which could one day immigrate to California waterways.

So what? A crayfish is a crayfish, right? Well, they all seem very similar, until we look closely. Some crayfishes live under rocks in streams, rivers, and lakes; others flourish in sluggish, swampy waters; and some dig burrows on land and live a few feet underground where the groundwater keeps them wet. All of California's crayfishes live in streams, rivers, and lakes, but the introduced *Procambarus* crayfishes also live in sluggish water habitats, such as irrigation canals.

Studies on a species of invasive crayfish in the Midwest have revealed numerous negative impacts, including the disappearance of some native species. Since one species of *Pacifastacus* crayfish was introduced into Japan in 1928, the native Japanese crayfish, *Cambaroides japonicus*, has been declining due to either direct competition, a pathogenic fungus carried by the introduced crayfish, or both. Introductions of North American crayfishes into Europe have caused extensive mortality in populations of European crayfishes because of this fungus. The invaders can defend themselves against the fungus, but the European species are unable to combat it—just as human diseases brought from Europe took their toll on the indigenous people of the Americas, who lacked immunity to the foreign maladies.

We don't always know what will happen when a species gets moved into a new environment, but often it becomes abundant and can adversely affect native plants and animals. Our *Pacifastacus* crayfishes have lived with salmon for thousands of years, but how might salmon fare among some of the nonindigenous crayfishes? The California coast is also home to an endangered species of freshwater shrimp (*Syncaris pacifica*) that lives in only a few counties. What will befall our shrimp if a species of nonindigenous crayfish invades its habitat? California already has more than its fair share of nonindigenous species, including some 10-legged cousins of the crayfishes, the European green crab (*Carcinus maenas*) and the Chinese mitten crab (*Eriocheir sinensis*).

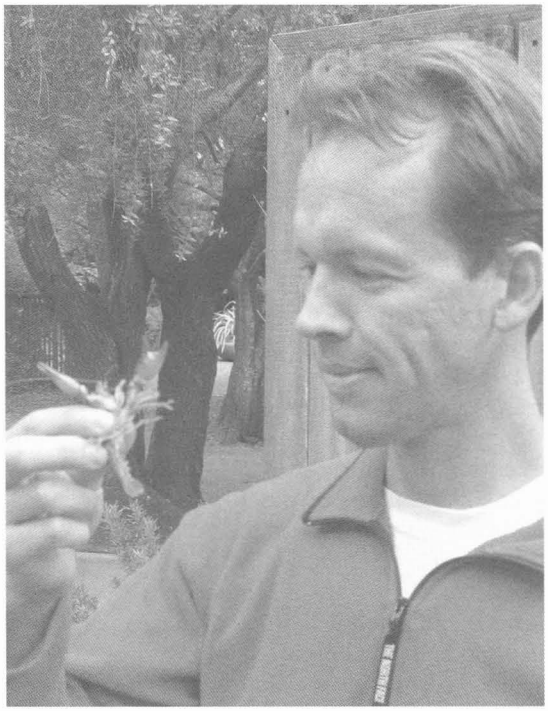
With our increasing awareness of the negative effects of invasive species, it has become even more critical to be able to identify native vs. nonindigenous species. The nonindigenous species of crayfish in Oregon, *Orconectes neglectus*, was named as a new species (called *Orconectes transfuga*) in 1966, then over a decade later was determined to be a midwestern species that was introduced. In other cases, native crayfish species have been misidentified as invasive species for over a century. How can we initiate an effective response to control or eradicate an invasive species if it takes decades to realize that one is present? Our ability to identify an introduced species first requires a solid understanding of what species occur natively in a particular area—hence the need for species surveys and taxonomic studies. The surveys also help in conservation of our native species.

In most cases, the overall impacts of invasive species are unknown simply because there is seldom much quantitative data on native species prior to introduction of the invader, nor is there adequate funding for comprehensive studies on effects of invasive species. Control of invasive plants and animals in the United States costs billions of dollars every year; therefore, invasive species are much more than minor nuisances. Nowadays, many biologists believe that relocating species is not a good idea, except for protection of rare or threatened species. Of course, many introductions are unintentional, such as when species are transported in ballast water inside ships.

Since Riegel's study, a few other biologists have done more work on California's native and introduced crayfishes. There are probably more discoveries to be made, especially considering that in the midwestern and eastern United States more than 20 new species of crayfishes, including the aforementioned leopard crayfish, have been named in just the past ten years! It goes to show that one doesn't have to travel to the tropics to discover new species of invertebrates—they're still being found in the temperate zone of the United States. Are there more new species of crayfishes right under our noses? Because few people study them and the resources available to carry out research are

(continued on page 37)

Bill Poly holding a *Pacifastacus*



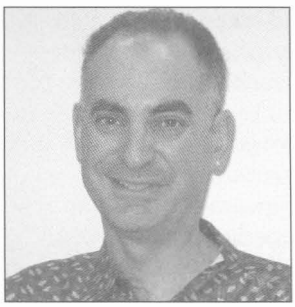
WILLIAM J. POLY

Growing Our Natural Capital

I RECENTLY TOOK AN ONLINE test designed to determine how much and what kind of exercise I like to do. My results indicated that I was someone who enjoyed exercising outside. I can't say I was surprised, since I have been a backpacker since about age 14, a bird watcher for almost two decades, a cross-country skier since I moved to California, an avid road cyclist for the last ten years or so, and am now dabbling in downhill skiing.

I am not alone in my desire for outdoor exercise. According to "Public Opinions and Attitudes on Outdoor Recreation in California 2002," a telephone and mail survey conducted by the State Parks Department, almost all of those who responded said they'd participated in at least one of the top ten outdoor activities for at least part of a day in 2002. In case you're wondering, the top ten (of 55 activities listed in the survey) are: walking for fitness or fun, driving for pleasure, visiting historic sites, attending cultural events, beach and pool activities, visiting museums, picnicking at developed sites, wildlife viewing, trail hiking, and "using open turf areas" for games, relaxing, or other casual activities. A secondary survey of a much smaller number of Californians age 17 and under showed about the same percentages for participation, but a different top ten list: walking; visiting swimming pools, water sites, beaches, outdoor nature centers, outdoor cultural events, and historic and cultural sites; picnicking; biking on paved surfaces; and playing in open turf areas.

The full list of outdoor activities practiced by Californians is staggeringly long, running from abalone diving to visiting zoos. As I pointed out in a previous column, this is a state known for inventing new outdoor activities, as well as attracting devotees to the old ones. Managing all these activities is an enormous challenge, especially with California's population growing by about 500,000 people a year. Moreover, the state has the most ethnically diverse population among the 50 states, and it is growing at both ends of the age spectrum. Aging boomers and young people often have very different recreational needs.



Managing an ever-growing and often conflicting range of recreational activities is the job of State Parks and our regional and local park systems. Acquiring more land in coastal areas is our job. Since 1999 the Coastal Conservancy has helped acquire almost 150,000 acres of land for Californians. In 2005 alone the SCC helped protect 5,700 acres (4,323 acres in fee and 1,374 acres under conservation easements) of land for public recreation and to protect natural and scenic properties. Voters have been extraordinarily supportive of parks and open space, passing resource bond measures four times in the last five years. This has enabled the Conservancy and our sister agencies, such as the Wildlife Conservation Board and State Parks, to add significantly to our state's open space. All else being equal, the more land we can protect and make available for recreation, the easier it will be to accommodate the huge diversity of needs and expectations for outdoor recreation. We still face daunting challenges managing the diversity of experiences desired by our ever-increasing population, but so far we have risen to the task of growing our natural capital.

I am hopeful that Californians will continue to put their money into the places their feet want to go. As long as we do, we will be able to accommodate future residents' desire for outdoor life. Perhaps I'll even be able to take up some new sports. I already like white water rafting . . . maybe I should take up kayaking?

Sam Schuchat is the executive officer of the Coastal Conservancy

A hiker looks toward the Pacific across the Willow Creek property, recently protected with the help of the Coastal Conservancy.

COASTAL CONSERVANCY NEWS

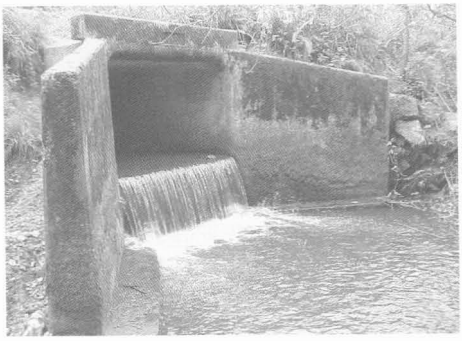
PRESERVING HUMBOLDT COUNTY RANCH AND FOREST LANDS

PRICE CREEK RANCH, a 1,280-acre timber and cattle ranch west of Rio Dell in Humboldt County, will be preserved as a working ranch through a conservation easement to be acquired by the California Department of Forestry with the help of a $1 million grant from the Conservancy, approved in December 2005. The Forest Legacy Program and the Wildlife Conservation Board will contribute the balance of funds, approximately $630,000.

Four other properties are being considered for easements as part of a project to protect nearly 10,000 acres between Six Rivers National Forest and the ocean. Ranch owners in the area have been under heavy pressure to sell their lands for development, while struggling to survive on diminishing incomes.

The owner of Price Creek Ranch is developing a plan that will allow sustainable timber harvests and grazing in addition to habitat restoration and protection. The easement will prohibit residential development and commercial timber harvest within riparian corridors.

A grant of $357,500 approved by the Conservancy in March will help the City of Arcata buy the Sunny Brae Forest, 175 acres of commercial timberland upslope from Arcata, to be added to the Arcata Community Forest. The land, owned by Sierra Pacific Industries, was to be logged this year. The City will use a mix of public and private funds, including $1.3 million from the Department of Forestry, to meet the $2.7 million purchase price. It intends to harvest timber selectively, remove invasive plants, decommission roads, address erosion problems, keep up to 40 percent of the property in reserves, and permit recreational and educational uses where appropriate.



PHOTOS THIS PAGE: ART REEVES

An excavator installs a new bridge (left) and improved fish passage, Clark's Creek, Del Norte County

HELP FOR SALMON AND STEELHEAD

STRUGGLING FISH populations will get a boost along the coast from Del Norte to San Mateo County, with the help of $890,000 approved by the Conservancy for the removal of stream barriers and the creation of offstream water storage to protect flows.

Trinity County will receive $700,000 for barrier-removal projects throughout Del Norte, Humboldt, Mendocino, Siskiyou, and Trinity Counties. At thousands of sites in these five counties, badly built road crossings, culverts, and other structures keep fish from migrating upstream to spawn. Some barriers in the Mad River watershed and elsewhere have already been removed with the Conservancy's help, resulting in the return of steelhead and coho and Chinook salmon.

Organic farmers along Pine Gulch Creek in Marin County have agreed not to divert creek water for irrigation during the low-flow months of April through December. In return, the County, Coastal Conservancy, and Point Reyes National Seashore (through which Pine Gulch Creek flows before reaching the ocean) are helping to build offstream ponds for storing irrigation water for the dry months. The Conservancy will provide $50,000 to help plan and design the ponds, negotiate transfer of water rights, and conduct an environmental analysis of the project. The farmers will be protected from further restrictions if endangered California red-legged frogs colonize the ponds. The project, developed in 1998, will help maintain habitat for state-listed endangered coho salmon, which returned to the creek in 2001 after an absence of 30 years.

The Conservancy will also provide $120,000 to help build a well in San Mateo County's Memorial Park to provide water for park facilities, including a popular campground. Water now comes from a dam in Pescadero Creek that blocks salmon from swimming upstream. Removing the dam and other barriers will help restore riffles, pools, and other stream features that provide spawning habitat for salmon and steelhead. Another grant of $20,000 will be used to identify other San Mateo County fish barriers for removal.

SONOMA STREAM RESTORATION AND PUBLIC ACCESS FUNDED

THE CONSERVANCY approved five grants, totaling $1,135,000, for restoration, access improvement, and interpretive programs along rivers and creeks in the Russian River region of Sonoma County. The funds, approved by the Conservancy in December 2005 and February 2006, will help an effort to transform a stretch of Santa Rosa Creek from a concrete channel into the healthy

stream it once was; expand stewardship programs at a park near Jenner; build trails, picnic areas, and other visitor facilities at two parks along the Russian River; and restore habitat along that river's largest tributary, Laguna de Santa Rosa.

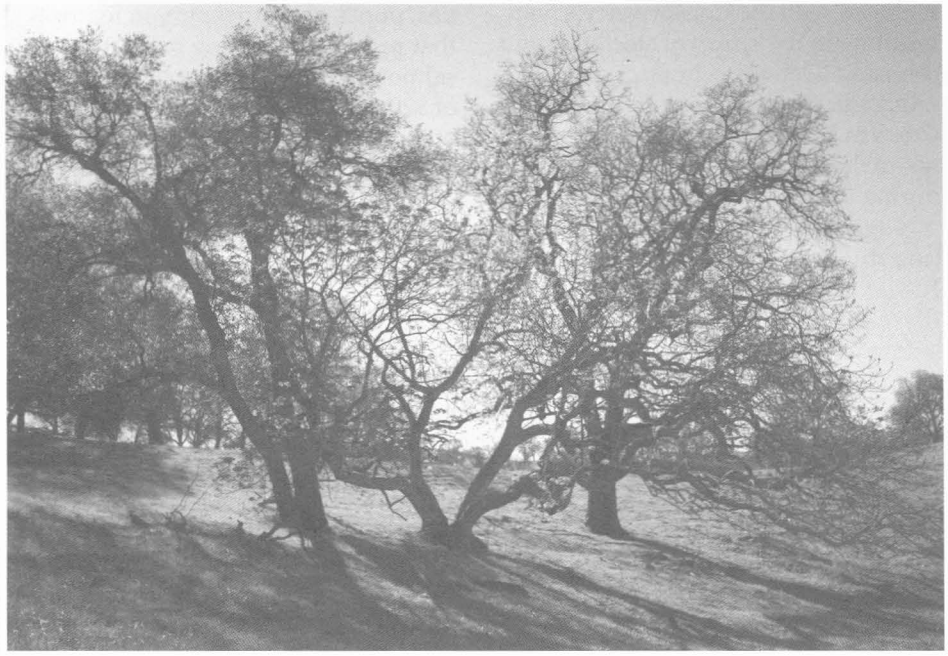
RANCH LAND NEAR MOUNT DIABLO TO BE PROTECTED

THE CONSERVANCY will help the nonprofit Save Mount Diablo to buy 208 acres of the 233-acre Mangini Ranch, in the foothills of Mount Diablo. The ranch has a variety of woodlands, open grasslands, canyons, and an 1,100-foot ridge with views across San Pablo and Suisun Bays. Home to such rare plants and animals as desert olive scrub and the Alameda whipsnake, the property adjoins the Lime Ridge Open Space and is about half a mile from Mount Diablo State Park.

New trails will extend the Lime Ridge Ridgeline Trail and the California State Riding and Hiking Trail farther south, and Save Mount Diablo will offer guided hikes until a long-term management plan is developed. The group plans eventually to transfer the land to either California State Parks or the City of Concord.

The Mangini family, which has owned the ranch since the 1880s, agreed last year to sell the land to Save Mount Diablo, which has already raised most of its $555,000 share of the $1,455,000 purchase price; the Conservancy will provide $900,000. The family will retain 25 acres, and a neighbor will continue grazing cattle on the property, except in sensitive areas.

ABE DOHERTY



ABE DOHERTY

SANTA CRUZ RIGHT-OF-WAY FOR RAIL AND TRAIL

MORE THAN 30 MILES of railroad right-of-way along the Santa Cruz coast is being set aside for possible development as a passenger rail and trail corridor. The county's Regional Transportation Commission intends to buy the Santa Cruz County Branch Rail Line with the help of a $10 million loan approved by the Conservancy in December 2005, to be reimbursed when promised state funds become available.

FROM NIKE TO NATURE

THE 102-ACRE White Point Nature Preserve, opened to the public in 2003, sits along seabluffs in the Los Angeles community of San Pedro. Before World War II, a mineral springs resort serving Japanese Americans was on the shore below. After California residents of Japanese descent were imprisoned in relocation camps, the military took control of the land. It was later released to the City and opened to the public as a park and reserve. In

Left: Mangini Ranch, near Mount Diablo

Below: This old missile assembly building will become an interpretive center at White Point Nature Preserve.

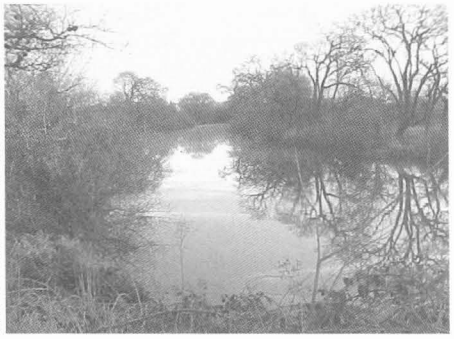
PALOS VERDES PENINSULA LAND CONSERVANCY

February the Conservancy approved $100,000 to be used with $205,000 in City funding for creating an interpretive center and environmental classroom in a building that had been used for Nike missile assembly and testing. The Palos Verdes Peninsula Land Conservancy, which manages the preserve for the City, will renovate and convert the building. Exhibits will depict the land's use by the Gabrielino Indians, immigrant Japanese abalone fishermen and farmers, and the military. Native plants will be brought back and trail improvements will include a wheelchair-accessible pathway.

LAGUNA COAST WILDERNESS PARK ADDITION

THE CITY OF LAGUNA Beach will use $171,300 approved by the Conservancy in March to add nearly 11.5 acres to Laguna Coast Wilderness Park. The Decker/Bossard property, in the Laguna Canyon Creek watershed, is almost pristine coastal sage scrub and chaparral, and contains numerous sandstone outcrops and caves. It lies on a steep slope adjacent to the Alta Laguna Regional Ridgeline Trail, a major accessway that links the coast to the 19,000-acre South Coast Wilderness system of parks and preserves. The Conservancy has helped to buy other nearby properties that were added to the Laguna Coast Wilderness Park, which is managed by the County of Orange.

Laguna de Santa Rosa, a tributary of the Russian River, is part of the Sonoma Stream Restoration Project



PHOTOS THIS PAGE: KENYON WEBSTER

MAPPING THE CENTRAL COAST SEAFLOOR

WHILE SMALL SECTIONS of offshore California have been mapped, most of the state's seafloor has yet to be charted. This year, researchers will begin the first phase of a project that is expected to eventually map California's entire seafloor in unprecedented detail. New technologies in acoustical and optical data gathering (see *Coast & Ocean*, Autumn 2005) make the project possible, and a $1.2-million grant from the Ocean Protection Council to the Monterey Bay Sanctuary Foundation is part of what makes it feasible.

The first phase of the project will focus on the Central Coast between Monterey and Bodega Bays, an area that includes three national marine sanctuaries: Gulf of the Farallones, Cordell Bank, and Monterey Bay. Among the project's goals are helping to identify fish habitats, navigational hazards, and geologic formations capable of producing tsunamis. Biologists and fishery managers are particularly interested in identifying rocky areas of the seafloor, which often support large populations of fish and other marine animals. In some areas, maps will be sufficiently detailed to reveal the precise composition of the seafloor.

More information is available at http://resources.ca.gov/copc.

CWO '06 *California and the World Ocean '06*
Implementing the Vision for Ocean and Coastal Protection

CALL FOR PRESENTATION ABSTRACTS FOR CWO '06

THE INTERNATIONAL California and the World Ocean Conference '06 (CWO '06), to be held September 17–20 at the Hyatt Regency in Long Beach, will address science, resource management, and policy issues related to the coast and ocean in California and worldwide. The conference is being organized by the California Resources Agency, California Environmental Protection Agency, and the Coastal Conservancy Association.

Proposed oral and poster presentations should focus on implementation of the California Ocean Protection Council's strategic plan, a draft of which is available at http://resources.ca.gov/copc/strategic_plan.html. Also at this site are other key policies, including the California Ocean Protection Act, the Governor's Ocean Action Plan "Protecting Our Ocean: California's Action Strategy," and the California Ocean and Coastal Information, Research, and Outreach Strategy. Priority will be given to presentations directed at helping the Ocean Protection Council to implement its strategic plan goals. Submit proposals by May 12 at http://resources.ca.gov/ocean/cwo06. Please note that the electronic form requires a 300-word abstract and a 300-word biography.

Crayfish, continued from p. 33

limited, crayfishes can remain undiscovered for decades.

Riegel's 1959 paper, and discoveries in other parts of the United States, suggest that further statewide study of California's crayfishes has great potential for uncovering new species, learning whether non-native species have been spreading and more have arrived, and finding our native species in places where we didn't know they lived.

Currently I'm involved in studies of other North American crayfishes, as well as parasitic crustaceans of the genus *Argulus* that live on fishes. My colleagues and I plan to initiate additional research on the crayfishes of California to build on the discoveries of our predecessors. Although crayfishes are neither as charismatic as birds nor as cute and cuddly as pandas, they are important components of aquatic ecosystems—perhaps more important than we know now—and deserving of more attention. ■

William J. Poly studies fishes, crayfishes, and parasitic crustaceans (e-mail: argulus5@siu.edu). His crayfish collaborators are Dr. James E. Wetzel, II (Lincoln University, Missouri) and Dr. James W. Fetzner, Jr. (Carnegie Museum of Natural History, Pennsylvania).

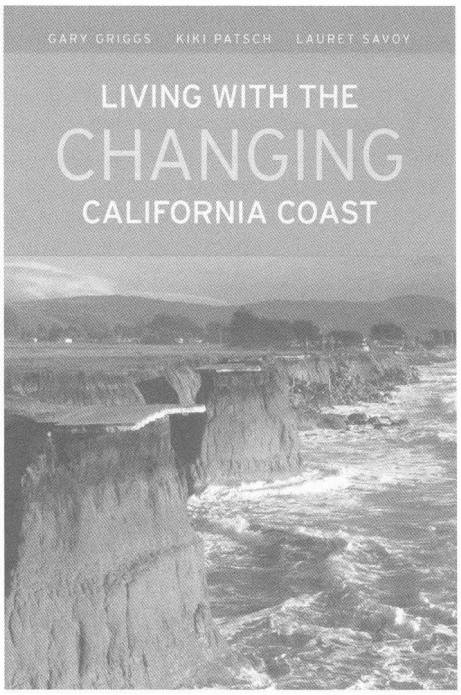
A DYNAMIC GEOGRAPHY

Living with the Changing California Coast, *by Gary Griggs, Kiki Patsch, and Lauret Savoy. University of California Press, Berkeley, 2005. 551 pp., including 279 photographs and 81 maps, $60 (hard cover), $24.95 (paper).*

THE COVER PHOTO of this thorough and informative book gives a good sense of what's inside. Taken by co-author Gary Griggs, professor of earth sciences since 1968 at the University of California, Santa Cruz, it shows, as the back cover explains, "accelerated bluff erosion adjacent to the Half Moon Bay breakwater due to concentration of wave energy by the breakwater." That's the factual explanation for the flat expanses of asphalt that hang suspended off cliff edges or, in one case, have become the artificial "caprock" of a little island. In the distance, these former parking lots have crumbled into piles of rubble at the bluffs' base—nothing so fine as beach boulders; just a jagged chaos of broken tarmac, pummeled by waves.

Also key to the contents of the book is the central title word: *changing*. Since the first edition of this book, titled *Living with the California Coast*, was published 20 years ago, some of the 1,100-mile shoreline between Oregon and Mexico has changed dramatically. Coastal development has continued apace, but so has shoreline retreat, driven on one side by the incessant attack of waves and on the other by bluff collapse and erosion caused by a combination of human and natural causes. The California dream of a home on the shore has, for some who achieved it, become a nightmare.

The book comprises 20 chapters. The first seven, written by the principals (Kiki Patsch earned her Ph.D. in earth sciences at UCSC, Lauret Savoy has a master's in earth sciences from UCSC and a Ph.D. in geology from Syracuse University), give a strong overview of the dynamic processes that shape our



coastline—extreme weather, erosion, waves, sand transport, sea level change, etc.; discuss issues that need to be considered in building or buying on the coast; and look at potential responses to coastal hazards, including relocation or coastal armament such as seawalls, and the long-term consequences of different approaches. In Chapter 8, "An Overview of California's Coastal Hazards Policy," Charles F. Lester, the California Coastal Commission's deputy director for the Central Coast region, outlines the purpose, requirements, and guidelines of the 1976 Coastal Act, discusses the commission's role in regulating coastal development, and outlines some "directions for policy reform," particularly with regard to hazard response. The final 12 chapters, written by the principals together with other experts in geomorphology, oceanography, and geology, break the long stretch of California coastline from the Oregon border to the remnant delta of the Tijuana River into sections. The resulting coverage is exhaustive, expert, and generally engagingly written. It goes into the history of discovery, natural history and geology, recent development, and case studies exemplifying the issues that arise "when development ventures close to an unstable coastline." A good extent of the coast is parsed through detailed maps that describe landforms, erosion rates, existing armoring, and level of hazard (instability). Map scales are satisfyingly large, ranging from one inch to one mile to one inch to five miles, and map annotations give detailed information—for example, on the map "Trinida[d] to Arcata County Airport" (p. 177), at Moonstone Beach, annotation C: "At the mouth of the Little River the coastline changes dramatically to the Humboldt Bay lowlands, a 33-mile-long area characterized by sand spits, dunes, marshes, and estuaries. The northerly 2 miles of the sand spit is protected in park land." Each stretch of coast is broken down into smaller sections, so no matter where you are on the California shore, this book should give you pertinent information for that very chunk of sand—or falling-down bluff.

Black-and-white photographs with detailed captions—some of them breathtaking in their depiction of the impact either of natural forces or of hubris (or both)—fill in the gaps that maps and annotations don't quite complete in the imagination. Series of photographs are especially telling. For example, there's the Julia Pfeiffer Burns waterfall, which in 1963 plunged right into the ocean but now pours undramatically onto the beach that formed after a huge landslide in 1983. Or there are the three pictures of "Cow Cliffs," also in Big Sur: the first from 1934, showing a slope of active rock fall; one from 1937 showing the newly constructed Highway One; and the final one from 2003, with a net now installed to keep that rockfall section "under control." That's just 40- to 60-odd years of geomorphology at work (a far cry from full-on geology), but the story

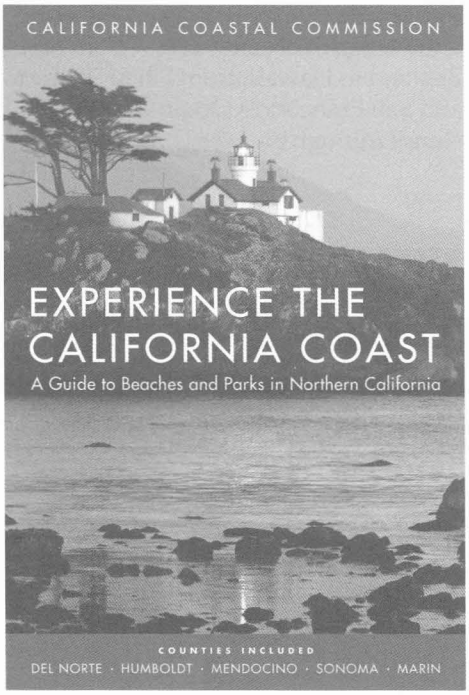
these photographs show is striking—indicative of the dynamism of this land on whose edge we seek to perch.

I found this book riveting for the areas I know well, and for the other areas I got a much better sense of land and of potential hazard. For anyone who lives near the coast, this book will prove illuminating. For anyone comfortable with the idea that life is uncertain, it will prove instructive. For anyone actually living on the shore, it might be imperative. For those who think that we humans have everything under control, it might prove frightening. I will just sum things up by saying, this book does have something for everyone. It is erudite, informative, meticulous, and good reading to boot.

—*Anne Canright*

MORE THAN JUST A GUIDE

***Experience the California Coast: A Guide to Beaches and Parks in Northern California**, by the California Coastal Commission. University of California Press, Berkeley, 2005. 320 pp., $24.95 (paper).*



IN THE 1980s the Coastal Commission produced, and the University of California Press published, the *California Coastal Access Guide* and the *California Coastal Resources Guide*, both of which became indispensable reference books for anyone interested in visiting the coast or learning about it. They remain uniquely valuable, despite the fact that much has changed since they were published or, in the case of the *Access Guide*, last updated. Now comes *Experience the California Coast: A Guide to Beaches and Parks in Northern California*, a delightful, richly informed, and user-friendly guide to the Pacific shoreline from the Oregon border to the Golden Gate. Nobody who lives in this area or means to visit it should be without a copy. The compact format makes it easy to stash in a glove compartment or backpack.

This book is a labor of love. It could only have been produced by people who know the coast intimately, are committed to protecting it, and want to make sure that others can enjoy and appreciate it. Just leafing casually through the book is inspiring, even if you think you know the coast well, because it is full of little revelations.

Written and edited primarily by Steve Scholl, who retired two years ago after 27 years on the Commission staff, the book describes more than 300 beaches, parks, nature reserves, campgrounds, hostels, and public paths to the shore, including both multi-use trails and hidden little trails that someone traveling along Highway One would be unlikely to find without help from a local resident or this guide. Coastal Commission staff know them because many of these accessways are open thanks to their efforts.

Take just one entry, "Garcia River Access," 2.4 miles north of Point Arena: "Unpaved Miner Hole Rd., impassable in winter, leads from Hwy. One along the south bank of the river to a turnaround just short of the road's end. Park at the turn-around, and look on the north side for a half-hidden path through a willow thicket to the riverbank, a popular fishing spot. Private ranch lands are located across the river; do not trespass. On the south side of the pull-out there is access through a fence to former Stornetta Ranch lands, now administered by the Bureau of Land Management." That kind of detail is invaluable, especially in places where free public access to the shore is scarce or hard to find.

The book has much more, though. It is cleverly designed to invite effortless learning. It portrays common coastal plants, birds, and other life forms that you may have always meant to look up when you got home but never did. It is also enriched by brief items about geological features, pre-Columbian inhabitants, and odd bits of history and lore. Contributors are mostly long-time Commission staff, experts in various fields.

The color photographs, many of the 300 or so taken by Scholl, reveal the special character of different places. You will know what to expect on the trail north of Big Flat on the Lost Coast, for example, when you see the photograph. The 49 color maps, produced by Commission staff, include 42 color topographic maps created with ArcView GIS software. It's easy to see how rugged or flat the terrain is in any given place, as well as where roads and major trails run.

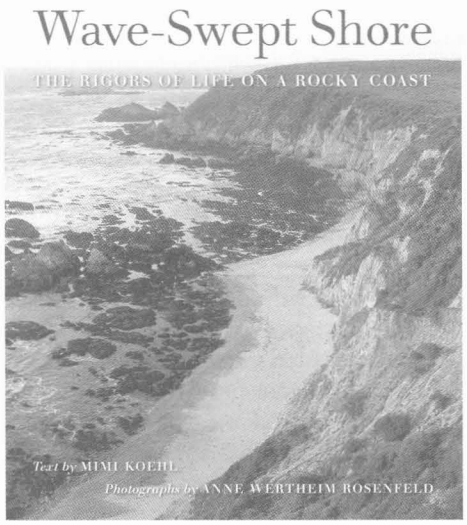
This volume, the first of four scheduled regional coastal guidebooks, is a treasure.

—*RG*

LIVING IN THE SURF

***Wave-Swept Shore: The Rigors of Life on a Rocky Coast**, text by Mimi Koehl, photographs by Anne Wertheim Rosenfeld. University of California Press, Berkeley, 2006. 200 pp., $39.95 (hard cover).*

IN *WAVE-SWEPT SHORE*, Mimi Koehl, a professor of integrative biology at the University of California, Berkeley, looks closely at one stretch of rocky northern California shoreline less than a kilometer long (the location is not identified). She examines how plants



and animals there are adapted to live with the often violent forces of water, wind, and weather that act upon their intertidal habitat.

The intertidal zone of a rocky shoreline is a web of microhabitats defined both by the contours of the shore and by the elements affecting it. Small variations—in wave action, for example—can create distinct habitat niches that are close together or even intermingled. Snails that would be dried out by exposure to sun and wind on rock faces at low tide, for example, can survive by crowding together into crevices. Koehl explains clearly how various species cope with these dynamic environments: how they keep from being washed away, how they feed and eliminate wastes, reproduce, maintain sufficient moisture, and generally how they manage to live in a place that's hostile to both land-dwelling and undersea life.

Wave-Swept Shore is a beautiful book that feels good in one's hands. The photographs by Anne Wertheim Rosenfeld show the rich textures life creates as it crowds into crevices, caves, and pools or clings to rock faces. They combine with Koehl's lucid explanations to make scientific principles easy to understand, and help the reader to see how life and place are integrated.

—*HMH*

HABITAT-ORIENTED GUIDES

Introduction to the Plant Life of Southern California: Coast to Foothills, *by Philip W. Rundel and Robert Gustafson. California Natural History Guides 85, University of California Press, Berkeley, 2005. 300 pp., $50 (hard cover), $18.95 (paper).*

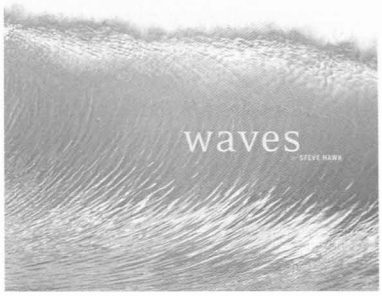
Introduction to California Bird Life, *by Jules Evens, photographs by Ian Tait. California Natural History Guides 83, University of California Press, Berkeley, 2005. 280 pp., $45 (hard cover), $16.95 (paper).*

ALONG WITH DESCRIPTIONS and photos of plant species, *Introduction to the Plant Life of Southern California* presents in-depth discussions of habitats and ecological processes that put plant diversity in meaningful context. Organized biogeographically, the chapters cover coastal dunes, bluffs, and terraces; coastal and interior sage scrub; chaparral; woodlands; grasslands; wetlands; and riparian environments from Santa Barbara County south to the Mexican border, as well as habitats of the Channel Islands. There are also sections about the relationship between plants and fire, invasive non-native plants, and preserving biodiversity. This habitat-oriented approach helps the reader to understand how individual plant species fit into the complex web of life.

Introduction to California Bird Life is also organized by habitat, in this case for the entire state, encompassing the marine environment, shoreline, coast ranges, the Central Valley and Delta, mountains and foothills, the Great Basin, and deserts. It describes physical environments, climate factors, and food webs, and their relationships to bird species distribution and behavior.

Though the habitat-oriented approach may be less useful for identifying individual species in the field, it provides much greater understanding of the lives of its subjects. As much as we may love the beauty or uniqueness of particular plants and creatures, knowing how they live in relation to others and their environment much enhances our appreciation.

—*HMH*

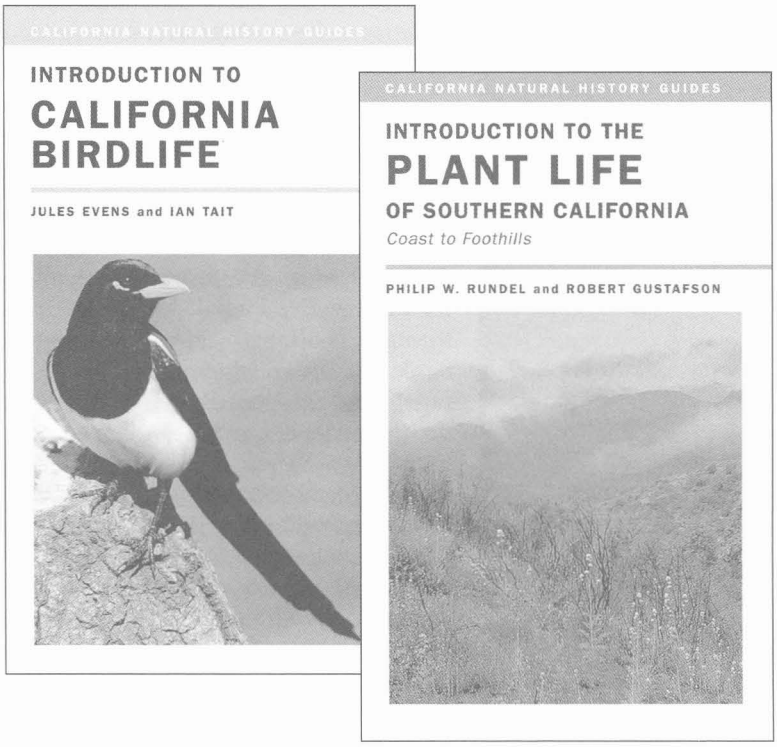


THROUGH SURFERS' EYES

Waves, *by Steve Hawk. Chronicle Books, San Francisco, 2005. 132 pp., $29.95 (hard cover).*

SIT DOWN AND LEAF through this book slowly, and you will find yourself surprisingly refreshed and inspired. Such is the power of the 100 photographs here, almost all taken by professional surf photographers and gathered by Steve Hawk, life-long surfer and former editor of *Surfer* magazine. "Their bond with the sea pervades their work, and they appreciate, perhaps more than anyone, the aesthetic potential of waves," he writes in the introduction. Passion and intimate knowledge of ocean waves—from New Zealand to Hawaii, from Fiji to Ventura and San Francisco's Ocean Beach—shines through on every page.

—*RG*



ROBERT SCHWEMMER, CHANNEL ISLANDS NATIONAL MARINE SANCTUARY

ANACAPA

Hard to image—
because you live far from the coast—
the way the islands drift in winter,
floating fragments lining the horizon,
breaking the skyline into mirage
upon an unseen fog.

I'm sure your eyes would disbelieve
this vision of islands caught in suspense,
hanging in mid-light above the sea,
slowly separating, gently expanding
until they splinter
and float apart.

I want to take you sailing there,
across the channel to phantom shores,
where the hard-packed soil feels
just like homeland, dusty and solid
despite the illusion,
waiting like a dream.

—Abigail Brandt
from The Geography of Home: California's Poetry of Place
edited by Christopher Buckley and Gary Young
Heyday Books, 1999

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