living on the edge

by **Bruce Willey**

Beach Erosion

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A saga of seawalls, who wants them, who doesn't, and the fate of California's disappearing coastline

"The sea is mother-death and she is a mighty female, the one who wins, the one who sucks us all up." —**Anne Sexton**

"Our perspective, without being too harsh on the Redevelopment Agency, is they have money in their pocket and they want to spend it. They've done some great things for Pleasure Point, but we haven't found they are willing to listen to alternatives. Once the seawall is here there's not much else you can do."

— Teresa Ish,
vice chairperson/treasurer, Surfrider Foundation, Santa Cruz chapter

Jack O'Neill's green house sits perched on the crumbling cliffs of Pleasure Point like a giant cormorant drying its wings. O'Neill, the wetsuit pioneer—the one that made surfing possible in cold water—sits in his living room with bare feet, jeans and, of course, the iconic eye patch. Later, when he moves throughout the room that overlooks the ocean, it's with youthful enthusiasm, though his feeble hearing (cold water? age?) makes it necessary to sit near his right side.

O'Neill has lived in this house for 25 years. When he takes a shower in the morning he can look out of the brass portholes and check the surf. An old navy surplus door on the bottom floor serves as his beach access. And during a storm or when the waves are large, kelp and seawater can sluice into the house if he forgets to batten the hatches. "You've got to pay some dues if you want to live on the coast," he says.

One of those dues takes the form of the big boulders that jut out in front of the house. Otherwise known as riprap, these boulders are but one way to shore up the California coastline, a coastline that is receding on average six inches to a foot a year. O'Neill says he has spent more money on boulders and armoring his house against the encroaching sea than he's spent on the house itself. "The ocean's going to get us finally," he says, smiling, looking out across the water from what seems more like the bridge of a ship than a house. "I saw a 30-year projection and my house wasn't there."

At War With the Ocean?

To begin to answer the question why Jack's house might not be there in 30 years, it helps to consider that the cliffs and bluffs are eroding largely because of one fact: sea levels are rising. Whether it's carbon dioxide pumped into the atmosphere from our copious consumption of fossil fuels or the natural ebb and flow of climate change (it could be a combination of both), one thing is certain. As the oceans rise, millions of people who live on or near the coast, and the coastal infrastructure themselves, are threatened—from homes to businesses to roads to the benches and beaches we sit on while admiring a sunset.

California, with 80 percent of its residents living within an hour's drive of the coastline, is engulfed in a war with the encroaching Pacific Ocean. As with any war, there is conflict about how to fight it, or whether to fight at all. Of the 1,100-mile California coastline, almost 110 miles—or 10 percent—of the coast is artificially armored by seawalls, riprap and other man-made structures. In Santa Cruz County alone nearly 30 percent of the coast is armored. At this rate of coastline recession and subsequent armoring, it's conceivable that the coast of California, like the Great Wall of China, will become one of the few man-made structures to be seen from outer space.

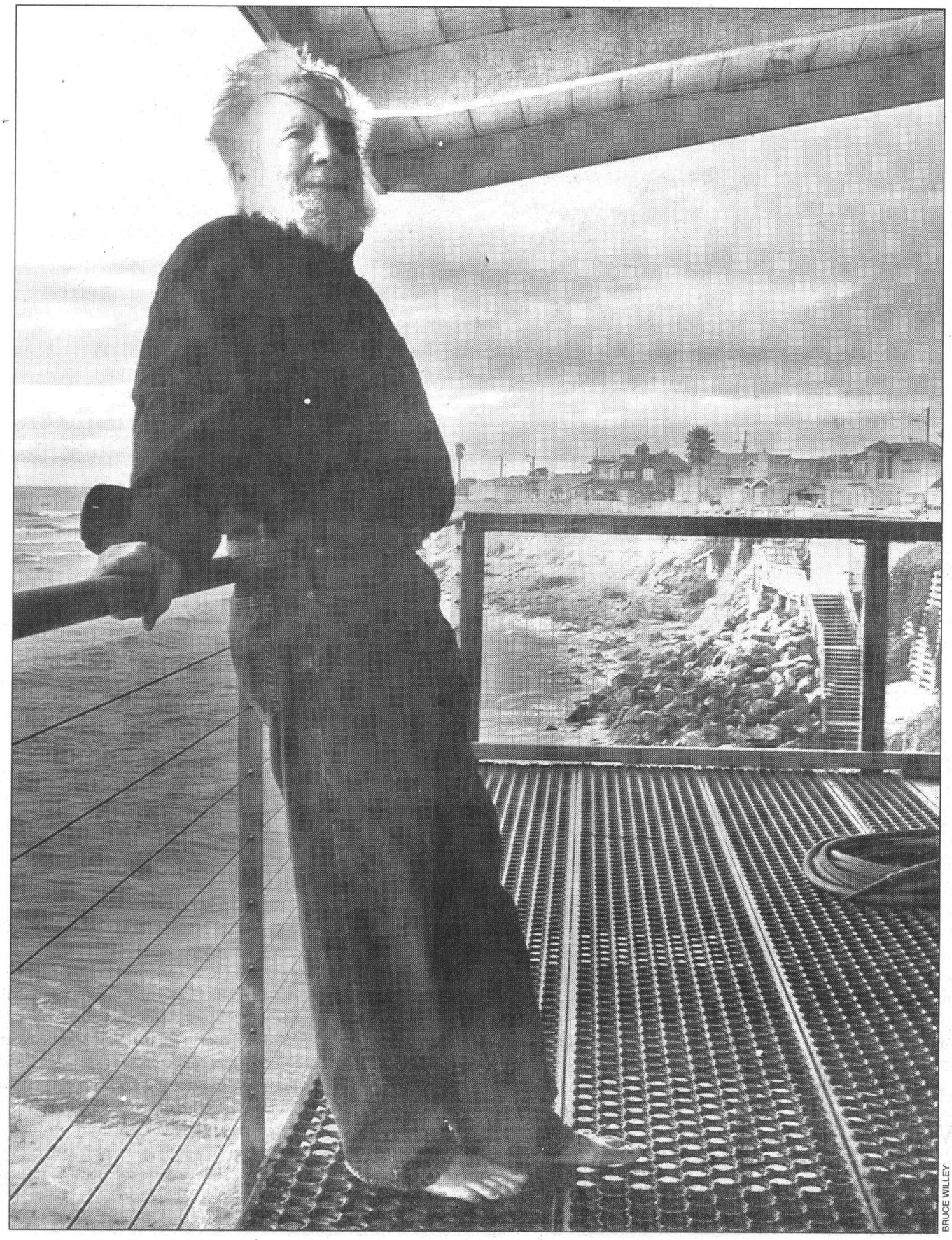
Moreover, the cost of shoring up the shore is enormous. Seawalls and riprap can cost more than $5,000 per linear foot, with many more complicated and bigger structures costing much more. The proposed 1,100-foot seawall, or cliff stabilization project along East Cliff Drive in the Pleasure Point area for example, is estimated to cost $4.5 million or more than $4,000 a foot when, or if, completed in 2004.

Beach nourishment programs are equally expensive and often the sand is swept away, either in slow amounts or entirely during a big storm. As a whole, Californians shell out an average of $75 million annually to keep the shoreline intact, yet some coastal armoring projects fail in a single winter, often because they are poorly or hastily built. Even well-built armoring projects are designed to last between 50 and 100 years at best. Which leads to the question: Is it worth the fight?

Gary Griggs, director of the Institute of Marine Sciences and professor of Earth Science at UC Santa Cruz, has been studying the impacts of coastal armoring for more than two decades. He's considered one of the experts when it comes to coastal erosion and his expertise is sought throughout the state. We meet at the end of Woodrow Avenue along West Cliff Drive in Santa Cruz. Even with his fancy brown leather street shoes, Griggs easily negotiates the riprap boulders and finds a place to sit on sandstone shelf a few feet from the crashing waves. Incidentally, during last December's storms, this area had to be re-armored to protect the road and walkway above.

"There are basically three options," Griggs says, beginning his tutorial on seashore armoring. "There's armoring, which has been the traditional one, and then you can tweak that—everything from concrete walls and gunite walls to riprap boulders. There's retreat, and that's happening but it's not real popular. And then there's (beach) nourishment."

Griggs points out that the sea level is rising one to two millimeters a year. But there is more at work than just the rising sea. Recently Griggs and a graduate student analyzed historical records dating back to 1910 and concluded that of the storms that caused significant erosion or damage along the coast, 75 percent occurred during El Niño years. With the possibility that the frequency of El Niño's may be on the rise due to global warming, coupled with rising sea levels, shoreline erosion may become one of the most pressing issues facing beach communities such as Santa Cruz.



BRUCE WILLEY

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◀Jack O' Neill

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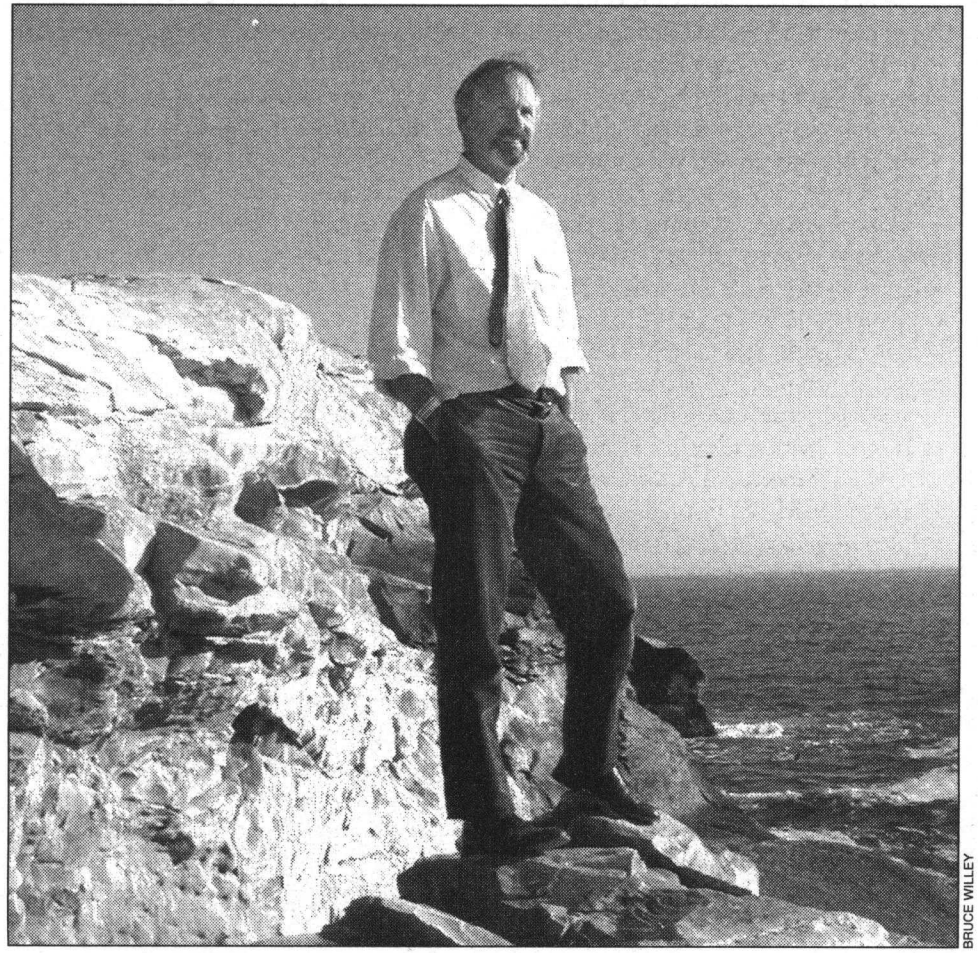

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"I think the real question we need to answer, and it's not going to be easy," says Griggs, "[is] if we knew what the climate was going to do, if we knew that it (sea level) wasn't going to get but a foot higher, then we could hold the line for 50-100 years. The question is, what's going to happen next? And the best estimates now, by the year 2100, the sea is about three feet higher. That's probably the median. Some think it will go higher, others think it will be lower. But the fact that it's still eroding suggests that it's gaining on us a little bit."

In the hills of Santa Cruz County it's possible to see that these sea-level fluctuations are part of the natural process. And the futility of trying to tame the wave-battered coast becomes apparent when you look at the former marine terraces that have been uplifted by geological forces along Highway 1 north of Santa Cruz. These former coastal bluffs point to a time when the coastline was much lower and sea levels a little higher, Griggs says. In fact, most of Santa Cruz, Live Oak and Capitola lie on marine terraces.

"Do you want the whole coastline to look like a wall?" Griggs asks. "I try to be neutral when I'm analyzing a structure or

problem, but my aesthetic sense says we deserve something better than that. I think we need to redefine what our main objectives are in the Coastal Act. It was written almost 30 years ago, and it didn't deal with coastal erosion. That was sort of a minor issue. Now, every seawall is a controversy. East Cliff (the proposed seawall at Pleasure Point) is a good example. We're still not through the EIR (Environmental Impact Report). They may lose some more cliff before it's built."

The Coastal Act is the 1976 initiative that provides policies for the Coastal Commission to manage and protect the coast. Coastal Commissioner Dave Potter, who's in charge of the Monterey, Santa Cruz and San Mateo County's coastline, says armoring has become one the commission's biggest issues.

"Developers that build too close to the coast are developmentally blind if they don't think we have an erosion problem," he says.

Controversy vs. Compromise

To see just how controversial a seawall can be, let's go back to Pleasure Point. But first, a stop at the Santa Cruz Redevelopment Agency is in order. Located on the fifth floor of the austerely gray Santa Cruz County government building, Paul Rodriguez—who is in charge of designing the proposed multi-million-dollar Pleasure Point seawall and seeing it through many bureaucratic hoops, public comments, permits and environmental impact reports—sits at a large drafting table. The seawall is still in its conceptual phase, and wrapping around the walls above Rodriguez's table is a giant photograph of where the 1,100-foot long, 30-foot high project will go. In addition to the seawall, the redevelopment plan for Pleasure Point also includes landscaping along the cliff and the addition of a park at the western end. The joint project between the Army Corp of Engineers (which will install the wall) and the Redevelopment Agency (which designed the wall) has already taken five years. Construction is slated to begin in the summer of 2004 if all goes well.

Rodriguez pulls out the plans and lays them on the table. It looks like an immense periodontal operation. Holes are to be drilled into the cliff, then shot with concrete, and the area behind and in front of the wall would be cleaned and filled in, stabilizing the weakened cliff from further erosion, thus saving the road, the sewer line that parallels underneath the road, the water lines—and the pricey property on the other side.

This project, technically called a soil nail wall, is unique in comparison to other seawalls covering the bluffs in either direction, Rodriguez explains. The Redevelopment Agency plans call for the wall to mimic the existing bluff both in color and in form, much like the walls on Highways 17 and 92 (above Half Moon Bay). There will also be two access stairs on either side leading down into the surf, and bathrooms for those who refuse to pee in their O'Neill wetsuits.

But some people have voiced strong opposition to the Redevelopment Agency's improvements.

"What's frustrating is when people take positions and then they don't listen to reason," Rodriguez says, after he's explained the project. "You can't fault people for getting emotional or having opinions about these issues. But it's just a matter of how you deal with it and how you reach a compromise. The purist, the natural 'return-to-earth,' group says we shouldn't be trying to do anything. From a philosophical standpoint I can agree with that. But when

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coastal aerial photographer

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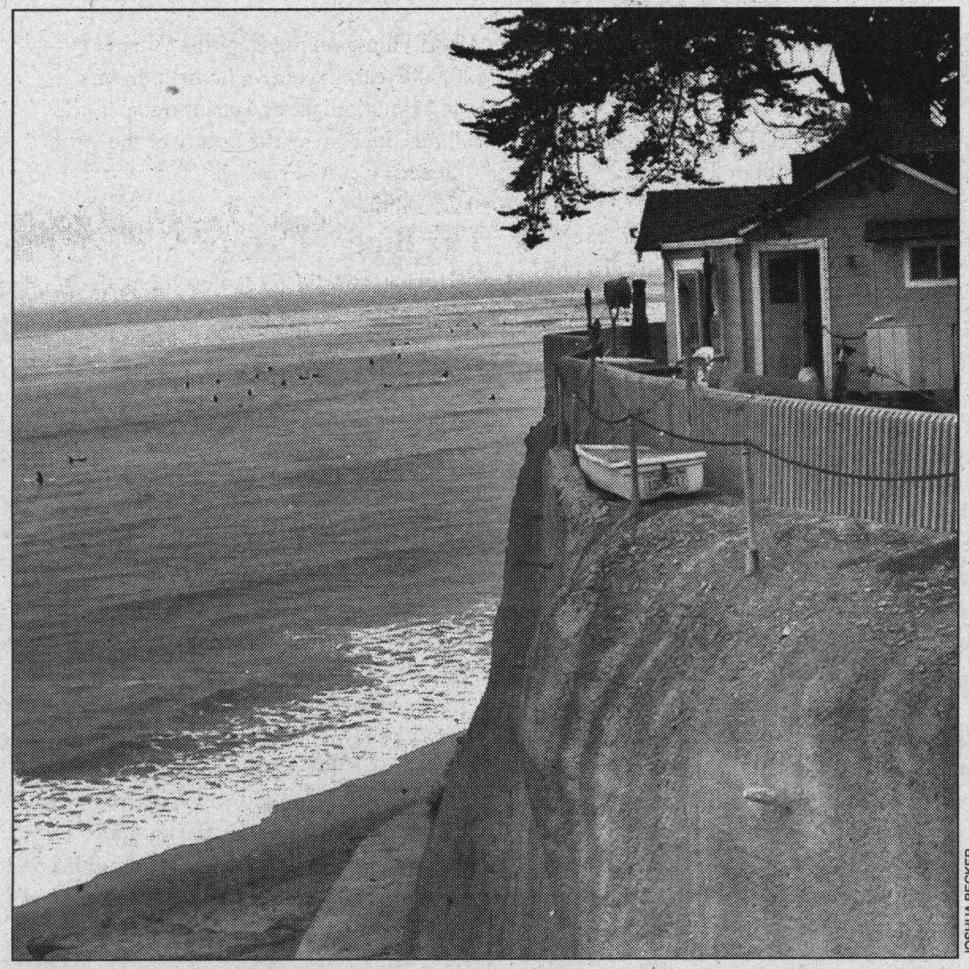

JOSHUA BECKER

you get into a region like this (Pleasure Point) where people are living and there are heavy uses, it's a kind of ideal, that to my mind, is unattainable."

Diminishing Pleasures

Like its name suggests, Pleasure Point is a sunny microcosm of quaint little homes, walkers, joggers and baby buggies cruising the bicycle lane, and surfers hanging out on the crumbling Bermuda grass-covered bluff overlooking the surf. Even Jack O'Neill can be seen taking a nap in the sun on his porch. So it's easy to see why nostalgia runs high and change comes hard. Not so long ago things cost less, and you didn't need to make six figures to afford a humble little beach shack here. Or, in the case of this story, you didn't need a 1,100-foot-long seawall.

With her feet dangling from one of the many small, sea-sprayed benches lining the bluff is Teresa Ish, vice chairperson and current treasurer of the Santa Cruz chapter of the Surfrider Foundation, an international grass-roots ocean advocacy group. Surfrider has long been an opponent of seawalls and have won numerous victories against their installation. Seawalls, they

contend, can reflect waves back into the surf, creating backwash and destroying a surfable break. Seawalls also contribute to beach loss by undermining the natural processes of erosion.

"Our perspective," says Ish, "without being too harsh on the Redevelopment Agency, is they have money in their pocket and they want to spend it. They've done some great things for Pleasure Point, but we haven't found they are willing to listen to alternatives. Once the seawall is here there's not much else you can do."

Some of those alternatives Ish and Surfrider say need to be looked into includes removing the small mishmash of riprap lining the base of the bluff that she says eats into the cliff; put a stricter weight limit for vehicles using the one lane road because the vibrations can affect the stabilization of the cliff; build better curbs and gutters to stop the surface runoff from going over the bluff; and close East Cliff Drive, making it pedestrian-only.

"Seawalls beget seawalls," Ish says, "Once you start armoring you can't really stop unless there's a natural hard object like a granite cliff, which we don't have around here. The fact is, the beaches do belong to all of us and we stand a chance of losing them if we don't let nature take its course."

Ish also points out a recent economic study done by Charles Tilly, a graduate student at California State University Monterey Bay. Called Travel Cost Modeling, he estimated the surf at Pleasure Point to be worth $8.4 million annually. He came to that conclusion by surveying people going in and out of the water, asking how much a year they spent on surfing, and found that, on average, 400 people surf at the point every day. It's hoped that by giving the world-renowned surf spot a dollar value it can be treated with the same respectability, that, say, a national or state park is treated.

A similar survey, done in 1997 by San Francisco State University, estimated that California beaches generated $10 billion annually to the economy.

"It sounds like the value of beaches and surfing far exceeds the value of four or five houses," say Ish.

Gary Griggs wagers the value of the coast might be in the trillions of dollars. In some ways it's like MasterCard's heartrending ode to consumerism. Waitress' salary working the tables at the Wharf House on the Capitola Wharf: $20,000/year. Expensive home in harm's way: $1 million. Jack's wetsuit trade: in the millions. Preserving the beauty of the California Coast? Priceless.

The Bigger Picture

Using a super fast G-4 laptop, a Nikon digital camera and Robinson R44 helicopter, Gabrielle and Kenneth Adelman, a husband and wife team out of Corralitos, have been flying up and down the California coast from Mexico to the Oregon border, taking pictures in precise, GPS-controlled intervals of 300 yards. Though not an original idea, what they've accomplished is nothing short of stunning. After more than 12,000 shots taken offshore at approximately 500-700 feet, the Adelmans uploaded the results to the Internet, posting the pictures onto their Web site, www. californiacoastline.org.

Both are pilots, trading off the duties of flying to a particular stretch of coast they intend to document. Once there, Gabrielle pilots the helicopter and Kenneth hangs out the window and clicks away, handholding the camera to adjust for the copter's motion.

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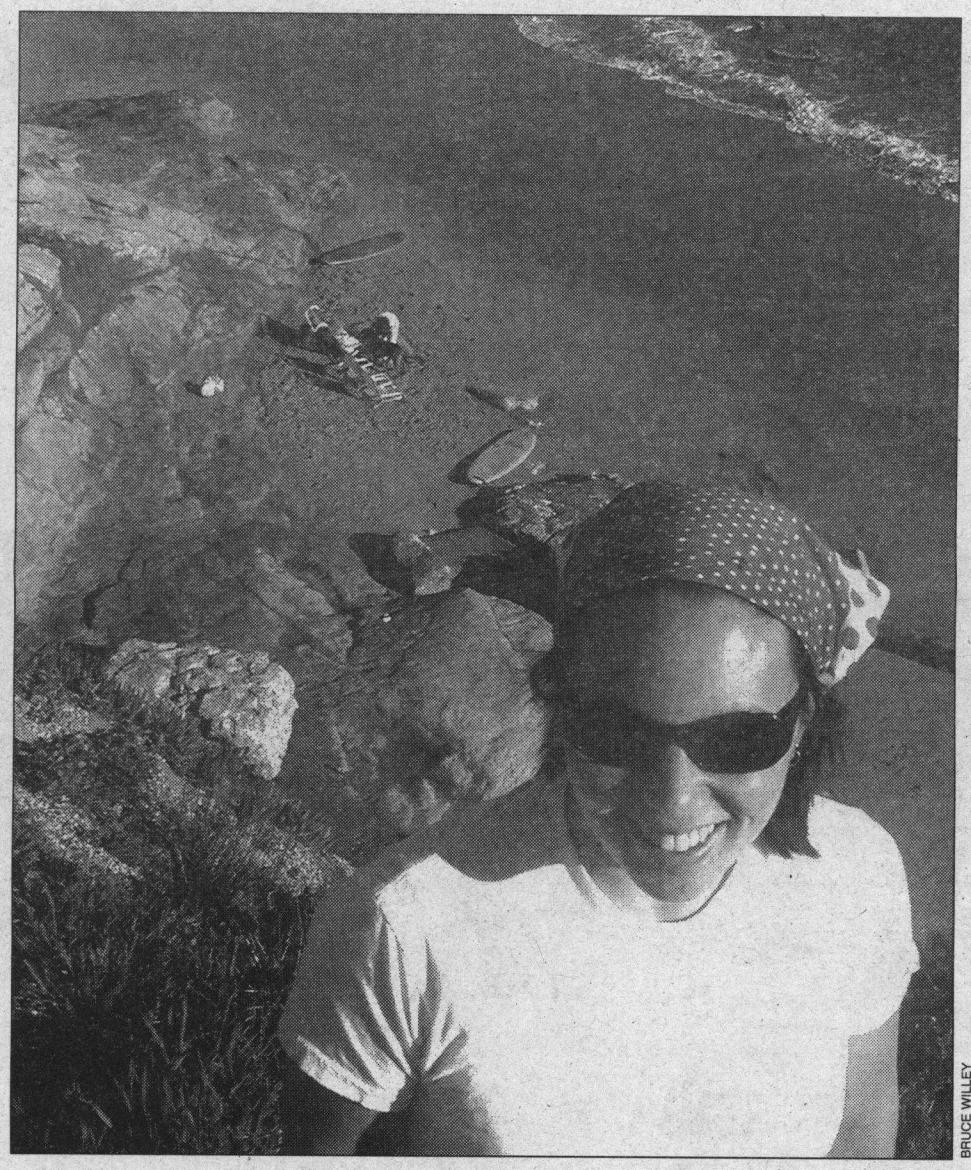
And what they have created is a permanent record of the changing coastline. Along the way they've also photographed violations of the Coastal Act, namely riprap in front of the Ritz Carlton in Half Moon Bay to protect the 18th hole of their golf course. It was the first enforcement action as a result of their pictures on the Web.

Upstairs, in their home situated high in the Corralitos hills, is the nerve center of their Web site. Beanbags and the latest in computers and high-definition monitors attest to the couple's dot-com past. To play fair, they have also included a picture of their home (from the air of course) on the site. Kenneth calls up a picture of Stillwell Hall, in the former Fort Ord area down the coast. One wing of the condemned, World War II-era building had to be removed before it fell off the bluff. And below sits a large strip of riprap defending what's left. The picture illustrates coastal armoring gone bad. On either side of the building the beach and the cliffs have extensively eroded.

From the air the Adelmans have been shocked by how much armoring they have witnessed, both here in Santa Cruz and California in general. "That's the biggest thing about seawalls," says Kenneth, clicking on another picture of the heavily armored Opal Cliffs near Capitola. "Even if you want to say 'I'm not an environmentalist, I'm a property rights advocate,' and you say that people own property and they have a God-given right to do whatever they want to do with their property — if we accept that as a premise, then what happens? Do they have an absolute, God-given right to dump rocks on public property [or] to protect their property from their stupidity? I don't think so."

"And the thing is," adds Gabrielle, "if your neighbor's seawall's energy gets directed to the sides, your cliff goes down faster. So what your neighbor does affects you. So your private property rights are being infringed upon by your neighbor."

"If we educate people about the coast, that's the first step in saving the coast," Kenneth cuts in.



BRUCE WILLEY

Disturbing Nature's Domicile

Closer to home, down at the intertidal zone, graduate student Dawn Osborn is researching another possible effect of coastal armoring on algae and animals. She set out to find, for her doctorate dissertation at UC Santa Cruz, if the varying non-native rocks such a granite, basalt and other hard, durable rocks used in armoring might affect the many shoreline species that make the wave-pounding environment their home. Most of these creatures rely on the coming and goings of the tide and are thus physiologically sensitive to heat and where they settle in the intertidal zone, among other factors. Her research began out of an area at the end of Rockview Drive in Pleasure Point and compared how the different species survived on different substrates or rocks.

"Nobody had ever looked at the effects of armoring on these intertidal communities," Osborn says, sitting at a concrete bench and table overlooking her first site. "I started wondering; the more armoring they do, how is that going to affect what can grow and live on the rocks?"

So far her research focuses on riprap, rocks that are often quarried in the Central Valley. When Osborn examined the established communities on the riprap versus native mudstone, she found that the intertidal algae and animals prefer to live on certain rock types over others. To be sure she gets uniform results, Osborn cut sections out of the different rock types into four-inch square plates and adhered them to the native mudstone at two sites. Since many of the animals and algae take a while to settle, her research with the plates is so far inconclusive.

"When you add rocks you change communities," she says, pointing to the riprap that is wedged between two native mudstone outcroppings. "What was under that before they threw rock in there?"

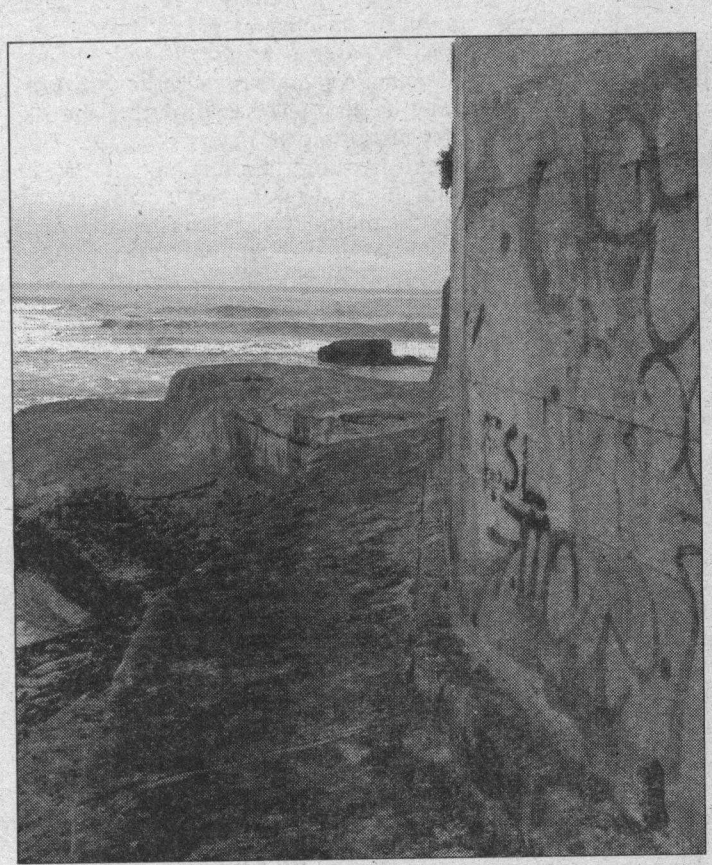
Riprap also moves a lot during storms, she says, and the rocks bump and grind against each other killing the things that live on them.

"Over time if they keep adding riprap and changing the native communities we really could see a different intertidal structure," Osborn says. "If there is very little native rock left exposed to the ocean currents, we could see big changes in the species that were not originally found on the native mudstone. These will still be intertidal species, and is one better than the other? I don't know. But I definitely see huge potential for change."

Up Against A Wall

Two thousand years before Christ professed the wise man built his house upon a rock and the foolish man built his house upon the sand, the Greeks were building seawalls—this according to John Kasunich, a man that talks as fast as a sand flea can jump. (He keeps two surfboards at all times in his car, is a member of Surfrider and knows his seawalls.) He also happens to be a coastal engineer.

"The people of the Mediterranean have been building bulkheads and harbors and seawalls around their cities for thousands of years," Kasunich says. "If they hadn't done that back then the coastal erosion process would have receded their coast and those cities wouldn't have existed. I bring this up because you can't allow the city of Capitola, for example, to recede back to the railroad tracks. When you're in an urban area, it's not stupid to maintain an urban area. And I'm not saying let's urbanize the coastline. But there are many urban areas that exist today along the coast and we must do something to keep them from being undermined by the coastal-erosion process."



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Kasunich quotes a study done by local geologist and UC Santa Cruz lecturer emeritus Jerry Weber on the Pleasure Point area, which Kasunich insists is a good read. In it Weber mapped out where the coastline was in the last ice age, about 17,000 years ago. The coast at that time was a quarter mile out from where it currently rests. Then Weber showed where the coastline will be in 50 years and 100 years—in 50 years the bluff recedes to across East Cliff Drive into private property.

"That's not voodoo science," says Kasunich, "So hear me out. The Surfrider Foundation, the Surfer Alliance … they have put up a real fight against the seawall. Just no seawall, seawalls suck. OK, right now they get to sit on benches, run back and forth, check the surf, do anything they want. They've got real access, physical and visual. In 50 years they're not going to have that access. In fact, private property will have that boundary and they (the property owners) are going to have a legal right to protect their homes and then they'll put in a seawall. So we're going to ideologically fight the war, no containment—i.e. seawalls—and in 50 years my own kids won't be able to do what all these people are doing now right along this stretch of beautiful surf and vision. There's got to be compromise."