

Even walls can't stop the ocean

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SANTA CRUZ — When it comes to ocean erosion on cliffs, Mother Nature doesn't distinguish between private homes or public recreational areas.

And so far, Gary Griggs, professor of earth sciences at UC Santa Cruz, has found that concrete sea walls seem to be the most successful in reducing erosion and property damage.

But, Griggs is quick to point out, few protective structures — whatever their material — have stood the long-term test of time without expensive maintenance or, in some cases, extensive rebuilding.

For the past two years, under a grant by the Army Corps of Engineers, Griggs has been studying coastal erosion and the effectiveness of sea walls in stopping it. Griggs, along with colleague James Pepper, an associate professor of environmental studies, also has issued a report on how individual cities, counties and the state deal with oceanfront land. That report was financed with a grant from the California Policy Seminar Program.

In 1983, the California coastline suffered \$100 million in damage from erosion. In 1978, another \$18 million in damage occurred.

According to Griggs, erosion, or retreat of the shoreline, is a continuing natural process along about 86 percent of California's 1,100 miles of coast. Unfortunately, Santa Cruz County has not been exempt from it.

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As recently as 1984, for example, Seacliff State Beach in Aptos suffered some \$600,000 in storm-damage repairs — much of it from ocean erosion. Major damage was sustained in 1978, 1980 and 1983, as well. A \$1.7-million sea wall that was constructed after the 1980 damage and was intended to last 20 years, actually lasted less than two months before it was destroyed again.

And, last year in Capitola, tenants from four units in the Crest Apartments were ordered to move by the city due to potential danger from continuing cliffside erosion caused by the ocean.

"The California coastline is eroding at rates varying from almost immeasurable centimeters per year to places where we see long-term rates as high as 10 feet per year," says Griggs.

Locally, Griggs says the Depot Hill area in Capitola continues to be the most vulnerable to erosion, with "weak, easily erosive, highly fractured sandstone cliffs." He estimates erosion at between 1-2 feet a year there.

Cliffs along the north coast, which ranges from Año Nuevo south to West Cliff Drive in Santa Cruz, erodes at 6½ inches a year on the average, Griggs adds.

He says the construction of some sort of sea wall — be it concrete, rock or timber — is one of four options open to oceanfront areas.

The other options include doing nothing and suffering the consequences; trying to sell, so as to pass the problem on to others; or relocate buildings to a less-threatened part of the property, says Griggs.

He has calculated that 110 miles of the California coast are armored by sea walls of some kind, at a cost of from \$300 to \$3,000 per linear foot.

"That's a big investment, especially when you consider that some of these sea walls built to last 20 years can be swept away in one. Also, sometimes a sea wall may cause waves to carry sand, so we may be saving the property, but losing the beach."

The Army Corps of Engineers-funded study made use of a sophisticated electronic distance meter, which included a laser beam and reflector to measure the elevation and slope of beach. Surveys of "beach profiles" were made as often as weekly or biweekly during months of active change to see how they differed in front of sea walls in contrast to adjacent areas without walls.

The surveys includes estimates of how much sand moves on and off beaches, including where it comes from and where it goes.

"Those are the kinds of things that have to be considered — the situations for which we need to collect hard numbers," Griggs says. "There have been a lot of wave-tank studies in small model basins, but that doesn't very closely approximate the real world. Nobody has ever gone out and systematically recorded what was going on in the vicinity of sea walls, which seems surprising after all the building."

Among the biggest problems is what to do with already built structures that are threatened by erosion.

Griggs and Pepper's report, based on the California Policy Seminar Program grant, deals, in part, with what Griggs describes as "large inconsistencies between the way individual cities or county agencies deal with the oceanfront and the way state agencies, which we might look to as leaders, deal with it."