

Our Ocean Backyard — *Santa Cruz Sentinel* columns by Gary Griggs, Director, Institute of Marine Sciences, UC Santa Cruz.

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California Coast—worn at the edges



Seacliff erosion in the Isla Vista area of Santa Barbara has undermined this student apartment.

At only 20 or 25 feet in height, the waves from this mid-January storm didn't get the go ahead for the organizers of the Maverick's Big Wave contest to blow the starting horn. They have decided to wait for larger waves. A month earlier and a few miles north, residents of an apartment complex in Pacifica were evacuated as storm waves tore away at the sandy bluffs beneath their homes. Although a

contractor was hired to pile rocks at the base of the bluff, at least some of the residents have lost interest in moving back in. How long can a pile of rocks hold back the Pacific Ocean? While the surfers are hoping for larger waves, some ocean front residents have had enough winter already. They don't share the same excitement for 30 to 50 foot high waves.

Large waves arriving at high tide are the major force behind most coastal erosion and storm damage. Shoreline retreat may take several different forms, however. As described in an earlier column, the change from low energy summer waves to high-energy winter waves leads to beach erosion every winter. Sand is scoured off the beach in December and January and stored offshore, only to return again the next spring when winter storms have abated and calmer waves return. This is an expected and normal process we can all observe. The severity of winter storm waves varies from year to year, however, usually being greater during El Niño winters. As a result, the extent of beach retreat and recovery varies each year as well. All oceanographic signs to date this winter indicate we can expect a moderate strength El Niño, but this may be of little comfort to coastal residents.

The coastal erosion that concerns cliff top residents as well as coastal communities isn't the seasonal beach erosion, however, but the erosion and permanent retreat of the cliff, bluff or dune. This is not recoverable, at least within our lifetimes or by natural processes.

The rate at which cliffs or dunes have historically eroded along the California coast varies from a surprising ten feet per year at some unfortunate locations, to a few inches or less in others. The former is obviously a cause of concern, especially if it's your front yard. Rates of coastal retreat are related to several different factors. The strength or resistance of the material making up the cliff or bluff to wave attack is usually the most important. Comparing West Cliff or East Cliff, the rock strength varies widely and includes the type of rock, the hardness or degree of consolidation or cementation, and the presence of weaknesses such as fractures or joints.

The amount of wave energy reaching any particular area of coastline is also a key factor, and while the waves approaching the central coast on any given day come from the same storms, nearshore bottom conditions or bathymetry will increase or decrease wave heights at specific locations along the shoreline. Waves at Steamer Lane are always going to be larger than those breaking on Main Beach or at Capitola. The final factor, the regional rate of sea level rise will need some additional explanation.