

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

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**Collapsing cliffs and shifting climate**



*January 2010 Emergency cliff stabilization in progress in attempt to protect apartments in Pacifica.*

It's been a bad month for the residents of the apartment complex on a high sandy bluff in Pacifica. They had to evacuate their homes as winter storm waves continued to erode the bluff fronting their two-story apartment building. Chunks of bluff continued to fail until their narrow concrete patios were left dangling over the edge, 80 feet above the ocean. In addition to dumping a half a million dollars worth of rocks at the base of the bluff in an attempt to halt wave attack, on Monday crews from a construction company began a \$6 million bluff stabilization project. The

plan is to construct a soil nail wall, similar to what has been placed along the Pleasure Point bluffs. I stopped by the site on Wednesday on my way back from San Francisco. Workers in a metal basket suspended from a huge crane were using a portable drilling rig to insert tiebacks, or huge nails, about 50 feet into the bluff. These soil nails will be grouted or cemented into place and then steel plates and a wire mesh will be connected to the soil nails and then covered with concrete.

The head of the construction company says he is dead certain that their proposed engineering fix will stop Mother Nature in her tracks-at least for 50 to 70 years. Looking at the loose sandy materials making up these bluffs I asked myself why a series of large apartments and other buildings were built here to begin with? A few hundred feet to the south along the Esplanade an entire row of older ocean front homes were undermined and either demolished and collapsed onto the beach just a decade ago during the 1997-98 El Niño winter. A half a mile in the other direction is the San Andreas Fault, which hasn't ruptured since 1906.

These high sandy bluffs have been eroding for decades. Long-term measurements of cliff retreat from aerial photographs indicate average erosion of a foot to a foot and a half a year. Some sections of this bluff to the south were cut back 30 to 45 feet during the 1982-83 El Niño winter alone. Mobile homes were moved inland as their concrete pads were undermined and existing seawalls were destroyed.

The Daly City and Pacifica area were urbanized between the 1950's and the early 1970's, like much of California's coast, with construction encroaching closer and closer to the edges of the bluff. We now know that the storm and wave climate of the Pacific Ocean oscillates or fluctuates over cycles lasting several decades. These Pacific Decadal Oscillations exert a strong influence on the coastline by virtue of changing storm conditions and wave energy.

The period from about 1945 to 1977 was a cool or La Niña dominated period characterized by less intense winter storms, lower rainfall and less severe wave attack of the coastline. This is also the period following World War II when California's population exploded and development took place on the cliffs, bluffs and beaches of California. This all changed in 1978, however, when the coastal climate shifted to an El Niño dominated period, bringing elevated sea levels, intense storms and coastal wave attack.