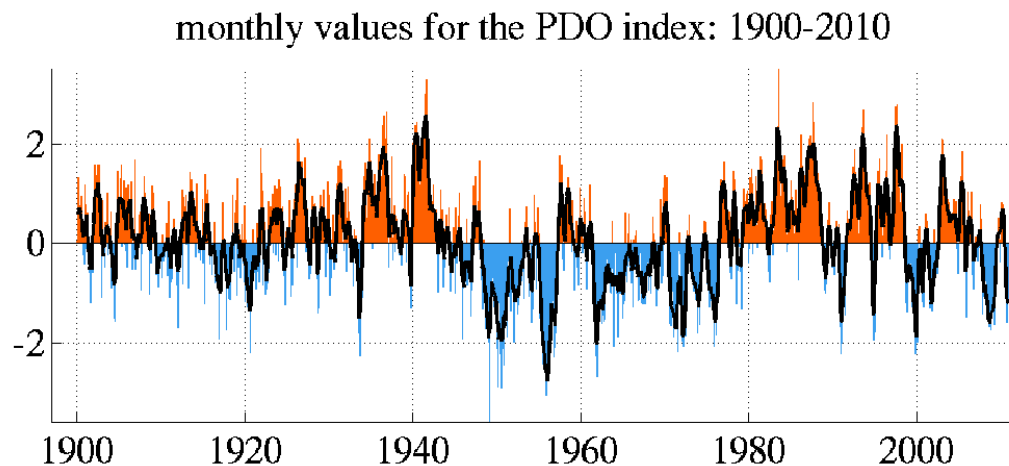


**Our Ocean Backyard — *Santa Cruz Sentinel* columns by Gary Griggs, Director, Institute of Marine Sciences, UC Santa Cruz.**

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**What's next for our shoreline—El Nino and La Nina**



*Pacific Decadal Oscillation history from 1900 to 2010. Red are warm or positive cycles characterized by more frequent and stronger El Niño events, with greater rainfall, more severe storms and coastal erosion and flooding. Blue are cool or negative cycles characterized by less severe storms and weather.*

It's always dangerous to say you are going to write about something in your next column, because if you are to maintain any credibility, you had better finish the story. Two weeks ago I talked about our relatively recent awareness of climate cycles and shifts and how we believe that these were reflected in the history of the sardine fishery in Monterey Bay. These climate changes that are now known to affect the entire Pacific Ocean also have had profound impacts on the California coastline.

The sardines had more or less disappeared by about 1945 as we entered a period generally characterized by cooler temperatures, less rainfall, fewer severe coastal storms, and reduced frequency and intensity of El Niño events. This interval, also known as a negative phase of the Pacific Decadal Oscillation (PDO), lasted until about 1978. It just happened to coincide with the years following World War II when people migrated to California in huge numbers and the coastline of southern and central California was rapidly developed. The beaches were wide, the coastline was appealingly warm and dry, and California seemed much more

desirable than the freezing winters of the mid-west and the summer humidity of the east coast. Houses were built as close as possible to the shoreline. We built on cliffs, on dunes, and on the beach itself, year after year. The limited amount of coastal property became increasingly more valuable. In Malibu, one of the desirable ocean front addresses was Sea Level Drive.

This ideal oceanfront world was rudely awakened with the arrival of the winter of 1978 when the first major El Niño in decades pummeled the California coast, including Monterey Bay. Low-lying areas like the Esplanade in Capitola, Pot Belly Beach, Seacliff State Beach, and Beach Drive in Rio Del Mar were hammered with a combination of El Niño driven elevated sea levels, high tides and large storm waves that arrived from the west and southwest, hitting the normally protected shoreline of northern Monterey Bay. The beaches were eroded and the waves then started in on foundations, decks and landscaping.

People in California tend to have short disaster memories, so within a few months when the winter storms had passed, the beaches returned, insurance companies were notified and repairs were made. In some cases, coastal homes were sold to unsuspecting new arrivals. 1978 was followed by the memorable El Niño winter of 1983, perhaps the most damaging to the California coast in half a century. Much of the newly reconstructed timber seawall at Seacliff State Beach was destroyed (for the 8<sup>th</sup> time in 60 years), waves washed into the Venetian Court Condominiums and the restaurants on the Esplanade in Capitola, and homes along Beach Drive in Rio Del Mar suffered major damage as seawalls were destroyed, sand levels dropped and some houses collapsed onto the beach. At Aptos Seascape, the protective rock revetment was overtopped and the storm waves went through the sliding glass doors into living rooms and kitchens. Damage was extensive. Ocean front houses at Pajaro Dunes were threatened as 40 feet of sand dune was eroded almost overnight leading to the emergency placement of 1000's of tons of rock in an effort to save the homes. Following the winter of 1983, the Coastal Commission and County Planning Department were inundated with permit requests for new seawalls and more riprap. The storms intermittently continued through the 1980's and 1990's, with the El Niño of 1997-98 being another major damaging event along our coast, but by this time, many of the threatened properties had been armored or sold.

What can we expect next? It appears as though we *may* have transitioned from the positive PDO phase with its severe coastal storms that extended from 1978 to perhaps 2000, and *may* have entered a calmer phase. At the same time, however, indications are that the rate of sea level rise has increased over the past 15 years

and as global warming continues, it isn't clear yet how this may affect the frequency and magnitude of future El Niño events.