

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

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Messing around with beaches



San Clemente Dam on the Carmel River is about 90% full of sediment.

Hundreds of dams on California's streams have trapped millions of cubic yards of sand that would have been carried to the shoreline under natural conditions and nourished our beaches. Sluices or pipes could have been built beneath these dams to allow sand to pass through, but this wasn't a consideration when these dams were built many decades ago. Those sediment filled dams that no longer serve any purpose are being evaluated for removal, but this has been a complex and time-consuming effort with no major dam removals yet.

The logical effect of all of the sand trapped behind those dams would be to reduce the size of the beaches, at least those that are downstream or down coast from the

dammed rivers. Do we see these narrowed beaches? Well, there are certainly lots of narrow beaches, and other areas with no beaches at all, but have beaches systematically narrowed? Most of the major dammed streams are in southern California, with about 50% of the original sand flow now trapped behind dams, so this is where we should have experienced the greatest beach losses.

We recently completed a study of long-term (60-80 years of historic aerial photographs) changes to the beaches of southern California from Santa Barbara to San Diego. Somewhat surprisingly, despite all of the dams, there were no long-term beach erosion trends identified throughout any of the littoral cells or beach compartments including the Santa Barbara, Zuma, Santa Monica, San Pedro and Oceanside littoral cells.

For those relatively natural beaches along this 300-mile stretch of coastline, (those that have not been altered significantly by breakwaters, jetties or groins), analysis of aerial photographs reveals decadal scale narrowing and widening of up to 100 feet related to El Niño and La Niña climatic conditions. Beaches tended to be narrower during El Niño dominated periods, and wider during La Niña dominated periods.

Many of the beaches of southern California, however, have been under human influence for decades. The large breakwaters and jetties built to protect harbors and marinas (Santa Barbara, Ventura, Channel Islands, and Oceanside, for example, as well as Santa Cruz) have led to beach widening updrift and erosion downdrift of these structures. Dredging and sand bypassing have usually been necessary to counter these effects. In addition, a number of large coastal construction projects such as dredging out new marinas, large construction projects in the dunes, and river channel clearing, added about 170 million cubic yards of sand to the beaches between Santa Monica and San Diego between 1930 and 1993; that's 2.7 million cubic yards a year!

Many beaches were thus artificially widened for decades, but the nourishment from these large public works projects ended some years ago. The El Niño storms from the late 1970s to the late 1990s also temporarily narrowed some beaches. And then there are many beaches, particularly those along the Malibu coast and in northern San Diego County, which have always been narrow. So the disruptions created by large coastal engineering structures and the artificial addition of large amounts of sand, as well as a changing wave climate, may have partly overshadowed the reduction of sand from dam construction.