

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

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**Sand dunes—blowing in the wind**



*The bluffs along the southern portion of Monterey Bay consist of active and ancient sand dunes that extend for many square miles beneath the old Fort Ord.*

Even with hundreds of dams restricting river flows, California's streams still provide over 10 million cubic yards of sand to the state's beaches annually. It would seem that the continued addition of all of that sand to the coast would lead to wider and wider beaches. Once arriving at the shoreline, however, sand tends to get moved down coast due to the dominant waves from the northwest along most of the California coast. Since the beaches aren't getting wider, except where we have built breakwaters, jetties or groins, where does all that sand go?

This river of sand or littoral drift may carry sand grains 50 to 100 miles or more along the shoreline in some littoral cells, where they are eventually lost either onshore into dunes, or offshore into submarine canyons. Sand dunes occur inland

from beaches at some locations along the California coast and they can act as sinks where beach sand is permanently lost from the shoreline. Huge volumes of beach sand historically were blown inland at Ocean Beach in San Francisco, along the central and southern Monterey Bay shoreline, at Pismo Beach and Nipomo Dunes, along the Oxnard Plain, and from Santa Monica to El Segundo. Some of these dune areas are enormous and account for a lot of lost beach sand. In the 1800's dunes extended from Ocean Beach near Golden Gate Park clear across the San Francisco peninsula to the bay. Driving to Monterey you pass through the middle of a huge dune field covering over 50 square miles that extends from La Selva Beach to Monterey, much of it lying under the old Fort Ord military base.

In order for any significant area of sand dunes to form, we need to have a large supply of fine-grained sand, a wide expanse of beach such that an area of dry sand exists for at least part of the year, low relief topography landward of the shoreline that provides a place for the sand to migrate and accumulate, and equally important, a dominant onshore wind direction. As a beach widens and the area of dry sand on the back beach expands, a persistent onshore wind can begin to move the sand inland and off the beach.

Most of California's large fields of sand dunes formed under different conditions that we experience today, however. Twenty-thousand years ago during the last Ice Age, sea level was about 350-400 feet lower than at the present and the shoreline was considerably seaward of where it is today. In central and southern Monterey Bay, the shoreline was about 8 to 10 miles to the west and the Salinas and Pajaro rivers crossed the now exposed continental shelf. These rivers drained large inland areas and the sand they transported and then deposited across this broad exposed shelf was subsequently blown inland by persistent onshore winds to form the vast dune fields that now underlie Marina, Fort Ord, Seaside and Sand City.

Sea level subsequently rose as the Earth warmed and ice caps and glaciers melted; the shoreline retreated back across the shelf, and the dunes began to erode. Today the dunes along shoreline of southern Monterey Bay are retreating at two to over six feet every year.