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

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Beaches–moving on

Seabright Beach was very narrow prior to the construction of the jetties for the small craft harbor but the west jetty trapped hundreds of thousands of cubic yards of sand and widened the beach permanently.

There is nothing very permanent about a beach and the sand grains are only temporary residents. Not only do they move offshore each winter and back onshore each spring, but in most places along the California coast, the grains are moving along the shoreline as well. This transit of sand is called littoral drift. Every time a wave breaks it suspends or picks up billions of grains of sand. That sand is not only moved up the beach face, but depending upon the angle at which the waves approach the coast, the sand may also move along the shoreline, up or down coast.

Most waves approach the shoreline at some angle, simply because the storms that generated the waves were somewhere far out to sea to the north or to the south, but not usually directly offshore.

The uprush and backwash of each breaking wave will carry sand grains in a zigzag pattern along the beach face, moving them a short distance, perhaps a few inches or a few feet down coast. If you are out swimming or floating in the surf zone for any period of time, you will often notice that you will have been carried a short distance down coast from where you started. The sand grains are being carried alongshore by the same water movement.

This transport of sand or littoral drift can be thought of as a river of sand moving parallel to the shoreline. At first glance, this might not seem like a particularly effective mechanism for transporting sand, at least compared to a large river in flood stage. But if you stop and think about it for a minute, typical waves breaking along the Santa Cruz coast may have an average period of 8 seconds. In other words, another wave will break about every 8 seconds. There will be 450 of these 8 second waves breaking on the beach every hour or 10,800 every day! That's a lot of energy to move sand around.

If each breaking wave moves individual sand grains only 1 inch along the beach face, this amounts to 900 feet of transport along the shoreline every day. Because the more energetic winter waves usually approach the California coast from the northwest, the littoral drift of sand along most of the state's beaches is from north to south. So sand in Santa Cruz moves from Cowell's to Main Beach and then on to Seabright over the course of hours or days.

How much sand can be transported as littoral drift? The best indicators we have along the California coast turn out to be where we have built harbors. Santa Cruz is a good example. After the sand has reached the south end of Seabright or Castle Beach, it is carried around the jetty and into the harbor entrance where it must be dredged out in order to keep the channel open. In recent years, the dredge has removed about 250,000 yds^3/yr. If this sand were being transported along the shoreline in dump trucks, rather than by littoral drift, it would require a truck every 20 minutes, 24 hours a day, 365 days a year.