

WAVES AND BEACHES

somehow related. Steep beach, coarse sand; flat beach, fine sand. But determining more precisely what the relationship is took quite a while. There are lots of places on a beach to take sand samples and to measure slope, and on the same beach the results vary greatly from place to place. A good deal of sampling and measuring was done before a "reference point" was selected. If the sand sample is taken on the beach face in the zone subjected to wave action at mid-tide and the slope is measured at the same place, consistent results are obtained. Figure 65 shows the relationship for *exposed* beaches. Here again the effects of wave energy cause variations. If the berm is retreating before the pounding of the waves, the slope is less steep than if sand is being added.

A more important effect of exposure to wave action on sand size and slope is illustrated in Figure 66, which shows four beach profiles made along the continuous beach at Half Moon Bay, California. There, Pillar Point completely protects the beach at profile one from the prevailing northwest swell. Profile four is exposed; between these extremes are two beaches of intermediate slope. In the protected zone behind the point, the beach is flat and the sand fine, but toward the south the beaches grow steeper and coarser. This demonstrates how beaches adjust to the wave environment.

Longshore bars, or beach bars, are underwater ridges in the beach material that parallel the shoreline. Often more than one bar is present, the number depending on the size of the waves, the bottom slope, and the tide range. We have discussed already how they are formed by currents that flow when steep

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storm waves arrive. Once formed, bars have a pronounced effect on the waves. Because they are abrupt shoals, they tend to act as filters causing all waves

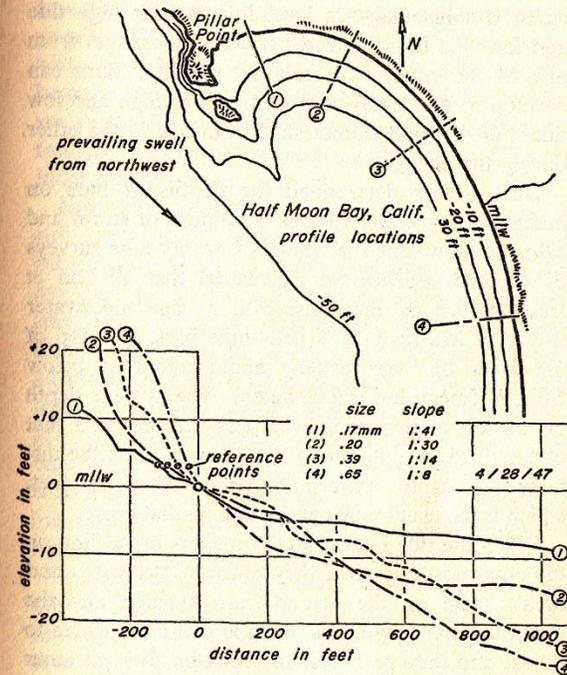


FIG. 66. The effect of a protecting headland on beach slope and sand size.

above a certain size to break at one spot (instead of breaking over a wide zone as they would on an even slope). Moreover, since bars rise abruptly and slope