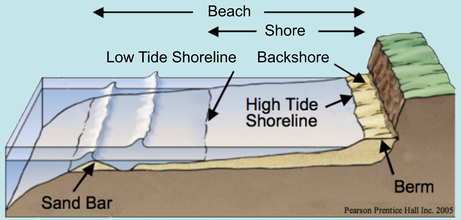
Parts of a Beach

What makes up a beach?

The beach is not just the sand that you walk on. It extends out to where the waves break offshore. The part of the beach above the water during low tide is called the **shore**, and during high tide, the dry part of the beach is called the **backshore**.

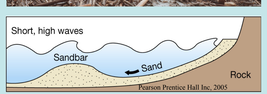
Can you see waves breaking offshore?

This is where sand has built up in an offshore shallow sand bar. The high dry part of the beach where people put their towels is called a **berm.** The berm is built up by gentle summer waves.



Seasonal Changes

The beach changes dramatically from season to season. In the winter, storms produce large, forceful waves that carry sand off the beach and form shallow sand bars offshore. Large amounts of the beach can be removed during a single storm. Waves also carry big pieces of driftwood up onto the beach. If you see large logs on the beach, they were all brought here by the ocean. Even the ones far back on the beach! In the summer, small waves pick sand up off of the sand bars and redeposit it on the beach forming a broad beach with a gentle slope. Seabright can be up to 600 feet wide during summer months!



Monterey Bay

On a clear day you can see Moss Landing (two smokestacks to the Southeast). This is where the sand from the Salinas River empties into the underwater Monterey Canyon, which is as deep as the Grand Canyon! When sea level was lower during the last ice age, the bay was smaller and the shoreline was at the edge of the canyon.

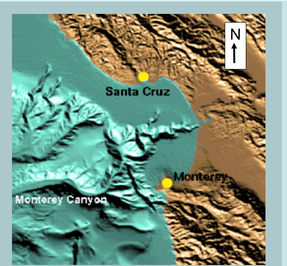
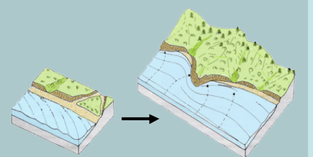


Image from www.oc.nps.navy.mil/

Refraction

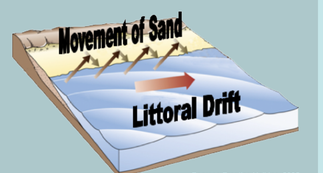
Waves approaching the coast from the northwest **refract** (are bent around) the resistant rock at the north end of Monterey Bay and erode the softer, sandy cliffs within the bay. Refraction creates an irregular coastline with wave energy concentrated at headlands This leads to protected beaches and the characteristic “C” shape of the bay.



Griggs and Savoy 1985

Rivers of Sand

Waves often approach the coast at a slight angle. This causes sand grains to slowly drift down the coast (think of beach sand as part of a large sand “river” that slowly flows along the coast). This is called **littoral drift**. In Santa Cruz, most waves come from a northwesterly direction. This produces the refraction of waves into the bay and drives the zigzag motion of the sand down the beach face in a easterly or downcoast direction. It is this refraction that has helped along with geologic formation of different resistance to erosion) to produce the “C-shape” of the bay. San Lorenzo Point and the harbor jetties prevent some of this sand from drifting down the coast.

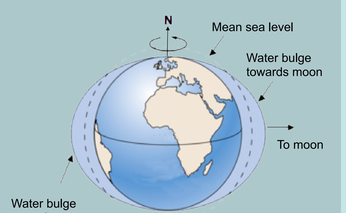


Pearson Prentice Hall Inc, 2005

Tides

Is it high tide or low tide? How can you tell?

Watch the waves. If it looks like the waves are touching dry sand, the tide is probably coming in. If there is wet sand above the reach of the waves, the tide is going out. Tides are mostly caused by the gravitational pull of the moon on the water, causing the water to bulge upward. When the bulge reaches a shoreline, the water reaches higher up on the beach creating a high tide (narrow beach). As the moon circles the earth, this bulge of water follows the moon, leaving a lower sea level behind the bulge, and creating a low tide (wider beach). There are two high and low tides a day because the moon causes water to bulge out at the same time on both sides of the earth.



Pearson Prentice Hall Inc, 2005

Shore Platforms

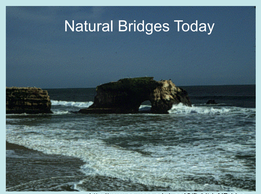
http://www.es.ucsc.edu/~es10/fieldtripNBridge

Why is this flat rock rather than a beach?

Sometimes waves are too strong to allow sand to deposit as a beach. Here powerful waves have cut vertical cliffs, and they have smoothed out flat, horizontal shelves called **shore platforms** at the base of the cliffs. Platforms are most common on exposed windward coasts, where waves are very powerful. Once a platform has formed, it helps protect the cliff behind it from further erosion.

Look closely at a shore platform or sea cliff. How would you describe the rock?

This rock, called Santa Cruz mudstone, formed 7-9 million years ago. Santa Cruz mudstone is relatively resistant to erosion. However, fractures in the rock provide weak areas where erosion can occur more easily. These zones of weakness allow waves to carve caves and arches in the rock.



http://www.es.ucsc.edu/~es10/fieldtripNBridge

Sea Cliffs and Erosion

Is there a cliff at the back of the beach? If so, how steep is it? Are there a lot of plants growing on it?

Steep cliffs mean erosion is occurring. Moderately sloped cliffs and plants indicate less erosion. In general, beaches and platforms help protect cliffs from waves and erosion. Nevertheless, large waves, especially during the winter, can erode sea cliffs and make them unstable. Erosion changes the coastline every year. Many coastal features such as the “bridges” at Natural Bridges State Park collapsed after being eroded by waves during large storms.

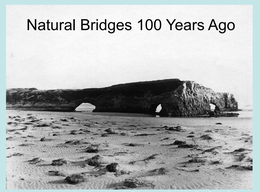


Photo provided by Dr. Gary Griggs

Do People Increase Erosion?

Not all erosion is caused by waves. Rain runoff, irrigation, and paths also increase erosion. Each of us has the ability to help prevent coastal erosion. For example, it is best to use designated pathways instead of making your own as this can speed up erosive processes.

Interested in learning more?

- Coastal Geology of Natural Bridges: http://www.es.ucsc.edu/~es10/fieldtripNBridge
- Sanctuary Integrated Monitoring Network (SIMoN): www.sanctuarysimon.org
- UCSC Institute of Marine Sciences: ims.ucsc.edu
- Griggs et al. (2005) Living with the Changing California Coast. University of California Press.

Acknowledgments

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