Agent Splishsplash: Waves
Assignment: From Sea to Shining Sea

Waves are curving swells of water caused by wind, tides, and even earthquakes. They move along the surface of the water. They are another powerful agent of change. The size and strength of waves often depend on the winds moving them. Strong winds will create large waves; lighter breezes will produce smaller swells.

Waves reshape the shoreline, which is the area where a body of water meets land. The rate of erosion depends on several factors. The size of the wave is important, as is the force of the wave. A normal wave can erode the shoreline at a rate of 1 to 1.5 centimeters (.4 to .6 inch) per year. Weather conditions greatly affect the rate of erosion. Severe, stormy weather may increase the rate to as much as 25 meters (82 feet) per day! The type of rock, or earth material, along the shoreline is also an important factor. Loose, fragile soils will be eroded faster than large blocks of dense rock.

As waves move near the shoreline, their movement begins to slow down. Gravity pulls at the crests of the waves and they tumble over, forming the surf. This breaking action of the waves fragments the rocks beneath it. The water picks up rock material and carries it toward the shore as suspended pieces of rock and other debris. When the waves hit the shoreline, these suspended particles fragment the rocks along the shoreline.

The action of the waves also pushes water into cracks and holes along the shore. The abrasive action of the particles in the water makes the cracks and holes larger. The process continues until the cracks and holes become large enough to break the rocks into pieces that fall along the shoreline or into the water.

Waves are constantly eroding the shoreline.

Agent Splishsplash: Waves
Assignment: Beaches, Bars, and Spits

Wave action is responsible for eroding the shoreline. As this process takes place, several different kinds of features may form.

When waves pound into cliffs (steep faces of rock along the shoreline), the bottoms of the cliffs begin to wear away. As the base of the cliff recedes, the top may break off and fall into the sea. There the action of the waves may grind the rocks into sand and silt. This area is called a terrace, a flat platform at the base of a cliff. The terrace will slow down the action of the waves, slowing the rate of erosion.

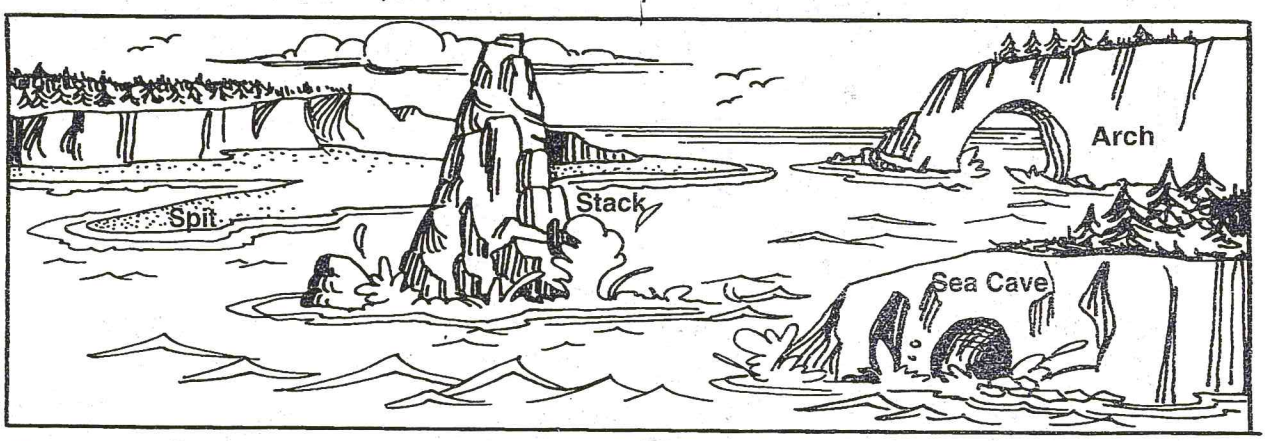
Some of the rocks along a cliff may be resistant to the action of the waves. They do not wear away or fall over, forming a terrace. They remain standing while the rocks around them erode. These tall islands of rock are called *stacks.*

Sometimes part of a sea cliff will have less resistant material than the rest of the cliff. This area will erode first, forming a hollowed-out area, or a cave. If the waves are able to wear away the rock through the back side of the cave, an *arch* may be formed.

When the waves erode the landforms, they move the earth material to other places. The deposition of these particles may form other interesting features along the shoreline. One with which most of us are familiar is a *beach.* Beaches are formed when the eroded particles are deposited parallel to the shore. They may be made of finely ground sand or large pebbles. They may be formed from material brought by the waves from nearby shorelines. They may also be formed by materials deposited by rivers and streams and then carried along by waves.

The color of a beach may give some indication as to the types of material from which it was formed. Beaches along the Atlantic coast of the U.S. are often white, sandy beaches. Most of them are formed from eroded quartz. In Hawaii, the black beaches are made of weathered volcanic rock. Other beaches may be made of shell or coral materials.

Most of the time, waves do not come straight at the shoreline. They come in at an angle. The waves turn the water so it runs parallel to the shoreline. This is known as a *longshore current.* If the shoreline bends, the longshore current may deposit its material in the open ocean. The material will build up over time, forming a *sandbar.* If the sandbar is connected to the shoreline, it is known as a *spit.*



The eroding action of waves can create several different rock and land formations.