How do beaches change over time? Where does sand come from? How do waves interact with the shores that they crash onto? You can make a model of a beach and make your own waves to see what happens! You may even make new sand by breaking your shoreline into smaller pieces, a process called erosion.

**MATERIALS**
- Sand, dirt, or aquarium gravel
- Water
- Rectangular container, such as a plastic tub, Deep tray, casserole dish, or paint tray
- 1–2 inch tall object to prop up the container (such as a stack of magazines, deck of cards or short tupperware)
- **Optional:** Blue food coloring
- **Optional:** Rocks or shells
- Empty plastic water bottle
- Stop watch or timer
- Science notebook or piece of paper
- Pen or pencil

**PROCEDURE**
- Fill one side of the rectangular container with about 4–5 cups of sand (or your homemade mixture). This will become your model of a beach.
- Place an object underneath the sandy side of the container to make a slope with the sand at the top. Push the sand up hill so it makes a gradual slope down to the empty side of the container. Option to mold the homemade container into a cliff shape instead of a slope.
- **Optional:** Place some rocks or shells in the sand

*Experiment continued on next page...*
PROcedure  continued...

- Fill the plastic bottle with water and a few drops of blue food coloring. Shake well.
- Pour the water from the bottle into the lower side of the container. Add more water until the water level overlaps slightly with your shore.
- Take the empty plastic water bottle and place it on top of the water. Start the timer and gently push up and down on the water bottle to make even waves for about 30 seconds.
- Observe how the water affects the sand. What do you notice? Write your observations down in your science notebook.
- Now make waves for 1 minute straight. How much has the beach eroded? Write down the time and your observations in your science notebook.
- Now make waves for another minute. How much more has the beach eroded? Write down the time and your observations in your science notebook.

Try This

- What do you think would happen if the waves moved faster? Slower? Try it out!
- Wind, rain, and big storms like hurricanes are all natural events that can cause erosion to beaches. How would rain change our model beach? What about wind? Write down your prediction in your science notebook then test it out! Make your own wind and rain and observe what happens.
- Are there any beaches, rivers, or lakes near you? Find a map of the shoreline near your community from a previous time period. Do you notice any changes from then to now?
- Check out this interactive map from the U.S. Geologic Survey that shows historic shorelines along the coast of Washington and the United States: https://marine.usgs.gov/coastalchangehazardsportal. Go to shoreline change → historical shoreline positions and zoom in on the area you want to look at.
DID YOU KNOW

The sand in your tub and on beaches is made out of tiny pieces of rocks and shells. The water in your tub and the water in the ocean are made up of even tinier bits called molecules. The molecules moving around when you make waves in the water is like really fine sandpaper rubbing against the shore, and it rubs pieces of the shore off into the water. When it rubs against rocks, it breaks tiny pieces of rock off and those pieces are new sand! The sand now in the water can help rub off more pieces of shore into the water.

You are also creating currents in the water with your waves. These currents pick up particles, like your sand, and carry them where the water goes.

On coastal beaches, you may notice mounds of sands. These are called dunes. Dunes often have tall grass on top of them. The roots of the grasses help keep the sand in place and the dunes sturdy. The dune grass is also very important to the coastal ecology in Washington! Walking on dunes can weaken the structure and speed up erosion. We try to protect them by only walking on designated paths!

Seawalls and jetties are coastal structures that can help slow down erosion and protect the shoreline. Seawalls are built parallel to the shoreline to help protect against erosion and flooding that could damage buildings and roads that are close to the water’s edge. Jetties are structures that are connected to the shore and stick out into the ocean. They help protect the coastline from currents and tides that could wash away beaches.
CURIOSITY AT HOME
BEACH EROSION

K–2 GRADE EXPLORATION
Here are some questions you can explore together.

• What do you think happens to the sand that gets eroded from the beach? Where might it go?

• Do you have a favorite beach you like to go to? What do you do when you go to the beach?

• Try adding some toys to the water or the beach. Now make more waves. Does anything change?

• After letting the waves erode your beach for a while, try eroding it with your hands. Can you make any interesting forms in your beach? A spit is a long, thin sand bar going out into the ocean. A cove is an area of ocean almost entirely surrounded by land. What might erode a real beach like your hands eroded your model beach?
3–5 GRADE EXPLORATION

Explore the following questions and write your observations in your science notebook.

- How could you help prevent or slow down beach erosion? Test out your idea in your model beach! After you’ve made your barrier, use the stop watch to record how long you make the waves. How did the barrier hold up after 30 seconds? After 1 minute? How much erosion occurred? Was it different from your first experiment? What was successful? How could you redesign it?

- In many places of the world, there are other land features right next to beaches, such as dunes, mountains, marshes, and rivers. How could these features change the rate of erosion at your beach? In your model, use the sand to build a mountain, or use water and a spoon to make a river. Now test what happens when it rains or there are heavy winds. Record your observations in your science notebook.

- Not all beaches are the same! Some places have white sand beaches while others are rocky beaches. How would erosion change a rocky beach versus a sandy one over time? To test it out, run this experiment again but with courser or finer sand than your first experiment.

- The Dungeness Wildlife National Refuge Park in Sequim, WA has the longest natural sand spit in the United States. Sand spits are an extended stretch of beach that goes from the mainland out to sea. How do you think this affects erosion of the shoreline? Can you make one in your model?
6–8 GRADE EXPLORATION

Explore the following questions and write your observations in your science notebook

- How could you help prevent or slow down beach erosion? Test out your idea in your model beach! What things do you want to keep the same between the different tests in order to test as accurately as possible? How can you measure how eroded your beach is after each test? Write these down in a science notebook. What was successful? How could you redesign it?

- What could be some consequences of humans forcing beaches to stop natural erosion?

- In many places of the world, there are other land features right next to beaches, such as dunes, mountains, marshes, and rivers. How could these change the rate of erosion at your beach? In your model, use the sand to build a mountain, or use water and a spoon to make a river. Now test what happens when it rains or there are heavy winds. Record your observations in your science notebook.

- Not all beaches are the same! Some places have white sand beaches while others are rocky beaches. How would erosion change a rocky beach versus a sandy one over time? To test it out, run this experiment again but with courser or finer sand than your first experiment.