

EROSION

Erosion is happening all around us. Even though you may not recognize it, the forces of erosion are constantly shaping our planet. Sometimes, as in a mudslide or avalanche, erosion happens quickly. More often than not, erosion happens so slowly that you can't even see it. Over time, the simple act of water running downhill can not only carve out a hole the size of the Grand Canyon, but it can literally move mountains!



Before wind and water can carry material away, rock first has to break down. Geologists call this process "weathering." As the name suggests, weathering is controlled by things like wind and rain, and it comes in two basic forms. Chemical weathering happens when substances like water or



acids get into rock and react with the minerals that make up the rock. You may have noticed that if you leave your bike or other steel object out in the rain, it tends to get rusty. Well, it turns out that the same thing happens to certain minerals inside rocks. After enough time, these minerals change so much that they simply crumble.

Mechanical weathering happens when things like ice physically break rock apart. If you have ever left a can of soda in a freezer too long, you know that when water freezes to ice, it expands so much that it may actually split the can apart. The same thing happens when rain gets inside



rocks and freezes. Known as "frost wedging," this process can reduce solid rock to tiny pieces in just a few short years!

Once weathering breaks a rock down, then it's up to gravity to move them along. That's right, I said *GRAVITY!* Think about it. Why does water flow

downhill? Gravity! What makes a rockslide happen? Gravity! Why do your pants fall down when they're too big? Gravity! It turns out that if it wasn't for gravity always pulling things down, very little erosion would actually happen!

The Grand Canyon

If you have ever gone to the Grand Canyon, or even seen photos of it, you can't help but be amazed at the size of it. Stretching more than 250 miles, the canyon averages close to a mile deep and in some places it's almost 20 miles wide. The Grand Canyon is a great example of how water flowing downhill can steadily wear away at the rock below. In this particular case, the Colorado River has been actively cutting the main gorge of the canyon for thousands of years. While the river is responsible for cutting the depth of the canyon, wind, water, rock falls and mudslides along the sides of the canyon are responsible for the width. Together, these agents of erosion remove close



to a half-million tons of sediment from the canyon every day — and as long as the water keeps flowing, the Grand Canyon will get grander!

Glaciers

While they may look like big solid masses frozen in place, glaciers are really "rivers of ice" slowly flowing downhill under the force of gravity. While streams and rivers cut narrow channels across the land, glaciers have the ability to level entire continents! The only hitch is that they take a long time to do it! Glaciers start as big piles of snow that slowly build up at the tops of mountains. As the weight of the snow builds up, the material at the bottom of the pile is turned to ice. Slowly, the ice begins to flow downhill under the weight of the entire mass, and as it flows, it picks up any loose rock in its way. Glaciers can pick up and carry sediment that ranges in size from sand grains to boulders bigger than houses. Moving more like a conveyor belt than a bulldozer, a single glacier can move millions of tons of material!



Wind

Anyone who has ever been caught on a beach on a blustery day knows how much sediment the wind can move! Being caught in a windstorm at the beach is a lot like having your body sandblasted! Unlike water and ice, wind can only move small particles of sediment. However, once they get going, they can do a great deal of damage. In desert regions where water is scarce, wind is often the key agent of erosion. Not only does wind pile up and move sand dunes from place to place, but when it's carrying sand, it can actually wear away the face of other rocks and carve intricate patterns as it blows. Back in the





1930s, severe droughts in the middle of the United States, coupled with high winds, created an occurrence that became known as the "Dust Bowl." Because of overgrazing by cattle and a lack of rain, many plants died. With few roots to hold the soil in place, the blowing winds caused so much erosion that they became known as "black blizzards."

Moles, Voles, and People

Think about moles, voles, and people in the dirt: Most people don't think about it, but one of the chief causes of erosion are all the billions of critters that continuously dig up the soil in search of food and homes. Insects, worms, reptiles, and mammals all help to disturb the upper layers of the Earth. Once soil is disturbed, then wind and rain can more easily wash it away. While it's easy to point our fingers at the other members of the animal kingdom, it's important to remember that the biggest culprit when it comes to biological erosion is humans. The amount of erosion resulting from one storm hitting an open construction site or a freshly ploughed field is often greater than all the erosion caused in the same area by other animals working more than 100 years!

