

Weathering

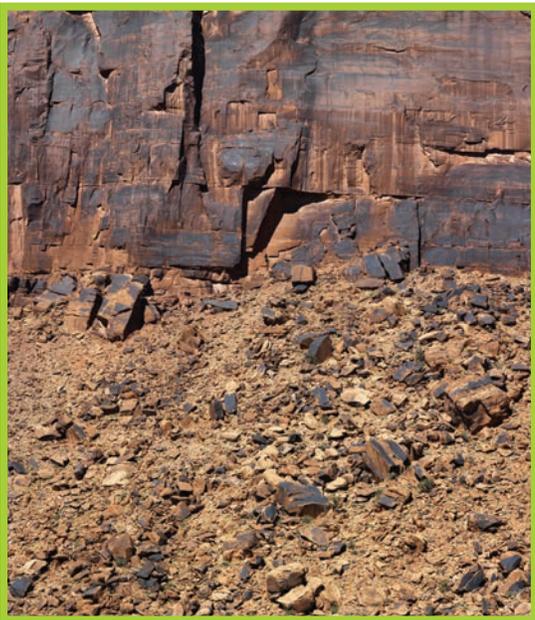
Pebbles and sand are pieces of rock. Pebbles are pretty big. You can count a handful of pebbles. Pieces of sand are tiny. You can't count the particles in a handful of sand. All pebbles and sand particles start out as huge masses of rock the size of mountains. How do mountains break down into pebbles and sand?

The answer is **weathering**. Weathering is the breaking of rocks into smaller pieces. Weathering happens to all rocks when they are exposed to water, air, and changing temperatures.

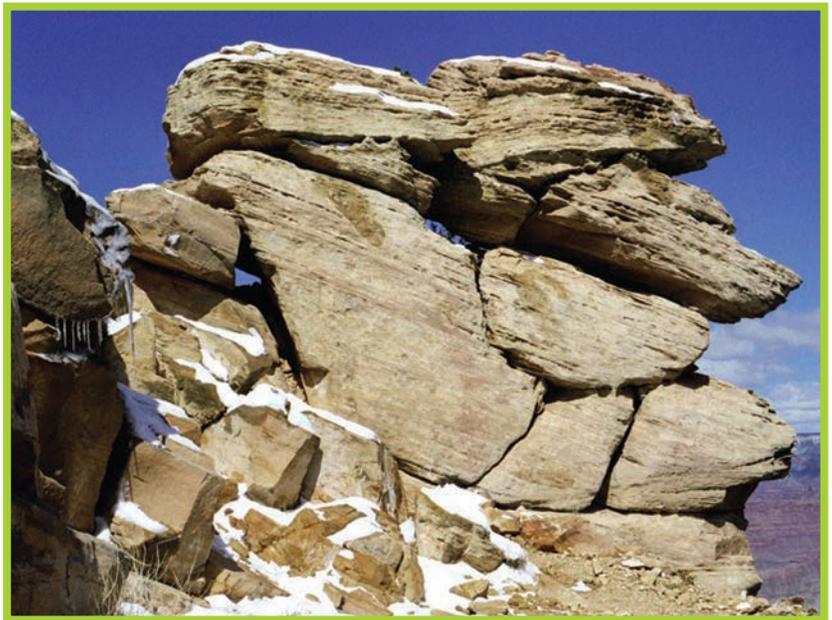
Physical Weathering

Rocks break down in two ways. **Physical weathering** makes rocks smaller, but does not change the rocks in any other way. When a big rock falls from the side of a cliff, it breaks into lots of smaller rocks. All the **minerals** in the small rocks are the same as the minerals in the big rock.

When rocks get hot and then cold, they can crack. Sometimes water gets into cracks in rocks. Water expands when it freezes. It can expand enough to break big sections of rock along the crack. When ice melts, the rock may break into smaller pieces.



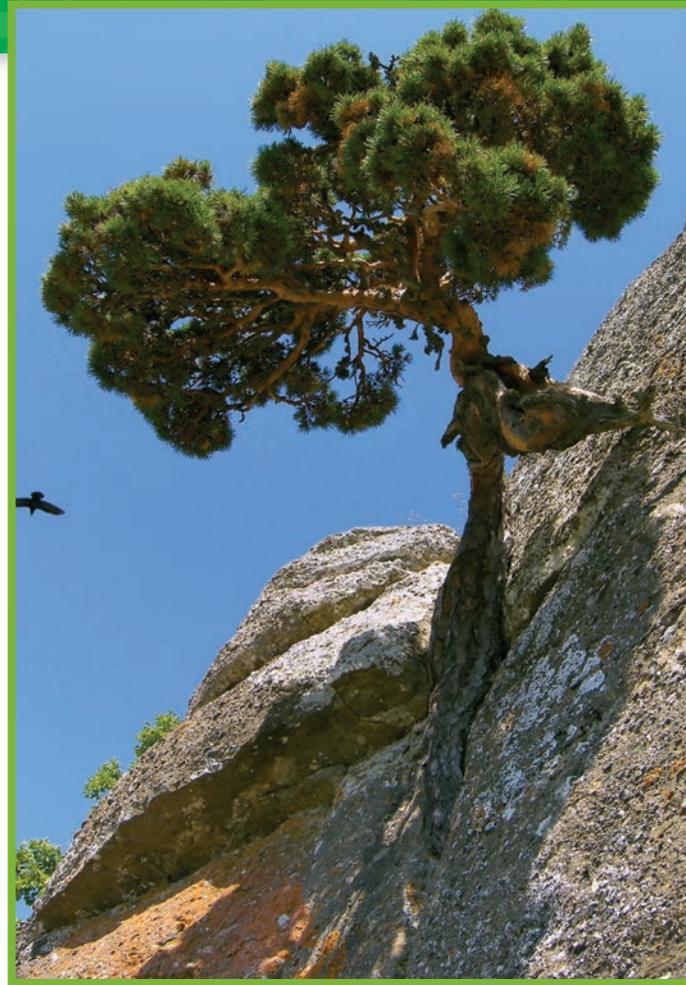
Physical weathering of cliffs



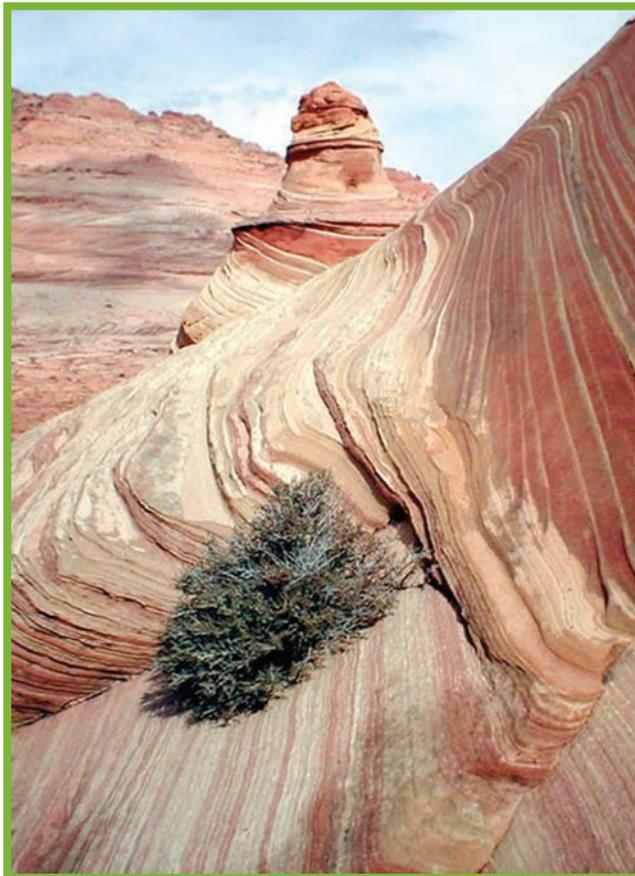
A rock weathered by freezing and thawing of water

Roots of trees and bushes can grow down into cracks in rocks. As roots grow, they make the cracks bigger. Sometimes the cracks get so big that the rock breaks apart.

When rocks bang into one another, they get worn down. Rubbing, grinding, and banging is called **abrasion**. Abrasion is a kind of physical weathering. It happens when rocks fall in **landslides**, tumble in flowing water, or crash around in waves. Wind can blow sand against rocks. This sandblasting weathers the rocks.



Tree roots grow into and break rocks.



Weathering of cliffs by wind and sand



Blowing sand can weather rocks into interesting shapes.

Chemical Weathering

Chemical weathering happens when minerals in rocks are changed by chemicals in water and air. The starting minerals change into new substances.

Many rocks contain iron. When oxygen in air comes in contact with iron, the iron in the rock can rust. Rust is iron oxide. Iron oxide is softer than other iron minerals. This causes the rock to break apart faster.

Carbon dioxide gas in the air **dissolves** in water droplets. This makes **acid**. The acid droplets can fall as rain. The acid dissolves the **calcite** in **limestone** and **marble**. This is a chemical change. Monuments, buildings, and gravestones made of marble or limestone weaken when exposed to acid rain.

Salt can cause chemical weathering. Salt water can **react** with minerals in rocks to make new minerals. When the new substances are softer than the original mineral, holes can form. The weak rock breaks and falls apart more easily.



Chemical weathering of a rock containing iron



Chemical weathering of marble by acid rain

Chemical weathering of sandstone by salt water

