



Erosion and Weathering Background Essay

Earth's surface is constantly being shaped and reshaped by natural processes. Some of these processes, like earthquakes and volcanic eruptions, produce dramatic and rapid change. Others, like weathering and erosion, usually work less conspicuously over longer periods of time.

Weathering causes rocks at Earth's surface to fragment, crack, crumble, or otherwise degrade due to physical, chemical, or biological interactions. Because different kinds of rocks form in different settings, they react differently when exposed to temperature swings, moisture in the air, or pressure changes. Although all rock types have natural areas of weakness, certain rocks weather more slowly because of their mineral composition and structure. For example, the silica and quartz crystals found in granite formed through the slow cooling of magma deep within Earth make granite an extremely hard rock. Sandstone, by comparison, forms under water from bonded sand-sized particles. Its porosity makes it more vulnerable than granite to processes of physical erosion.

Chemical reactions also weather rock. For instance, water dissolves minerals found in certain rock types, such as limestone, to form *karst* terrain, a landscape characterized by underground caves, fissures, and streams. Finally, certain living organisms, such as lichens, produce corrosive acids that eat away at the surface of the rock on which they grow. Others, such as plant roots, enlarge cracks in rocks, ultimately breaking the rocks into pieces.

Erosion loosens and carries away rock debris formed by weathering. Without erosive agents, including water, wind, and glaciers, rock debris would accumulate where it formed. Moving water is the most potent erosive force on Earth. Powered by the force of gravity, the world's rivers deliver about 20 billion tons of loose rock fragments, or sediment, to the oceans each year. Moving air, or wind, is another important transporter of sediment, especially in dry regions. When tiny sand grains are lifted and carried by the wind, the wind also becomes an erosive agent, capable of sculpting rocks into a variety of shapes, as evidenced in the still images.

Because erosion can strip vital components such as soil and sand from a local environment, initiatives have been designed to help manage the consequences. For example, in coastal environments where beaches and dunes serve as critical habitat for wildlife or protection against hurricanes for property owners, seawalls and other structures may be erected to help reduce erosion. Furthermore, along rivers where flooding events can destabilize surrounding hillsides and where the build up of fine-grained sediment such as mud or clay may threaten to block a river's progress downstream, banks can be reinforced and native vegetation restored to minimize erosion's damaging effects.

Reprinted from *PBS LearningMedia*: Erosion and Weathering

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