

Reflect

Look at the picture of the Grand Canyon to the right. This enormous surface feature is the largest canyon on Earth. The Colorado River is seen flowing at the bottom of the canyon. What constructive forces built up the many layers of colored sediment you see on the canyon walls? What destructive forces caused the deep canyon to form in the first place? This module can help you answer those questions.



Surface Changes

Nature's change agents have been both constructive and destructive by building up and carving Earth's surface for billions of years, creating slow and rapid changes to landforms that resulted in an amazing diversity of landscapes. Water from the Colorado River gouged out the majestic, mile-deep Grand Canyon. Water also deposited the silt from ancient seas on the broad plains. Glacial ice, which is now melted, scraped away sides of mountains in the North. This left behind long lakes, which became the Great Lakes, depositing the rubble hundreds of miles downslope and creating the rocky northeastern states. For millennia, relentless winds have chipped away at sandstone formations, leaving behind unusual rock formations typical of the Southwest. All regions on Earth have been slowly altered in a similar fashion, each with its own unique story of change.



Water carved the Grand Canyon.



Water deposited silt on the Texas plains.



Glacial ice left flat rocks in the N.E. states



Wind sculpted sandstone.

Constructive processes build surface features.

Several forces have been in action to alter the landscape of Earth for billions of years. Some are slow processes like the deposition of soil and the gradual uplifting of blocks of land along fault zones. Other forces are rapid processes that quickly change the surface, such as earthquakes and volcanic eruptions.

Soil Deposition

River deltas are examples of a constructive process where weathering sediment from higher ground is carried downriver and finally deposited in large deltas at the mouths of rivers such as the Mississippi in the southern United States and the Nile in Egypt.

Beaches build up along coastlines from the deposition of weathered and eroded sediments from higher ground and from the wave action that weathers shell fragments.

Dunes form in some deserts and along some coastlines where windblown sediments pile up in huge, sandy mounds that slowly shift day to day.

Sandbars occur where wave and tidal action build up deposits of sand in long ridges parallel to the shore that often come above the waterline.

Floodplains are deposits of rich sediments built up from a river flooding into the large, flat area surrounding the river.

Glacial moraines are huge ridges of rock and dirt debris left behind after a glacier melts. These enormous deposits were created by the constructive power of a glacier bulldozing through a region, pushing the rock and rubble to its front and sides.

Alluvial fans are large, fan-shaped deposits of debris and rock rubble that form at the base of some mountains where rain has weathered and eroded materials downslope.

Soil Deposition – Constructive Process



Deltas



Beaches



Dunes



Flood Plains



Glacial Moraines



Alluvial Fans

Look Out!



Confused about which forces build up or tear down? Sometimes, a process that alters Earth's surface can be both destructive and constructive, such as earthquakes and volcanic eruptions. Think about what the process is doing, such as building new land features or whether it is breaking down a surface feature. When earthquakes and volcanoes create new landforms, that force is considered constructive. If those processes destroy an environment, then destructive forces are at work.

Other Constructive Processes

Earthquakes

Earthquakes are usually associated with destructive forces due to the extensive damage caused by the violent seismic shaking. However, when earthquakes along divergent plate boundaries create new coastline or enlarge bays, the buildup of new landforms is considered a constructive force.

Volcanoes

Volcanic eruptions often destroy landscapes. However, when lava emerges and flows onto the sides of the volcano and the surrounding area, it builds up land, which is considered a constructive force. Entire islands have formed from volcanic hot spots that erupt and build up new land. When crustal plates move slowly over these hot spots, a series of volcanic islands are formed in an archipelago. The Hawaiian Islands are an example of this constructive process.

Faults

Faults are cracks in Earth's crust that result from the buildup of stress along plate boundaries. When that stress is released, new surface features are formed where land is uplifted as cliffs and scarps, or pushed upward into mountains.

Other Constructive Processes



Volcanoes can form new land, islands, and mountains.



Earthquakes can form new islands, coastlines, and bays.



Faults can form cliffs, valleys, and uplifted mountains.

Destructive Processes

Erosion

Erosion breaks down land as it carries away weathered material. The powerful forces of erosion by wind, water, and ice change the surface features in both slow and rapid processes. Over long periods of time, older mountains erode their all craggy peaks into low rolling crests such as the Appalachian Mountains. Erosion creates vast canyons from rivers carving their way down through floodplain. Water erosion can also wash away large areas of farmland and beachfront property. The Grand Canyon in Arizona resulted from eons of river water erosion. Wind erosion has sculpted desert sandstone, leaving behind arches and other windblown formations. Wind erosion blows away topsoil where farms have bare land.

Earthquakes

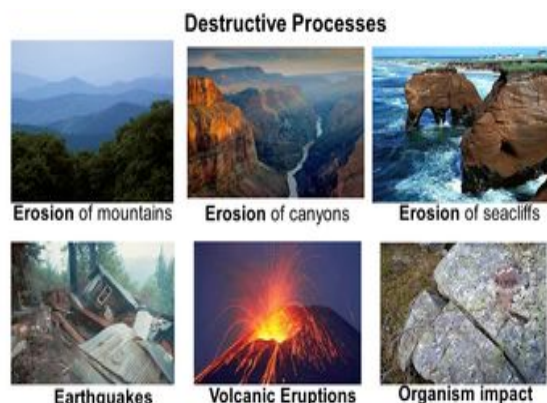
The strength of an earthquake can vary depending on the stress that has built up along cracks in the Earth's crust. The magnitude of the destructive force of an earthquake is measured on the Richter scale that ranks the relative disaster by the amount of damage done to the surrounding area. Earthquakes topple structures and destroy cities.

Volcanoes

The hot magma that erupts from an exploding volcano can result in lava destroying life in the surrounding area, ruining the landscape and wiping out all man-made structures, too. Often, the pyroclastic mud and ashes that can also erupt with large explosions can cause as much devastation as the hot lava.

Organism Impact

Living things interact with their environment to the point of destruction. Sometimes animals will eat all the vegetation in a habitat. For example, locusts destroy plants, leaving the ground bare so that erosion moves in and washes away the top surface or creates gullies in the land. Some organisms can erode rocks through chemical reactions such as lichen breaking down rocks. Other organisms make large burrows through the surface, which also breaks down the surface.



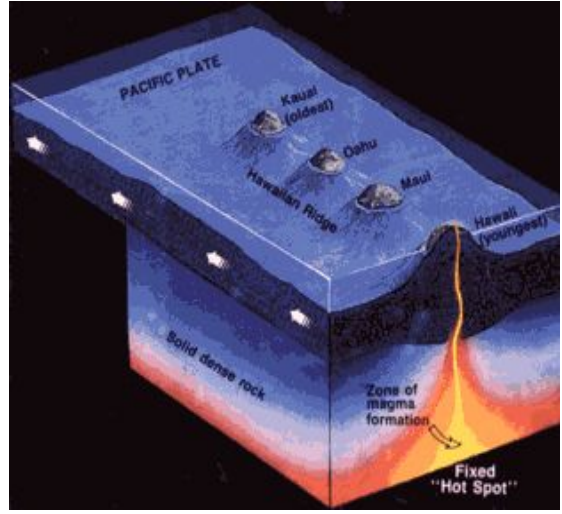
What Do You Think?

1. The hot spot volcanoes to the right are the Hawaiian Islands formed through constructive processes of repeated lava outflows building up layer upon layer until an entire island resulted. Describe three other events that build up land through the constructive process:

A.

B.

C.



2. Earthquakes can devastate populated areas when the surface shakes and shifts, destroying the surrounding area. Describe three other events that break down land through the destructive process:

A.

B.

C.



Connecting With Your Child

Surface Features Scavenger Hunt

To help your child distinguish between constructive and destructive forces that shape the surface features of Earth, create an Internet scavenger hunt in which he or she tries to find picture examples of each type of constructive and destructive process. Afterward, try to find the location of those features on a world map.

Below are suggested areas of research for the various **constructive** processes:

1. Soil deposition
 - River deltas
 - Beaches
 - Dunes
 - Sandbars
 - Floodplains
 - Glacial moraines
 - Alluvial fans
2. Earthquakes
3. Volcanoes
4. Faults

Below are suggested areas of research for several **destructive** processes:

1. Erosion
2. Earthquakes
3. Volcanoes
4. Organism impact

Here are some questions to discuss with your child:

1. What evidence did you use to justify you categorizing the event as constructive or destructive?
2. After finding these features on a world map, what relationship between the location of destructive processes and the coastlines bordering the Pacific Ocean did you find?
3. Which surface features have you personally seen?

Extension Activities

Try contacting your local, state, or federal park service staff for more background on those surface features that are located on government property.

Make a scrapbook of the surface features that you have visited or would like to visit. Write a brief description for each image.