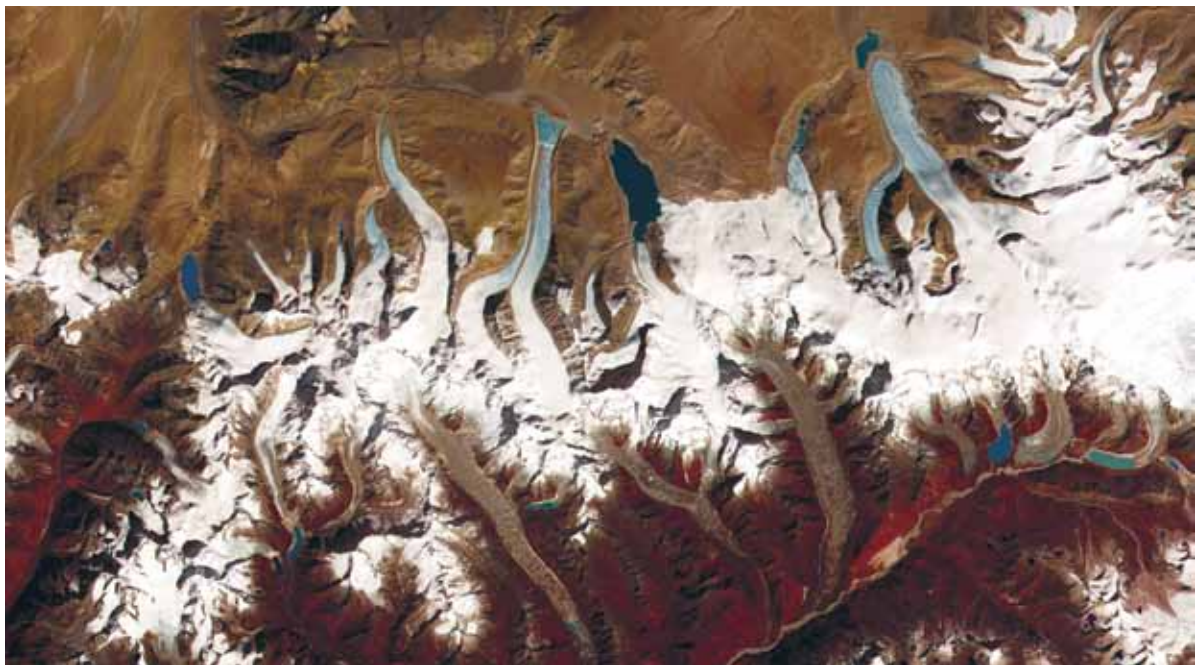


Glaciers Shape Landscapes

Glaciers Move the Earth

Glaciers are like giant Earth-moving machines. They scrape the Earth beneath them and break off rock and pick up sediment as they move. Glaciers carry rocks and sediment along as they move. Eventually these are deposited somewhere else. When glaciers weather, erode, and deposit rocks and sediment, they shape landscapes in unusual and interesting ways.

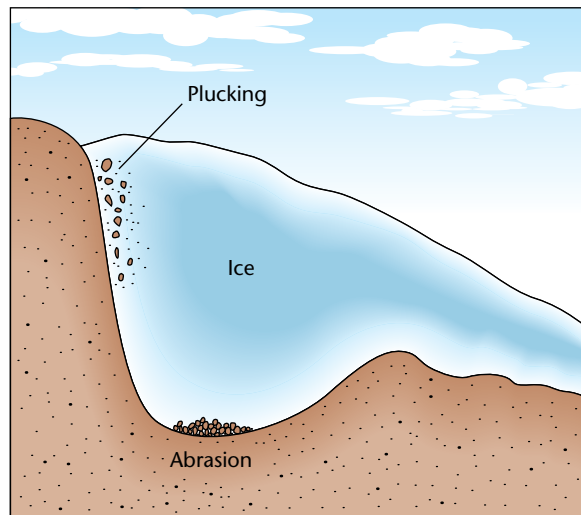


A view from space of mountains shaped by glaciers.

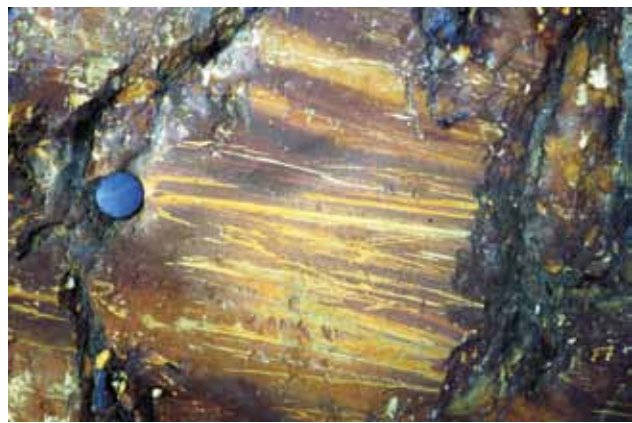
Glaciers Shape Landscapes

Glaciers Weather Rock

Glaciers weather rock in a number of ways. They pluck rock as they move down steep mountainsides. Over time, the bits of rock and sediment freeze into the ice, giving the underside of a glacier a gritty texture. As they move into flatter areas, the rocks and sediment abrade the Earth's surface.



Like sandpaper on wood, the glacier polishes the rock it slides over. After the ice melts, the exposed rock can have a smooth, shiny look. Geologists describe rock with this appearance as having **glacial polish**.



Glacial polish and glacial striations show the effects that glaciers have on rocks.

Glaciers can also abrade rock in other ways. As the glacier glides over a rock surface, rocks trapped at the bottom of the glacier can carve long scratches, called **glacial striations**. These striations help geologists figure out the direction that the glacier moved when it flowed.

Glaciers Erode Rock

Glaciers move more slowly than rivers, but over time their huge size and weight can make them more powerful. Compared to rivers, glaciers can carry sediment of almost any size—from very small pebbles and bits of soil to huge boulders the size of cars and houses. The ice pushes this collection of rocks into mounds or ridges, called **moraines**. Moraines form along the sides and front of glaciers, and can be left behind when a glacier melts.



Some moraines are only a meter high, others can be hundreds of meters tall. Lakes often form behind moraines after a glacier melts.

Glaciers Shape Landscapes

Sometimes a giant piece of ice can break off of a glacier and get buried in a moraine. When the ice eventually melts, it can leave a small scooped-out area, called a **kettle**. When kettles fill with water they can create small kettle ponds or larger kettle lakes.

Alpine (mountain) glaciers can erode a steep mountainside and create a rounded hollow, or depression, shaped like a shallow bowl. This kind of feature is called a **cirque**. After the glacier melts, the cirque can fill with water to form an **alpine lake**.



Mountain glaciers carve interesting features into the landscape.

Horns, such as Kinnerly Peak in Glacier National Park, Montana (shown on this page), are created when several cirque glaciers erode the sides of a mountain. The rock is scraped away from the peak until all that is left is a steep, pointed peak with sharp ridges leading up to the top.

Glaciers Deposit Rock

What starts out as a jumbled mess of rocks and other material of all different sizes sorts out and gets deposited in different ways over time.

Moraines (described above) are one landscape created when a glacier deposits the rocks and sediment that had been frozen into the ice. In some areas where glaciers existed long ago, you can still see the moraines that were deposited by large glaciers. Cape Cod, in Massachusetts, is an example of a huge moraine left behind by a giant glacier that melted.



Cape Cod, Massachusetts was formed by a huge glacier.

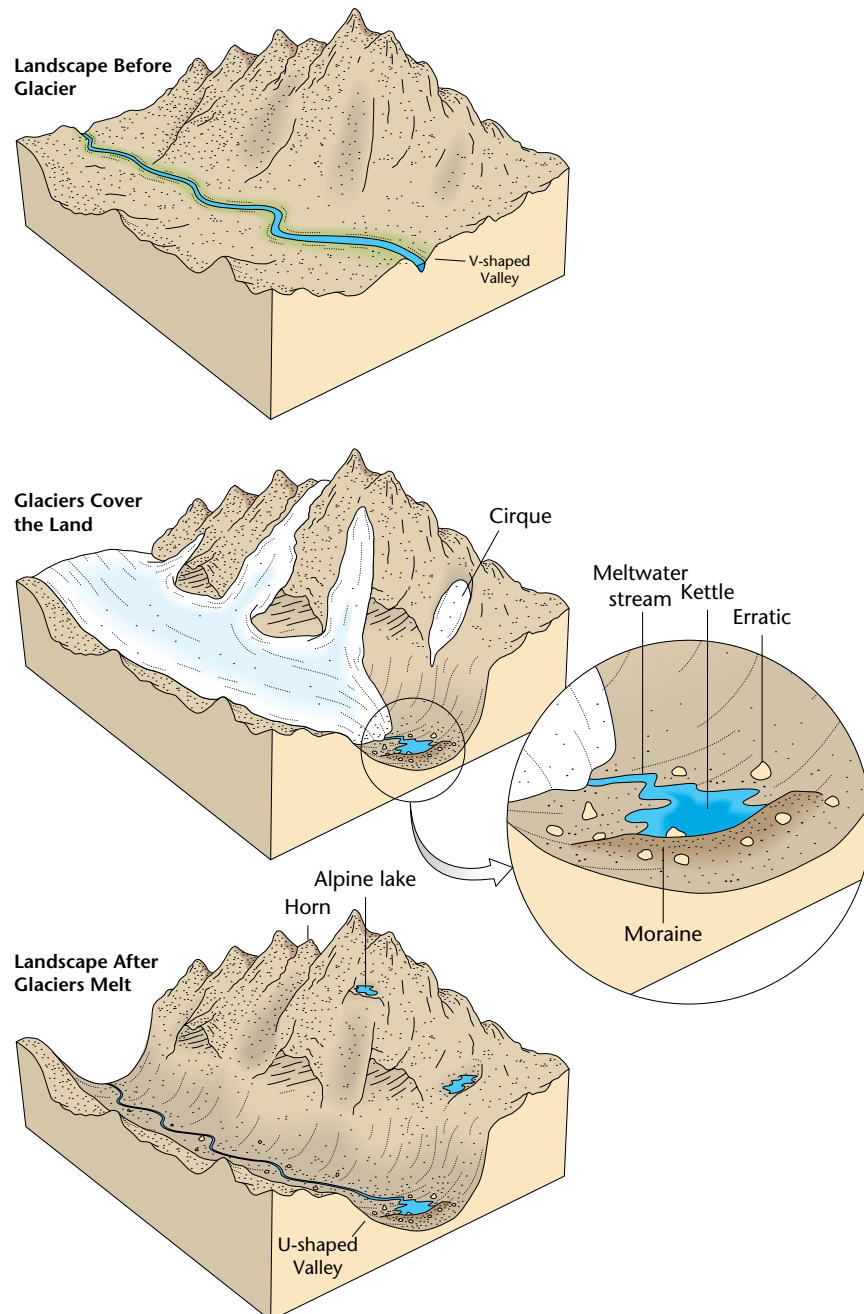


Erratics can look like giant boulders that have been left stranded.

Glaciers Shape Landscapes

Some glaciers can carry truck-sized boulders hundreds of miles. When the glacier retreats, the melting ice deposits the boulders. Often, no other large rocks are found nearby. These large rocks are called **erratics** because they can be rocks that don't match the rocks found in the local area.

The following picture shows how glaciers can create many of these landforms to create complex landscapes.



Why are Glacial Valleys Shaped Differently Than River Valleys?



A river makes a V-shaped valley because the water continues to dig its path deeper and deeper into the Earth and rock underneath it. The walls have a more-or-less uniform slope from top to bottom; the slopes erode over time.

Most glaciers start to form where a V-shaped river valley already exists. Glaciers erode on all sides, and scrape away everything in their path, so the walls remain steep and the valley becomes broad and U-shaped. When you think about how much rock and sediment is carved away to turn a V-shaped valley into a U-shaped valley, it is easy to see why glaciers can create large moraines at the end of a glacial valley.



Think About It!

Look at the images above. Why do glaciers carve the land differently than rivers?



Try It Out!

Glaciers are made of ice and rivers are made of water. Think of a solid, then a liquid. Pour some water over a rock, and then rub a piece of ice over the rock with some pressure. What differences do you think there will be between the two processes? How could this affect the valley formations shown above?

The Biggest Glaciers of All

The photographs of glaciers you've seen so far are all mountain or valley glaciers. But there's another kind of glacier that's even larger. These glaciers—giant sheets of ice called **continental glaciers**—can only be found in two places on the Earth, in Greenland and Antarctica.



A view from space of the ice-covered island of Greenland.



A computer-generated view from space of the “frozen continent,” Antarctica.

It’s hard to imagine just how huge these glaciers are. Although there are more than 150,000 mountain glaciers around the world, these two massive sheets of ice contain more than 90% of all the glacial ice on Earth. In fact, there is enough ice in Antarctica to cover the whole United States with a sheet of ice 3 kilometers (nearly 2 miles) thick. In some places, the ice on these glaciers is more than 4½ kilometers (nearly 3 miles) thick!

At one time much of the land in the northern hemisphere, including large parts of North America, was covered with glacial ice, just as Antarctica is now. You’ll learn more about how the Earth looked then, and how it shaped the landscapes we see today, in the next chapter, when you read about the Ice Ages.

Our Geosphere Fact

About 2% of all water is found in glaciers and ice caps. About 70% of all the Earth’s *fresh* water is located in these frozen sources.

Glossary

alpine lake

A lake that forms high up in the mountains as a result of glacial meltwater or snow melt filling a cirque or natural depression.

cirque

A deep bowl-shaped depression that a glacier carved out of a mountainside. Cirques usually have steep sides.

continental glacier

Sheets of glacial ice that cover a large expanse of land, such as Greenland or Antarctica.

erratic

A large rock moved and dropped by a glacier far from where it originated.

glacial polish

The smooth, shiny appearance of rock caused by movement of a glacier.

glacial striations

Long scratches in rock caused by movement of a glacier.

horn

A peak with many steep sides carved by small glaciers.

kettle

A small, scooped-out area left by the melted ice of a glacier. When filled with water, may become a pond or lake.

moraine

Hill-like piles of unsorted rocks and sediment dropped by a glacier.

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