

Teton Fault

Movement on the Teton fault accounts for the dramatic uplift of the Teton Range. Starting 10 million years ago, a series of massive earthquakes triggered by movement on the Teton fault tilted the mountain block skyward and dropped the valley block. Each of these earthquakes, up to magnitude 7.5, broke or offset the Earth's surface by up to ten feet.

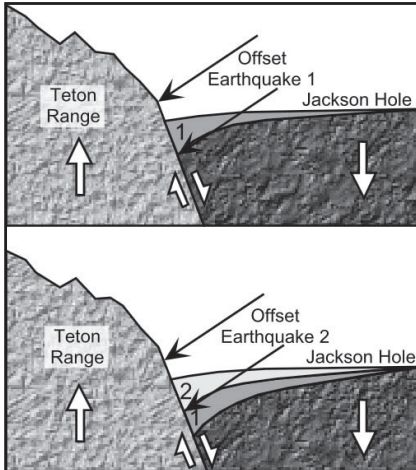


Figure 4. Each major earthquake breaks the Earth's crust forming a vertical face of raw dirt and rock called a scarp.

Today, the total offset on the Teton fault approaches 30,000 feet. The **Flathead Sandstone** caps **Mount Moran** 6,000 feet above the valley floor. This same sandstone layer lies buried more than 20,000 feet beneath the valley floor.

The best view of the **Teton fault** is from the **Cathedral Group Turnout** along the Jenny Lake Scenic Loop. From this vantage point, the fault "scarp" or break in the Earth's crust represents up to a dozen earthquakes since the end of the Pleistocene Ice Age. (Figure 4 ; Figure 5)

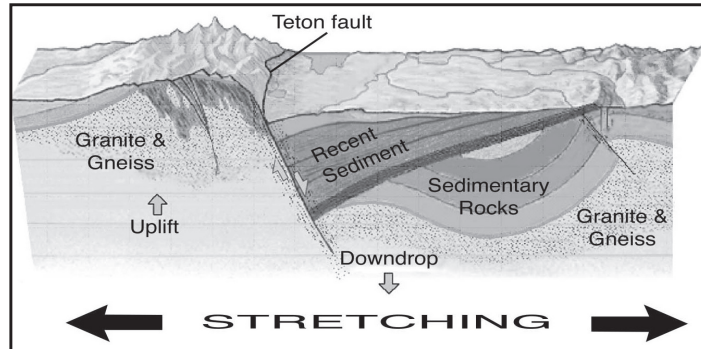


Figure 5. Regional stretching has generated thousands of earthquakes over the past ten million years; tilting the mountains skyward and hinging the valley down.

Every day seismic instruments record earthquakes up to magnitude 5 in the Teton – Yellowstone region. Few if any of these earthquakes occur on the Teton fault. Geoscientists discovered that the last two major earthquakes were around 4,800 and 8,000 years ago. Each of these earthquakes offset the Earth's surface by 4 – 10 feet. Someday another major earthquake will shake the ground, break the Earth's surface, and lift the mountains skyward once more.

The Teton/Yellowstone Connection

Today a plume of magma or "hotspot" lies beneath the **Yellowstone Plateau** (Figure 3). The magma heats the overlying rock and water to generate spectacular hot springs and geysers found in Yellowstone National Park. Five million years ago, the hotspot erupted west of the Teton Range sending clouds of volcanic ash into Jackson Hole. This heat caused the area to stretch more rapidly triggering earthquakes on the Teton fault

and continuing to uplift the Teton Range.

Between two million and 640 thousand years ago, the Yellowstone hotspot exploded three times. These eruptions destroyed mountain ranges and sent fiery clouds of gaseous lava south along both sides of the Teton Range. Deposits from these eruptions cap **Signal Mountain** and the north end of the Teton Range.

Glaciation

Ice, water and wind sculpted the stunning Teton Range. The Pleistocene Ice Age began 2 million years ago as the Earth's climate cooled. Snow accumulated across the high **Yellowstone Plateau** and compressed into ice. Gravity caused the large ice sheet, up to 3,500 feet thick, to flow down from the high plateau. As the climate warmed, glaciers melted and retreated and the cycle repeated.

Today's landscape preserves evidence of the last two glacial advances. The most recent glacial advance, called the Pinedale, lasted from about 50,000 to 14,000 years ago. This ice sheet wrapped around **Signal Mountain** and dug out **Jackson Lake**. The older glacial advance, called the Bull Lake, buried the town of **Jackson** under 1,500 feet of ice and pushed south toward **Hoback Junction**.

While ice sheets flowed from the north, alpine glaciers flowed eastward from the high

peaks. Glaciers slid on a film of meltwater picking up rocky debris in their bases. Debris acted as a belt-sander to polish and groove the bedrock. Glaciers also broadened V-shaped stream drainages into U-shaped valleys as seen in **Cascade Canyon**. When the glaciers reached the valley floor, they bulldozed out depressions and left behind ridges of rocky debris called moraines. Terminal moraines mark the furthest extent of a glacier's flow and form natural dams for valley lakes such as **Phelps, Taggart, Bradley, Jenny, Leigh and Jackson**. (Figure 6)

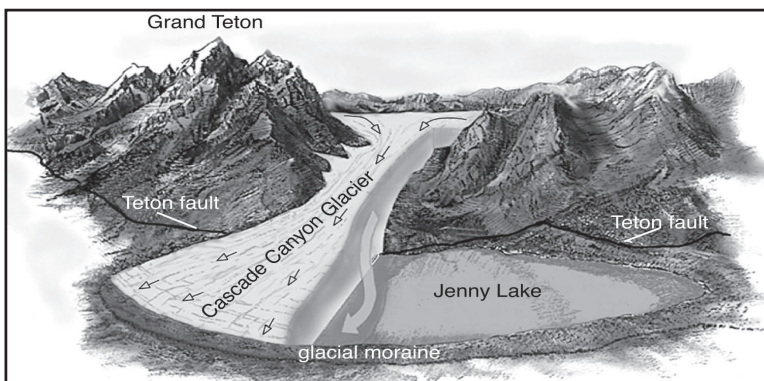


Figure 6. A glacier flowed out of Cascade Canyon gouging out a depression and depositing a terminal moraine forming Jenny Lake today.

Today the Teton Range hosts a number of small glaciers. These glaciers are not remnants of the Pleistocene Ice Age but formed during a cool period called the Little Ice Age, 1400 to 1850. Today, **Skillet** and **Falling Ice** glaciers continue to carve **Mount Moran**, and the **Teton Glacier** flows down the north flank of the **Grand Teton**. Even as these glaciers flow down due to gravity, warming temperatures cause them to shrink and retreat. During the past 40 years, these glaciers have retreated 20 to 25 percent.

Today's Landscape

Ice age glaciers melted and flooded Jackson Hole. The meltwater carved channels across the valley floor, washed away soil, and deposited glacial outwash plains of sand, gravel, and cobbles. As time passed, the **Snake River** cut through these plains leaving behind benches or terraces that step down to today's channel. On the outwash plains, sagebrush, arrowleaf balsamroot and scarlet gilia have adapted to thrive in this sandy dry soil. Silt in glacial moraines holds rainwater to support lodgepole pine forests. Today, these forests cover moraines such as **Timbered Island, Burned Ridge**, and around **Jenny**

Lake. Geology influences the vegetation and in turn, the wildlife found here.

As you enjoy the scenic beauty of the Teton Range and Jackson Hole, remember that geologic forces are still at work. Mountains continue to rise, while wind, water and ice erode the mountains as part of a never-ending story.

Park law prohibits collecting. Please leave rocks where you find them so that others may enjoy this geologic story.