The Geologic History of the Columbia River Gorge

You arrive home to see feathers and seed scattered on the floor, a plant next to the cage tipped over, a shaken bird, and the cat is hiding. Even though you did not witness the event, you can tell the cat went after the bird. It seems you would make a good geologist. Geologists can look at formations in the Gorge and piece together the story of how it was created. You can too! Read this sheet as you travel and see if you can spot clues to how the Gorge formed.

KA-BOOM!

50 – 18 million years ago (Eocene to Oligocene)

Thousands of volcanic eruptions piled layers of volcanic ash, lava, and mud flows over the region, creating the Ohanapecosh Formation. These rocks weathered into slippery red clay and greenish rocks visible near Stevenson, Washington.

Millions of years later, mud flows poured off volcanoes, covering the land with hundreds of feet of ash, boulders, and cobbles, creating the Eagle Creek formation. You can see this beige formation on cliffs north of Bonneville Dam and along I-84 near exit 41. Beacon Rock, just downstream from the dam, is the ancient core of one of these volcanoes.

Trees buried in the Eagle Creek formation petrified and their leaves fossilized. If you have a sharp eye, you might spot an ancient trunk in a rock outcropping along a trail. A petrified log from this formation lies in front of the Bradford Island Visitor Center.

Lava, lava everywhere!

16 – 6 million years ago (Miocene)

During this period, unusual volcanoes, called basalt floods, erupted in eastern Washington and Oregon. These volcanoes were cracks in the earth's crust, hundreds of feet long, which poured out floods of liquid molten rock. 41,000 cubic miles (170,000 cu km) of this lava spread to cover large parts of Oregon and Washington. Out of 270 lava flows that spread across the region, 21 poured through the gorge forming layers of rock up to 2,000 feet (600 m) deep. Look at the cliffs in the Gorge. Can you see these layers?

As the lava cooled it formed a dark gray rock called basalt. Many of these lava flows cooled into columnar basalt; the lava cracks, forming six-sided columns. As you look for lava layers, notice that some contain columnar basalt.

If you look closely at a columnar layer, you might notice it is divided into two parts. At the bottom, the lava cooled slowly forming regular, widely spaced columns. Higher up, it cooled rapidly creating a jumbled looking mass of irregular, closely spaced columns.

The Birth of the Gorge

2 million to 700,000 years ago (Pleistocene)

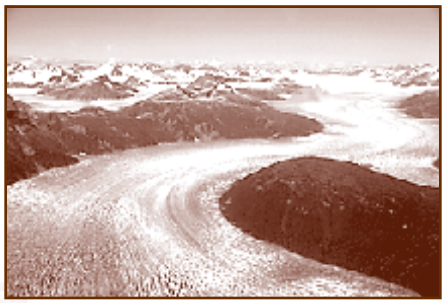
Hundreds of volcanoes erupted in the Cascade mountain range. You can still see the 14 major peaks and hundreds of smaller peaks and cinder cones that form the range. Near Hood River, Oregon, you see dramatic views of Mt. Adams and Mt. Hood. Both are dormant volcanoes that could erupt within the next 50 years.

The Columbia River flowed through a natural pass in the mountains. As the mountains grew, they formed the Columbia Gorge, the only near sea-level passage through the Cascades.

The Missoula Floods

16,000 – 14, 000 years ago (Pleistocene)

Did you know the largest floods to occur on the planet happened here? During the last ice age, ice sheets covered much of Canada. One lobe of ice grew southward, blocking the Clark Fork Valley in Idaho. This 2,000 foot (600 m) high ice dam blocked the river, creating a lake that stretched for hundreds of miles. When the lake was full, it contained 600 cubic miles (2,500 cu km) of water. How much is that? Imagine a block of water a mile high (as high as the mountains around Bonneville Dam), a mile wide, and stretching from Bonneville Dam to San Francisco!



Eventually, water traveled under the ice dam. The water, moving at sixty miles per hour, drained out of the lake in two or three days and flooded eastern Washington. The flood scoured out hundreds of miles of canyons called coulees, created the largest waterfall to ever exist, and left 300 foot (90 m) high gravel bars. At Bonneville, the water crested at 650 feet (200 m). If you look on the cliffs southeast of the dam, you will see a transmission tower (the one with three poles) that is 200 feet (60 m) above the high water mark.

During a period of 2,500 years as many as 100 of these floods scoured the Gorge.

It's a Gift From the Gods!

500 years ago

Near Bonneville, the lava layers making up Table Mountain slid into the Gorge. This series of four landslides, covering five square miles, blocked the Columbia River. The Second Powerhouse butts against this landslide. If you look north of the dam, you can see cliffs exposed after the mountain gave way.

Original inhabitants of the area may have marveled at the 200 foot (60 m) high landslide blocking the Columbia. They could have crossed the river on foot, possibly giving rise to a story about "The Bridge of the Gods." This natural dam created a lake that stretched almost seventy miles (up to the present day John Day Dam). After a few months, the Columbia rose high enough to wash through the southern side of the landslide creating a flood of water that was 100 feet (30 m) deep at Troutdale.

Things returned to normal, except the river was displaced a mile to the south and a set of rapids, the Cascades, had formed. In 1938, the rapids disappeared under water rising behind Bonneville Dam. The only hints of their existence are the remnants of a navigation lock at Cascade Locks built in 1896 to allow boats around the rapids.

The Gorge is still changing. In the winter of 1996, landslides similar to the Bridge of the Gods landslide destroyed homes in Warrendale. At milepost 35 on I-84 you can see this damage.

US Army Corps of Engineers®
Portland District

When you travel, look at the rock formations around you. Chances are, the pieces of an exciting geologic story sit right in front of you. Let's just hope that the pieces of another story involving a cat, bird, and potted plant will not be waiting for you when you get home!