

Lesson to Grow

The Columbia River Basalts: The Bedrock of the Northwest

In this reading you will learn about the Columbia River Flood Basalts. You will learn what they are, when and where the floods happened, and how they effected the land in Oregon and the Northwest. What are the three most important things you learned about the Columbia River Flood Basalts? Write them out and be prepared to discuss with the class.

Floods of Lava

One of a few known lava floods ever to happened on the earth's surface, was right here in the Northwest. These molten floods covered over 63,000 square miles of the region in basalt a mile deep.

When we think of lava flows, we tend to think of explosive red streams, sliding down volcanic mountainsides. The Columbia River flows however, were an oozing, rather than an explosive, lava called a flood basalt. No human ever witnessed a flood basalt in process. They are very rare events. These basalt lava flows did not come from a volcano. They came from vents in the earth surface. Some of these vents are over 90 miles long.

When did the flows happen?

Lava began flowing in the Columbia Basin about 17 million years ago and continued until about 6 million years ago. Scientists believe there may have been 300 individual lava floods. Lava eruptions typically lasted for several days to a few weeks, and the flows were layered 50-100 feet deep. Depending upon the surrounding terrain, the floods moved one-half mile per hour to about three miles per hour. The flows would have changed the flow of rivers—often forcing them into new channels. These rivers sometimes returned to their old locations as the “new basalt” was eroded to the earlier elevations of surface rock. Each lava flood was separated by thousands of years.

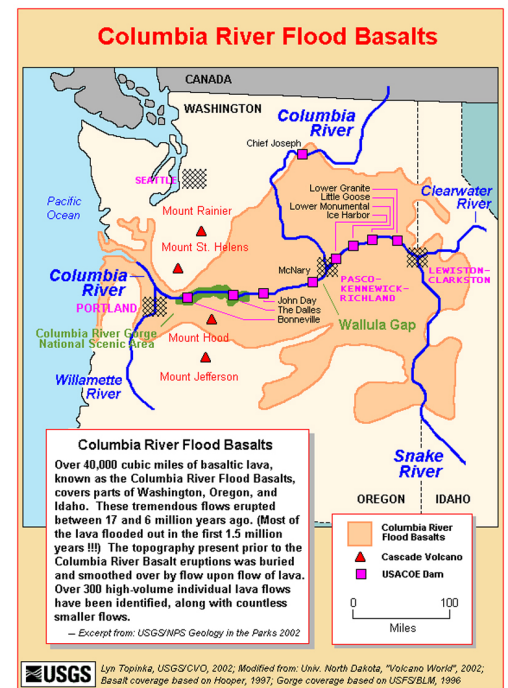
Where are the basalt flows located?

By the time these eruptions stopped, most of the Columbia Basin was coated with basalt rock at least one mile thick. In parts of the central and southern Yakima Valley the basalt measures three miles deep. The lava floods covered virtually all of Washington east of the Cascades and south of a line roughly following the Spokane River, Lake Roosevelt and the Columbia River.

In Oregon, streams of basalt lava carved a wide path through the Columbia Gorge region. Large areas of northeast Oregon were covered, as well as southeast Oregon and the Snake River Plain in Idaho. There were even parts that went all the way to the Pacific Coast. You can see dramatic remnants of the basalt flow on Oregon's coast in such prominent features as Tillamook Head. There, the ocean carved the basalt into massive cliffs



Above, the cliff walls of the Columbia River are made of columnar basalt.



Tillamook Head is one of many legacies of the basalt flows that spread across much of Oregon and the Northwest.

and small islands that provide habitat for seabirds. Such bird-friendly islands do not exist elsewhere along the Pacific coast, so this ancient “catastrophe” is now a haven for seabirds. At a place called Cobble Beach north of Newport, Oregon the waves have sculpted fallen basalt from the nearby cliffs into smooth cobbles that make a distinctive rolling sound as each wave subsides.

In total the Columbia River Basalt Floods cover more than 60,000 square miles. At least 50,000 *cubic* miles of basalt can be found within this area, and some estimates go as high as 90,000 *cubic* miles. The immense weight of this basalt literally caused the earth’s outer crust to sink and form the depression known as the Columbia River Basin.

What caused the lava floods?

While the basalt appears to have come from deep within the earth’s crust, scientists don’t agree on what triggered these huge lava floods. Some scientists think that millions of years ago there were volcanic “hot spots” in the Northwest, like the one’s found in Yellowstone National Park. Other scientists believe a huge asteroid rammed into southeastern Oregon and the impact created so much heat and disruption that it set off these violent eruptions.

What is basalt?

Basalt is a type of igneous rock. Igneous rocks are formed when molten rock wells up to the surface through the crust, cools and becomes solid. At first glance all basalt looks alike. However, there are differences in their color and the makeup. Some basalt has more silica, some contains crystals of olivine, and still others show evidence of exotic forms of feldspar. These differences help scientists determine from which volcanic vents the basalt flowed.

The exposed basalt on the vertical walls of canyons and buttes looks like rock fence posts or columns and is called columnar basalt. These columns were formed when the lava cooled and crystallized. When lava cools, it shrinks. This creates vertical polygons, usually five-sided, that separate by long cracks. The Columbia plateau is known for its distinctive columnar basalt cliffs.

Another form of basalt is “pillow basalt,” which is created when lava encounters water. It cools rapidly and forms shapes like connected loaves of bread or pillows. Pillow lava is easily found along the Oregon coast.

Because of these large and extensive lava flows, basalt is the dominant parent material for soil in Oregon and the Northwest. Basalt is also an important part of the regional aquifer system that is housed in basalt underground.



Large and small evidence of the basalt flows can be seen throughout Oregon like these basalt cobbles at the beach.



*Above: shows the five-sided tops of basalt columns in the Columbia plateau area.
Below image: cliff in from a distance shows towering basalt columns.*



The shorelines of Oregon’s coast are filled with examples of pillow basalt.