Glacial Lake Missoula and the Floods that Changed Oregon

In this reading you will learn about glacial Lake Missoula and the amazing floods. You will learn how geologists discovered the floods, the landforms created by the flood and the effects the floods had on Oregon & the Northwest. What are the three most important things you learned about the Missoula Floods? Write them out and be prepared to discuss with the class.

Glacial Lakes and Amazing Floods

During the last Ice Age (18,000 - 12,000 years ago) a massive Canadian glacier called the Cordilleran Ice Sheet crept south into the Idaho Panhandle, blocked the Clark Fork River and created Glacial Lake Missoula.

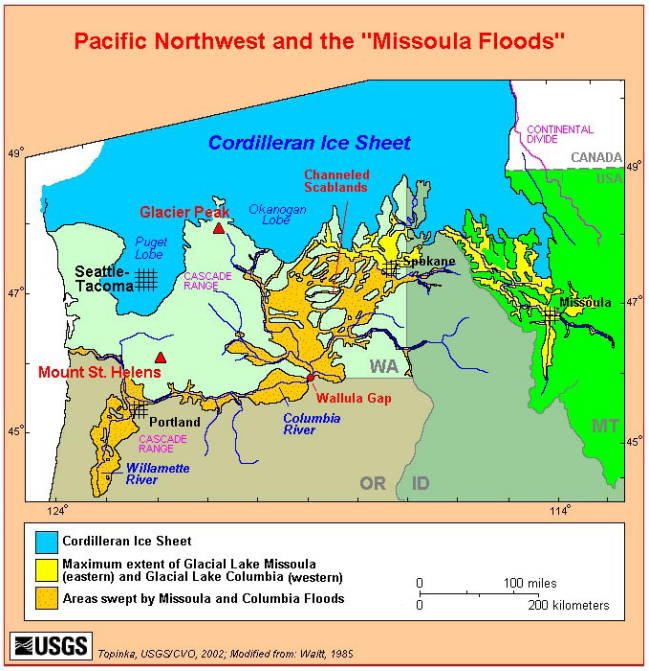
This ice sheet blocked the water from the Clark Fork Rivers creating an ice dam that is thought to be 2,000-feet high. This ice dam caused flooding in the valleys of western Montana. At its greatest size, Glacial Lake Missoula stretched east about 200 miles and contained more than 500 cubic miles of water – that is equal to the water in both Lake Erie and Lake Ontario.

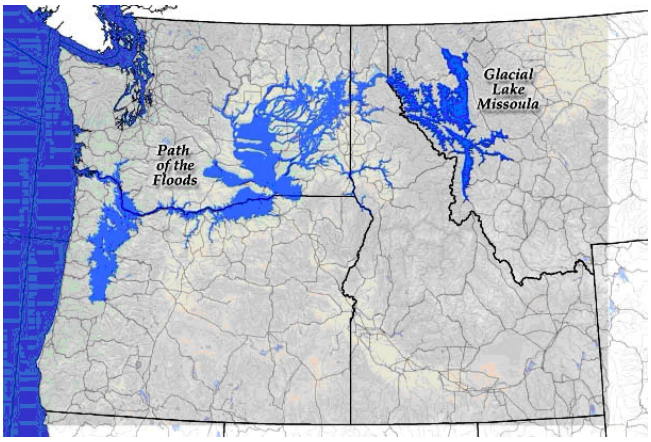
Periodically, the ice dam that created Glacial Lake Missoula would fail and often caused enormous floods of ice- and dirt-filled water to rush down across northern Idaho and eastern and central Washington, through the Columbia River Gorge, back up into Oregon's Willamette Valley, and finally pour into the Pacific Ocean at the mouth of the Columbia River.

Scientists believe the water from these floods roared across the landscape as fast as 65 miles per hour, shaking the ground as it roared towards the Pacific Ocean. The flood waters stripped away hundreds of feet of soil and cut deep canyons in the landscape. It is believed Lake Missoula would have drained in as little as 48 hours.

Over 2,500 years the ice sheet continued moving south and blocked the Clark Fork River again and again, recreating Glacial Lake Missoula many times. The lake filled, the dam failed, and flooding was repeated dozens of times, leaving a lasting mark on the landscape of the Northwest.

Eventually, the glacial ice sheet receded north so the dam did not reform, and the flooding stopped.





Experts believe the Lake Missoula ice dam reached as high as 2,000 feet above water, and perhaps another 1,500 feet below. Computer rendering of Glacial Lake Missoula.

How the Flood was Discovered:

The giant ripples at Camas Prairie were ground breaking evidence of a massive glacial lake and flood.

Geologists are really detectives. They observe the landscape around them, searching for clues about what happened in the past to form the landscape we see today. This is what geologist J. Harlen Bretzs was doing over 100 years ago when he was trying to figure out what formed the unusual, scarred and rocky landscape of eastern Washington.

Bretz spent much of his life studying an area he called "The Channeled Scablands." Bretz believed only an enormous flood could have formed the bare, black rock buttes and canyons in eastern Washington. In 1923, Bretz hypothesized this area must have been formed by a massive flood.

Other geologists at the time didn't believe Bretz's hypothesis. Geologists at the time tended to believe past geological events could only be explained by forces observable today. Since a flood the size Bretz suggested had never been seen, his idea was considered impossible. To make matters worse, Bretz could not identify what would have been the source of such a gigantic flood.

Flood waters passing Wallula Gap reached 1,200 feet. Glacial erratics, evidence of the flood, were left stranded on the slopes of the Horse Heaven Hills and nearby ridges.

In 1942, a geologist from Montana named Joseph T. Pardee found evidence suggesting a gigantic glacial lake had formed during the last ice age by glaciers that had moved into Montana from Canada and blocked up the Clark Fork River.

Pardee discovered giant ripple marks in an area that was once occupied by glacial Lake Missoula. These ripple marks were huge versions of the ripples you might see at the beach or river. They are 15-30 feet high and had a wavelength of 250 feet. These ripple marks are evidence that deep and swift flowing currents passed through this area. Pardee said they were formed by a sudden failure of the ice dam that held back Lake Missoula.

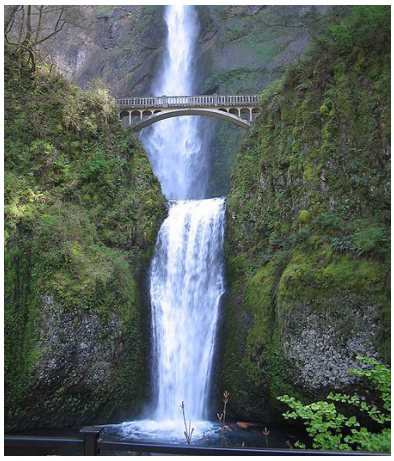
Hat Rock, east of Umatilla, is the remains of a basalt cinder cone, scoured by rushing flood waters.

With the help of Joseph T. Pardee, the clues to the puzzle had been pieced together into an amazing, and almost unbelievable story. Today, geologists continue to study landforms in the northwest that were formed by the great Missoula Floods.

Clues in Oregon's landscape of the great flood

Scoured basalt walls and monoliths can be seen in many places along the path of the Missoula Floods. In Oregon some of these include the basalt cliffs and monoliths near the Wallula Gap near Hermiston, Hat Rock State Park, along on the south side of the Columbia River and Beacon Rock near Portland.

Waterfalls from streams tumble down into the Gorge area including Multnomah Falls, the largest falls in Oregon.



Multnomah Falls

Rocky Butte in Portland - a volcanic cinder cone eroded by the flood waters.

The Floods Effect Oregon Agriculture:

Farmland in the Willamette Valley owes its rich soil to the Missoula Floods.

The Missoula Floods are a remarkable part of the Northwest's natural heritage. As they traveled through Washington these floods created scablands and dramatic dry canyons. In Oregon however, the floods created the exceptionally fertile, productive farmland, wetlands and aquifers found in the Willamette Valley.

How did this happen?
As the flood water thundered through the Columbia Plateau of eastern and central Washington, it scoured away much of the area's topsoil. When the floods reached Portland and the mouth of the Willamette River, some of the flood waters (full of top soil) backed up into the Willamette Valley and created Lake Allison.

Lake Allison was an enormous temporary lake created by the Missoula Floods. By examining clues in the landscape, geologist believe it covered 11,000 square miles of the Willamette Valley. It stretch from Portland to just north of Eugene and measured up to 400 feet deep. With each flooding event, Lake Allison would fill up and then recede back down the Willamette River into the Columbia River, leaving layers of deep mud and silts across the Valley floor. The last floods probably occurred less than 13,000 years ago.

Today the lake bottom is seen as the flat topography and fertile soils of the Willametter Valley. Geologist know icebergs, probably remnants of the glacier that dammed Lake Missoula, were carried this far, because the valley is littered with glacial erratics.

Glacial Erratics are rocks that are made of different material then the surrounding area. They can be small fragments to large boulders that weigh many tons. These exotic boulders puzzled Willamette Valley farmers for over 150 years and are now considered important evidence of the Missoula Flood. Over 300 boulder-sized glacial erratics have been mapped in the Willamette Valley. Originally from Canada, the erratics were trapped in the ice sheet, then floated across the Northwest in the floods when the ice dam broke.

The Oregon Erratic Rock Natural Site is just outside of Salem and features a 40 ton rock. This is the largest known glacial erratic in the Willamette Valley from the Missoula Floods.