The Columbia River Gorge

The Columbia River Gorge is famous for its stunning scenery, award-winning wines, and its endless outdoor and adventure sports. It also boasts an amazing array of geologic and Ice Age Floods features to delight everyone from the casual tourist to the most intensely focused researcher.

These features nestle in ecological zones ranging from alpine snow-clad volcanic peaks to conifer forests, boreal rainforests, oak woodlands, grasslands and high desert, all within a 50 mile wide swath surrounding 90 miles of the mighty Columbia River. These features provide insights to over 20 million years of tumultuous geological history that has shaped this seemingly idyllic landscape.

The Ice Age Floods Institute

The Ice Age Floods Institute (IAFI) is dedicated to the study of the natural prehistoric floods of basaltic ashwater that sculpted regions of MT, ID, WA and OR, and to the education of local and visiting public about the geological wonders that surround us.

Throughout the year the Columbia River Gorge Chapter hosts public presentations, field trips and materials by prominent authors, speakers, scientists and engineers about the Ice Age Floods and the geology of the Columbia Gorge region for the general public, schools and other organizations.

The Story of the Great Ice Age Floods

During the peak of the last Ice Age, a vast Cordilleran continental ice sheet covered southwestern Canada and the northern parts of Washington, Idaho and Montana. An eastern Purcell lobe of the ice sheet descended into the Idaho panhandle, blocking the Clark Fork River with an ice dam thousands of feet thick.

Water rising behind the ice dam flooded the valleys of Montana creating Glacial Lake Missoula – a great inland lake stretching over 200 miles to the east with a volume of water greater than Lake Erie and Lake Ontario combined.

The rising lake waters periodically caused the ice dam to fail, resulting in sudden, catastrophic floods that rushed across northern Idaho and the Channeled Scablands of eastern and central Washington, through the Columbia River Gorge, and into Oregon’s Willamette Valley, before emptying into the Pacific Ocean at the ancient mouth of the Columbia River. Glacial Lake Missoula would have drained in just a few days as a volume of floodwaters greater than all the rivers of the world combined roared across the landscape at up to 80+ mph.

Now imagine this happening not once but dozens, perhaps even hundreds of times as the advancing continental glacier rebuilt new ice dams!

Interesting Flood Facts!

Near the end of the last ice age, 18,000-14,000 years ago, a lobe of continental glacial ice repeatedly formed, 2,000’ tall, miles-wide ice dams that blocked a river draining all of central Montana, and repeatedly backed up Glacial Lake Missoula. At its maximum, Glacial Lake Missoula held as much water as Lakes Erie and Ontario combined.

Rising lake waters eventually caused each successive ice dam to fail catastrophically, releasing the imprisoned lake waters in rampaging Ice Floods. The released flood waters moved away at speeds over 60 mph and at rates greater than 10 times the volume of all the world’s rivers combined.

For millions of years before the Ice Age Floods began, the Columbia River had occupied a broad river valley that had cut through the high Cascades Range. When the raging flood waters came through they swept away those rock valleys and terraces away, widening the valley to produce the Gorge as we see it today.

The flood waters rose to over 1000 feet deep behind several progressively narrower sections of the Gorge. Generally, the flood heights along the Gorge can be recognized as the upper limit of the exposed basalt plateaus lining the Gorge.

The rising flood waters bathed flooded tributary valleys that formed temporary lakes where fertile Palouse soils stripped from central Washington were deposited. These deposits of Palouse sand and silt in the Gorge and backwater valleys now provide excellent farmland for premium wine grapes.

The flood waters also transported boulders, entrained cobbles and gravel from the collapsed Canadian ice dam, for hundreds of miles until the advancing iceground melted, and dropped the boulders as erratics along the floods path.

Our Cataclysmic Floodscape

A regional guide to geological evidence of the GREAT ICE AGE FLOODS that sculpted the Columbia River Gorge landscape

Highlighting prominent Ice-age flood features in the Columbia River Gorge

Detailed Map Inside

Ice Age Floods National Geologic Trail

Since the 1990s the Ice Age Floods Institute (IAFI) has worked to create and to build support for the Ice Age Floods National Geologic Trail.

The Ice Age Floods National Geologic Trail is essentially a network of marked tour routes extending across parts of Montana, Idaho, Washington, and Oregon, with several special interpretive centers located across the region. Many interested parties are being brought together in a collaborative and effective interpretive program at a remarkably low cost, despite the extraordinary size of the region.

The Trail is being developed under the National Park Service on existing public lands, with no changes in jurisdiction and no threats to private property rights. The role of the National Park Service is to coordinate and manage the planning of the project and the telling of the story, without taking custodianship of public and private lands.

The Columbia River Gorge is nearly 310 miles long and 25 miles wide, with a large river that flows through a steep gorge and a wide, flat plain at its mouth. The Columbia River originates in the Rocky Mountains of Montana and flows through the Pacific Northwest, draining into the Pacific Ocean at the Goldendale Delta. The river is one of the largest in the United States, with a discharge of over 300,000 cubic feet per second. The Columbia River is also famous for its hydroelectric power plants, which provide a significant portion of the nation's electricity. The Columbia River is a popular destination for fishing, boating, and other outdoor activities. The river is also home to a variety of wildlife, including salmon and steelhead, which are important to the local economy. The Columbia River Gorge is a popular destination for hiking, biking, and other outdoor activities, and is home to a variety of scenic viewpoints and parks.
Crown Point is a basalt promontory with a cliff-top viewpoint 733 feet above the Columbia River on the south side of the Columbia River Gorge. The underlying basalts are part of a lava flow that filled an old Columbia River channel 14.5 million years ago. From this scenic viewpoint it is easy to imagine the ice Age floods roaring out of the Gorge into the Portland Basin, depositing massive gravel bars that form the major islands in the river below. Vista House museum at Crown Point serves as a memorial to Oregon pioneers and as a comfort station for travelers on the Historic Columbia River Highway. With its high-grade marble interior and brass fixtures, some Oregonians derided it as the $100,000 Outhouse” during its construction. The absolutely breathtaking view from the Portland Women's Forum, about 2 miles west of Vista House along the Historic Highway, is one of the best spots to soak in the magnificent Columbia River Gorge. This area is a perfect starting point to a fun-filled day of adventure and discovery, exploring the waterfalls, scenery, gorgeous views and incredible wilderness and engineering all along the beautiful 100+ year old Historic Columbia River Gorge Highway.

Beacon Rock is one of the most prominent and distinctive geological features in the Columbia River Gorge, an 846-foot landmark that was once the basalt core of a volcanic cone. The cone is located on the north bank of the Columbia River, its Native American name, "Che-Che-op-tin", which translates to "the navel of the world", isn't far off since it once formed the belly of a volcano. Between 18,000 and 14,000 years ago, raging floodwaters and icebergs in 120 Ice Age floods tore away at the exterior cone, leaving Beacon Rock as a basalt monolith sticking out of the Columbia River, more than 120 miles from the mouth. This team of explorers also gave the rock its modern name, though they initially referred to it as Beaten Rock, then later as Beacon Rock. A dizzying mile-long switchback trail takes hikers to a tip-top perspective where there are lofty vantage points for eagle-eye views of a breathtaking section of the Columbia River Gorge that marks the border between Washington and Oregon. It definitely worth the climb.

Rowena Crest lies nearly 700 feet above the Columbia River at the upstream end of Rowena Plateau, a miles-long promontory that protrudes into the path of the river. The river flows around this promontory through a relatively narrow section of the Gorge known as the Rowena Gap. As the onrushing Ice Age Floods watered entered Rowena Gap and crashed against the Rowena promontory they were blocked and diverted northward. That created a major chokepoint in the path of the floods and backed up a temporary lake into The Dalles basin as the floods made their way through the Columbia Gorge. As the floodwaters hit the Rowena promontory they built to nearly 1000 feet deep and flowed over the promontory. They also undercut the face, procuring the chaotic landslide blocks below the viewpoint to the east. The diverted floodwaters also deposited a huge eddy gravel bar that blocked the Kickitat River and still underlies the entire town of Lytle across the river. It is estimated that each of the 40-120 ice Age Floods may have taken up to a month to pass completely through the system to the Pacific Ocean, but the duration of the floodwaters at any point along the path probably lasted less than a couple of weeks.

Hoodoo Scablands

The scablands just upstream of the John Day Dam include unusual low-standing hummocks and spires (hoodoos) of remnant, floods-deposited basalt. These Hoodoo Scablands are easily overlooked when passing by on this desolate stretch of Waterfall Country. Curious observers can't help but wonder how those small rock spires surprised the repeated pounding of the Ice Age Floods through here. It's a hoodoo mystery.

Mosier Erratic

The Mark Hatfield east Twin Tunnels trailhead overlooks the troughs of an immense gravel pit, where the eye is immediately caught by a huge white boulder standing alone in a sea of much smaller-sized chunks of black basalt. This is the Mosier Erratic, a car-sized block of far-removed granodiorite, standing out like a beacon, reveling the curious onlooker to wonder how it got there.

Bonneville Landslide

The Bonneville landslide crushed down across the Columbia River nearly 600 years ago. It dammed the river for upward to more than a mile as the Columbia flowed through. Later the Columbia River cut through the landslide and formed the Cascade Rapids that later impeded Lewis and Clark. It is part of a larger complex of over 200 landslides, some of which may have been triggered by the Ice Age Floods swept down the Columbia River 18-16,000 years ago.