Geology Rocks Cycle Oregon 2024

Landscapes

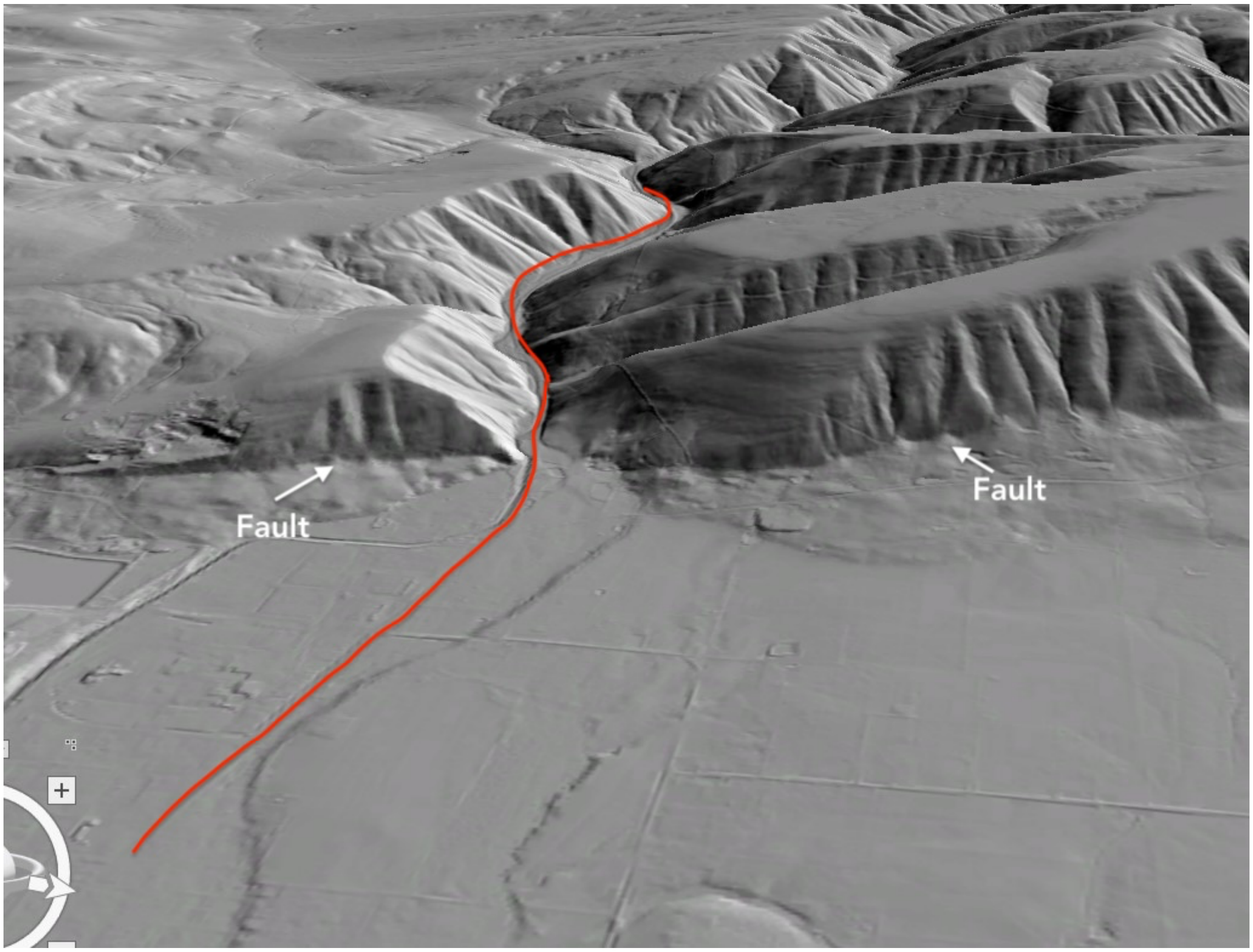
At the end of the great Columbia River Basalt eruptions 16 million years ago, then entire Rally route, and most of Eastern Oregon and Washington was a flat, barren plain of black lava. The landscape you will be riding through today is the result of dramatic earth movements, erosion and sedimentation acting over millions of years. The dominant force in building the mountains and valleys we see today is block faulting, which breaks the earth's crust into large pieces, some of which rise to form mountains while others sink to form valleys. The blocks are separated by active faults, and the rise of mountains and fall of valleys is accomplished six feet at a time, when the land moves during earthquakes.

As the mountains rise, they are attacked by the forces of erosion. Water freezing in cracks in the rock expands and breaks the rock up at the surface, where gravity can move it down the slope until a stream can pick it up and transport it to a river. The sediment moved by streams and rivers settles in the sinking blocks, forming wide, flat-bottomed basins flanked by steep mountain fronts. If the mountains rise high enough to collect more snow each year than melts away, ice accumulates and forms glaciers which flow down canyons, widening them and transporting more rock into the basins. In some places weak rock layers in the mountain blocks can break loose and form large landslides, creating areas of chaotic terrain. You will see evidence of all of these forces along the Rally route.

Day 1

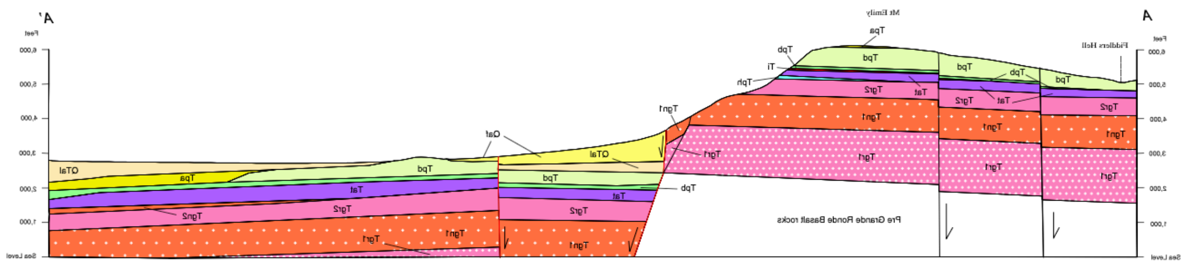
Elgin-Summerville paved option

Riding west from Elgin you will see a steep straight mountain front ahead that rises 800 feet above the valley. This is a small fault block mountain that forms the western boundary of the small sinking block that holds Elgin. The stream here has cut a narrow canyon into the rising block of basalt. After a few miles in the canyon, the route turns south and climbs on to a broad forested upland before descending into the Grand Ronde Basin.



The western wall of the Elgin Valley is a fault block mountain, and the road follows a narrow canyon cut by the creek through the rising block. The sharp line along the base of the mountain front is an active fault.

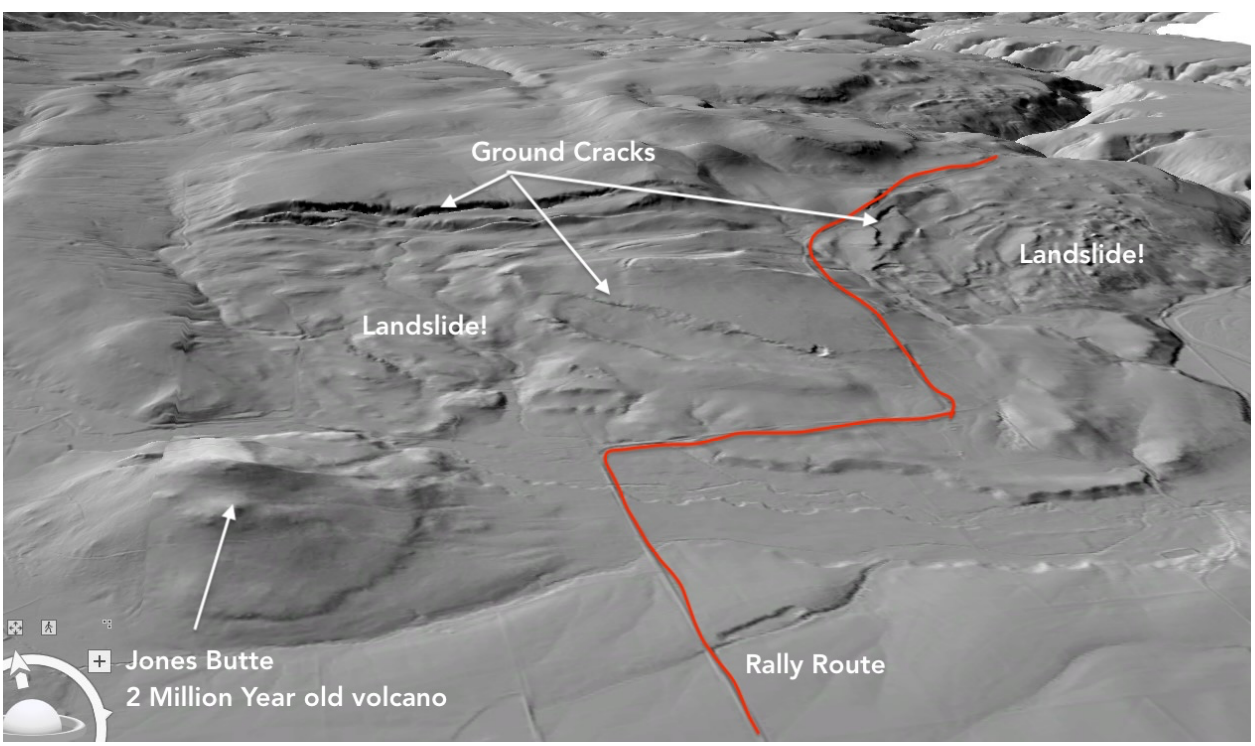
As you approach the basin you will begin to get views of the massive mountain front of Mt. Emily, which makes up the western edge of the Grand Ronde Basin, and Mt. Harris and Mt. Fanny which make up the eastern edge. The two mountain fronts are rising along the faults that run along the edge of the valley, while the broad floor of the valley is subsiding and filling with sand and gravel brought in by the creeks and rivers that flow into the basin. On the west side, Mt. Emily rises 3,300 feet above the valley floor, but the lava layers that make up the top of Mt Emily have been found 1,000 feet below the valley floor in a deep water well, so the total amount of uplift along the fault is 4,300 ft. The rise of the mountain and sinking of the valley occurs 5-6 feet at a time during large earthquakes separated by thousands of years of quiet. That means it took nearly a thousand magnitude 7 earthquakes spread over several million years to build this landscape. These faults are considered active, so there are more earthquakes on the horizon.



Geologic cross section of the west side of the Grande Ronde Valley. This slic@Wsx3e through the earth runs approximately east to west through the summit of Mt Emily. The different colors represent different rock layers, and you can clearly see how the rocks at the top of Mt. Emily match others buried deep in the valley. Image flipped to match the view of Mt. Emily from the Summerville day ride. From Ferns and Madin, 1999, Geologic Map of the Summerville Quadrangle.

Grande Ronde River and Lookinglass Fish Hatchery paved option

Leaving town heading north you will pass by Jones Butte on your left, which is only 2 million years old, making it the youngest volcano in the area by far. The route then drops into the shallow valley of Gordon Creek and begins to climb onto the toe of an enormous landslide that occupies the west bank of the Grande Ronde River for the next nine miles. In this area the lava layers are separated by a thin layer of clay. As the river erodes into the base of the slope, large blocks of lava hundreds of feet thick slide towards the river, breaking into a chaotic jumble of blocks. The route winds back and forth and up and down across the irregular surface of the landslide.   This is just one of many very large landslides that occur throughout this region. The route leaves the landslide at Cabin Creek and descends to the Grand Ronde River at the confluence with Lookinglass Creek.



Leaving Elgin, the route to Lookinglass hatchery passes Jones Butte, a young volcanic cone, then climbs onto the jumbled terrain of a large landslide that extends for nearly 9 miles .

Lookinglass to Elgin gravel option

After crossing the Grand Ronde River and climbing out of the canyon, the route crosses a broad rolling plain which is the top surface of the youngest Columbia River Basalt flow. There is no geology to see along the route, so just enjoy the ride!

Day 2

Elgin-Enterprise paved route

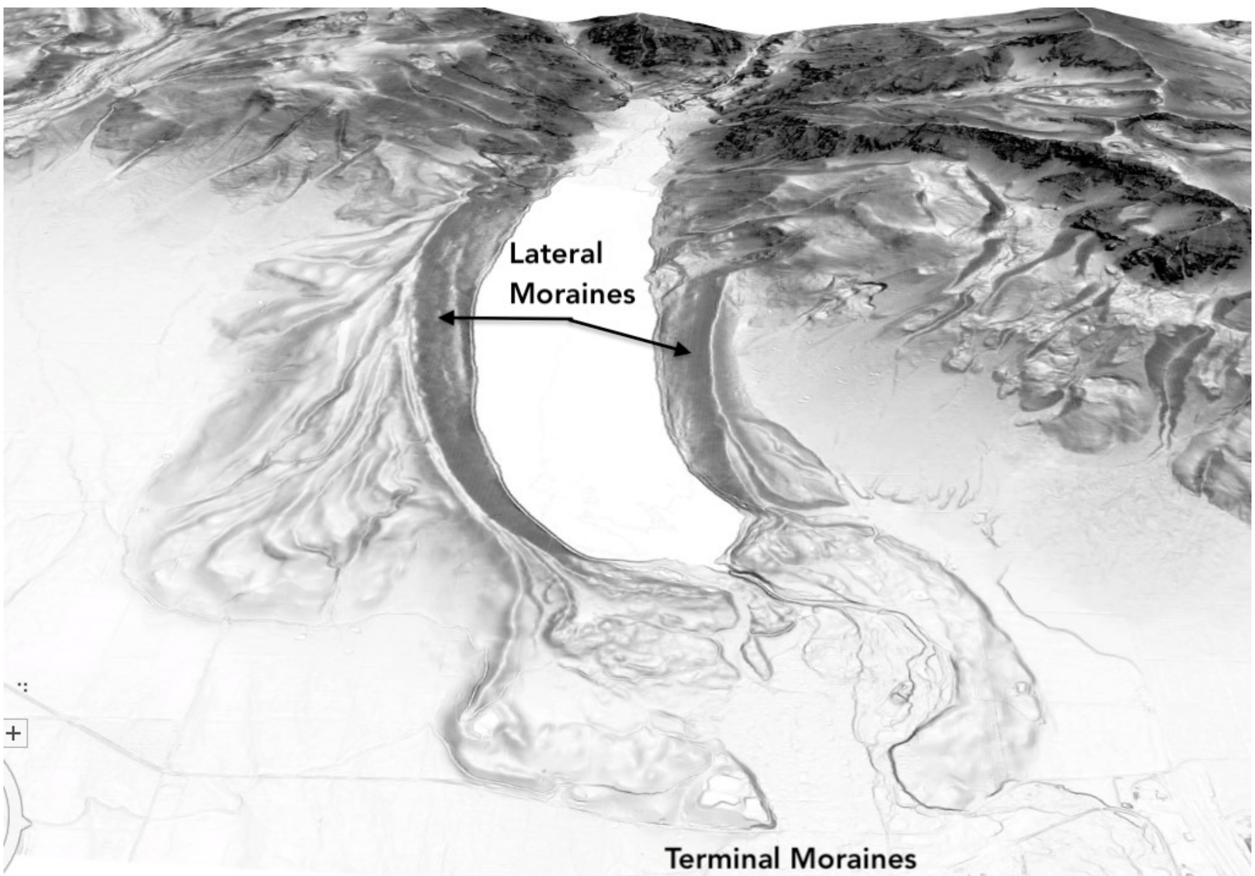
Leaving Elgin the route crosses the Grand Ronde River and starts to climb out of the Elgin basin, across another landslide. As you toil up the grade you will be able to appreciate the irregular terrain. After crossing a broad plain underlain by more basalt flows, the route descends into the canyon of the Minam River. As you whiz by the road cuts, you will see red-grey and brown lava exposed in some places with rough hexagonal columns which are common in the Columbia River Basalt. If you are too busy watching the road, don't worry, you will get plenty of time to look at the rocks when you climb back up this grade on the last day. The route passes the confluence of the Minam and Wallowa Rivers and begins to climb up the canyon of the Wallowa. Around mile 43, the canyon opens out into a wide valley, and you will see the impressive eastern front of the Wallowa Mountains on your right. The Wallowa Mountains here are another fault block, and you can see the straight front of the mountain that is being uplifted along the Wallowa Fault. Here the mountain rises about 2000 feet above the valley, but that will increase dramatically as the route continues south. By the time you get to Enterprise the first range of the mountains rise over 4000 feet above the valley, while the highest peaks in the interior of the Wallowas are nearly 6000 feet above the valley. From the confluence of the Minam and Wallowa Rivers to Enterprise, the bedrock in the valley floor and the eastern slopes of the Wallowas is all Columbia River Basalt. There is a thin layer of alluvial sand and gravel in the valley floor, but nothing like the 1000 feet of sediment in the Grande Ronde Valley.

Elgin-Enterprise gravel route

The gravel route climbs out of the Wallowa valley onto another broad rolling plateau of basalt. Although there is not much in the way of geology to be seen, there will be views of the steep faulted front of the Wallowas.

Day 3

All the routes on Day 3 will be crossing deposits of sand and gravel that have been washed out of the rivers and creeks that drain the high Wallowas. For the most part these form broad, gently sloping fans of gravel like Alder Slope just west of Enterprise. These uniform slopes make for better biking than geology viewing. The exception is the road to Wallowa Lake State Park, which takes you along the shores of Wallowa Lake. The lake is hemmed in by a spectacular set of glacial moraines that formed about 17,000 years ago at the peak of the most recent ice age. At this time the Wallowas were crowned with an ice cap, which fed large glaciers that flowed down every major canyon draining the high country. At Wallowa Lake, two large ice streams came together from the East and West forks of the Wallowa River forming a huge glacier that extended well beyond the mouth of the canyons, out onto the broad gravel plains. For hundreds of years the glacier remained in this location, acting as a conveyor belt to move rock rubble out onto the plain. Rock would become embedded in the ice in the mountains, either gouged out of the bedrock by the moving ice, or falling onto the ice surface as the glacier eroded the canyon walls. The embedded rock moved with the flowing ice, until it reached the leading edge, where the ice melted away, leaving the rock in remarkably neat piles. There are two very well-developed lateral moraines at Wallowa Lake, which formed along the sides of the glacier, and several smaller terminal moraines that formed at the snout of the glacier.



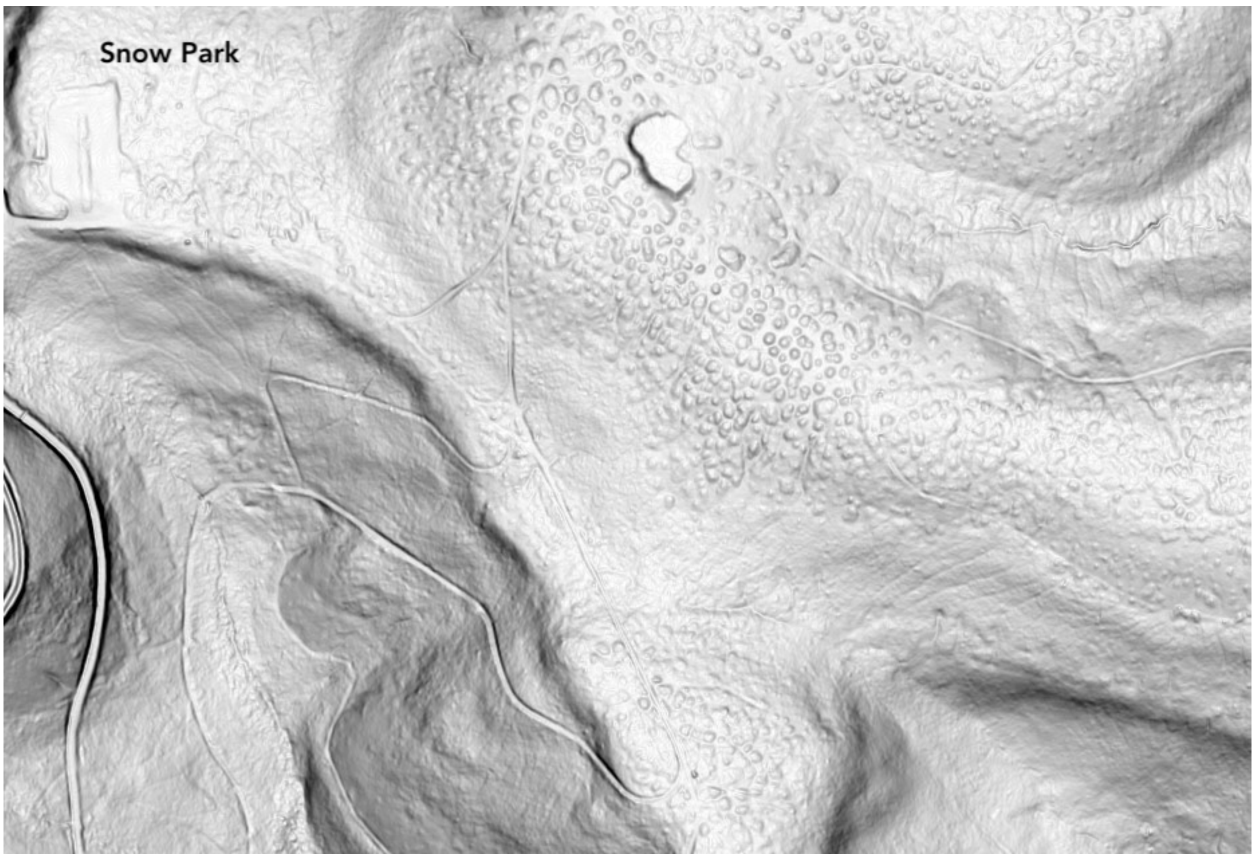
The beautifully formed moraines that encompass Wallowa Lake formed when a large glacier advanced out of the canyons of the Wallowa River and extended onto the broad plain at the foot of the mountains. The flowing ice transported rock rubble which was left behind as the ices melted away, leaving behind these distinctive landforms.

Day 4

Both routes on Day 4 start on the gravel plains at the foot of the Wallowas and then cross through more layers of Columbia River Basalt lava as they climb towards the Salt Creek Sno-Park. The gravel route crosses the terminal moraines of the McCully Creek glacier before entering the basalt.

Along both routes you may see some basalt in the roadcuts, look for columns that are formed when basalt cools, and bright red zones where the top of an older flow has been baked by the heat of the next flow covering it. Around Lick Creek Campground, the gravel route final gets beneath the basalt layers and passes through some of the older exotic terrane rocks, but you won't see much difference.

There are two cool features at the Salt Creek Summit Sno-Park. The first are mima mounds, enigmatic piles of soil that are found throughout eastern Oregon. These low bumps are 25-250 feet across and a foot or two high, and are very difficult to see from the ground. However, the lidar image below clearly shows these mysterious features, whose origin is still hotly debated. The current favored theory is ground squirrels!



This detailed lidar topographic image shows the mima mounds that cover the slopes to the east of the Sno-Park. The large roundish feature near the top center of the image is a small lake.

The other interesting features are the tree bands that are found in many areas where forest grows on Columbia River Basalt. The basalt is made up of layers of dense rock 30 to 100 feet thick, separated by rubble zones 5-10 feet thick. Trees have a hard time rooting and finding water in the dense body of the lava flows, and prefer to grow on the parts of the slopes that are on the flow tops, where the rock is crumbly and full of water. So the slopes end up decorated into bands of trees separated by grassy slopes, leaving fascinating geometric pattern is an aerial view.

This aerial photo shows the intricate tree bands that cover the slopes near the Sno-Park, formed when trees prefer to grow on the thin layers of rubbles that are sandwiched between the dense lava flows, which only support grass.