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LOST CREEK
GLACIAL TROUGH

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GEOLOGY AND HYDROLOGY OF THE LOST CREEK GLACIAL TROUGH

Ernest H. Lund
Department of Geology, University of Oregon

Introduction

In most valleys, the stream that enters the upper part has the same name as the stream that flows out the lower end. The water of the Lost Creek glacial trough, the valley followed by the McKenzie Highway (Highway 242), is an exception (see map, centerfold). Along most of its length, the watercourse bears the name White Branch, but the stream that flows out the lower end of the valley into the McKenzie River is named Lost Creek.

Lost Creek glacial trough lies to the west of the High Cascades in the northeast corner of Lane County. The area may be reached by traveling east on Highway 126 from Springfield to the junctions of Highways 126 and 242 and then continuing east on Highway 242 (the McKenzie Highway) or by going west from Sisters on Highway 242.

The watercourse that bears the name White Branch begins below Collier Glacier and continues to its junction with Lost Creek. Lost Creek originates in a cluster of springs about three miles southeast of its junction with the McKenzie River. The entire watercourse is about 20 miles long.

Because much of the water in this valley flows underground, a long stretch of the White Branch bed is dry most of the year. White Branch, a name of questionable validity as explained below, is therefore referred to here as a watercourse. Two porous, blocky lava flows that occupy the valley floor along most of its length divert the water from the surface into a complex system of subsurface channels that discharge their water at Lost Creek Springs, which issue from one of the lava flows about 2 miles above the lower end of the flow.

Geologic Setting

The history of the Lost Creek trough goes back to the time when the mountains themselves were formed and when water accumulated to form a westward-flowing stream. With the onset of Pleistocene glaciation in the High Cascades, glacial ice originating in the vicinity of North and Middle Sisters moved down this stream

valley. The valley was occupied by ice more than once during the Ice Age, and at its farthest advance, glacial ice extended down the McKenzie River valley to a few miles beyond Blue River.

The most recent glacier to occupy the trough terminated where the trough joins the McKenzie River valley. Glacial till is exposed in the roadcuts along Highway 126 on either side of its junction with Highway 242 and along Highway 242 to Limberlost Forest Camp about 2 miles southeast of the junction.

The steep walls and the U-shaped cross section of the Lost Creek trough where it has not been affected much by recent volcanism are characteristic of glacial valleys. The moving ice eroded deeply into the lava flows that make up the mountains, exposing in excellent cross section many of the flow units. Of particular interest is the valley wall at Deer Butte (Figure 1), where the glacier cut away part of a volcanic cone.

About 3,000 years ago, thousands of years after the ice had disappeared from the valley, a volcanic eruption at Sims Butte, located about 5 miles west and a little north of North Sister, sent flows of basalt lava, described by Taylor (1965, p. 137-138), down the Lost Creek trough in thin sheets to within a quarter of a mile of Limberlost Forest Camp, covering the veneer of glacial drift and stream gravel on the valley floor. As the lava flow moved along, parts of the flow solidified and then were broken by continuing movement. This fragmented lava rock with abundant void space between the fragments now provides subsurface channels for water. The pore space of the lava flows and of the gravel beneath them is enough to accomodate the large volume of water that goes underground along this glacial trough. The Sims Butte flows are old enough to have developed sufficient soil to support a dense forest, though in places blocky rock is exposed (Figure 2).

A later eruption at Collier Cone, the most recently active volcano in the vicinity of North Sister, sent another lobe of basalt lava into the Lost Creek trough. Flows from this cone, located at the base of North Sister and a little west of its north side, extended down the valley to about half a mile beyond Lower Proxy Falls, partly covering the Sims Butte flows. According to Taylor's lava chronology (1965, p. 145), the Collier eruption is older than 400 years. Conceivably it took place within the past 500 years, but it did not occur more than about 1,600 years ago. Very sparse vegetation on the lava rock in the higher altitudes and thin vegetation in the lower altitudes indicate a young age for these flows. The flows are very highly fragmented, and the surface is a jumble of large blocks (Figure 3). Taylor (p. 143) describes the lobe as "a mass of tumbled blocks and scoria." This condition provides high porosity.

Figure 1. Deer Butte from Proxy Falls trail.

Figure 2. Moss-covered rock of Sims Butte flow just east of Limberlost Forest Camp.

Hydrology

Meltwater emerging from below the Collier Glacier at the western edge of its terminus fed White Branch until about 1940. In the late 1800's, when observations were first recorded, the glacier terminated against Collier Cone, and ice stood high on the cone's south flank. Earlier in the glacier's history, ice rose to or above the level of the south rim of the crater, and meltwater spilled into the crater, distributing sand and gravel over its floor. Meltwater flowed toward a breach in the west wall of the crater (Oppie Dildock Pass), where it disappeared into the lava rock.

By the early 1920's, when the glacier was observed by Campbell (1923, Figure 4C) and Hodge (1925, Figure 55, p. 74), the ice level was considerably lower; but the glacier still terminated against Collier Cone. A terminal moraine now lies on the south side of the cone, but the glacial front has receded far up the mountain (Figure 4).

The glacier continued to shrink, but Ruth Hopson (1960, p. 6) reports that in the summer of 1933 the snout of the glacier extended to the terminal moraine. Returning to the glacier again in September 1934, she discovered a newly formed lake fed by the meltwater. The lake continued to grow, reaching its maximum size in the summers of 1940 and 1941. By 1940 it had reached a level that allowed water at the northwest side of the lake to spill out over the moraine and into White Branch. Hopson reports that water flowing out of the lake in the summers of 1940 and 1941 moved through the rocks without cutting a distinct channel. In the summer of 1942, however, after a winter of heavy snowfall and a hot spell in July, overflow from the lake breached the moraine and cut a channel several feet deep. This event clearly established the lake as the source of White Branch.

Surface flow from the lake, for which Hopson (1962, p. 47) proposed the name Collier Lake, fed White Branch until 1960. Hopson (1961, p. 37, 38) reports that in 1960, although meltwater from the glacier was still flowing into the lake, the lake had shrunk and that ". . . the surface was not high enough to overflow into White Branch." By August 1961 Hopson noted that the level of the lake had dropped far below its former outlet and only a small pond remained. The stream of meltwater no longer entered the lake but flowed to the northeast, where it disappeared into a hole (Figure 5). Hopson believes that ice remaining from the glacier and lying beneath the lake had acted as a seal until "Melting of some of this ice. . . in effect pulled the plug, allowing the water to flow into an unknown aquifer."

With the change in drainage into a subsurface aquifer, White Branch lost its source and ceased to exist. The stream originating at the glacier still flows into the hole, which is located at the base of Collier Cone in the northeastern corner of the basin. Hop-

Figure 3. Collier Cone flow from Obsidian Trail.

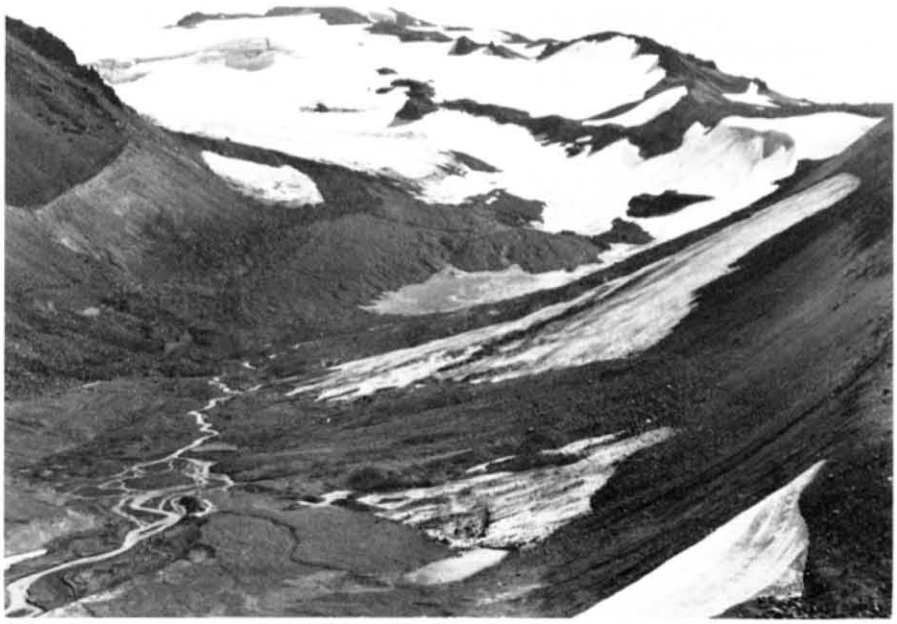


Figure 4. Collier Glacier from viewpoint on Collier Cone.

son (1962, p. 47) proposes the name Little White Branch for this stream because it was never a part of White Branch.

It is not known where the water goes after it enters the Melt-hole (name proposed by Hopson, 1962, p. 47). Although it could move toward the east and emerge somewhere east of the Cascade Range, it probably moves westward through the very porous rock of the Collier Cone flow. The Melt-hole is located west of the Cascade crest, and although no one knows how deep into the subsurface the water goes, if it enters flows that originated at North Sister, it should be directed toward the west because flows from North Sister should have a western component of dip at this locality.

If the water moves through or under the Collier Cone flow, it should not be expected to come to the surface until it reaches Lost Creek Springs because it would move from the Collier Cone flow into the Sims Butte flow in the subsurface where Collier Cone flow overlaps the Sims Butte flow.

The former channels of White Branch (Figure 6) between the moraine and Glacier Creek about 2 miles to the west are now dry except for a short time when the snow is melting. Even then, the volume of water is small. The headwater for the system is now Glacier Creek, a spring-fed stream that originates a short distance east of the Pacific Crest Trail about a mile southwest of Little Brother. This stream flows through the Sunshine Shelter locality and joins the White Branch watercourse a few hundred yards above the Obsidian Trail crossing. Another small unnamed stream joins the channel about 2 miles below the Obsidian Trail crossing. This stream deserves a special note and bears watching, because it is in the process of beheading Obsidian Creek and capturing its flow.

Obsidian Creek originates at Sister Springs, a group of springs emerging from the base of a talus slope on the east edge of the Obsidian Plateau along the Pacific Crest Trail about a mile and a quarter southwest of Little Brother. A short distance below its source, Obsidian Creek plunges off the Obsidian Plateau at Obsidian Falls and flows out onto a gently sloping meadow area. About a quarter of a mile below the falls, the stream divides; about half the water continues on in Obsidian Creek and the other half goes into the unnamed creek (Figure 7).

Conditions at the place where the water divides are not stable; in time all the water will flow into the unnamed creek. The capture might have been completed before now if it were not for a row of stones that helps keep water flowing into Obsidian Creek. From their alignment it appears that the stones were placed there by man.

A short distance below its beginning at the Collier Glacier moraine, the bed of White Branch comes against the Collier Cone flow and follows its south edge to a place south of Sims Butte.

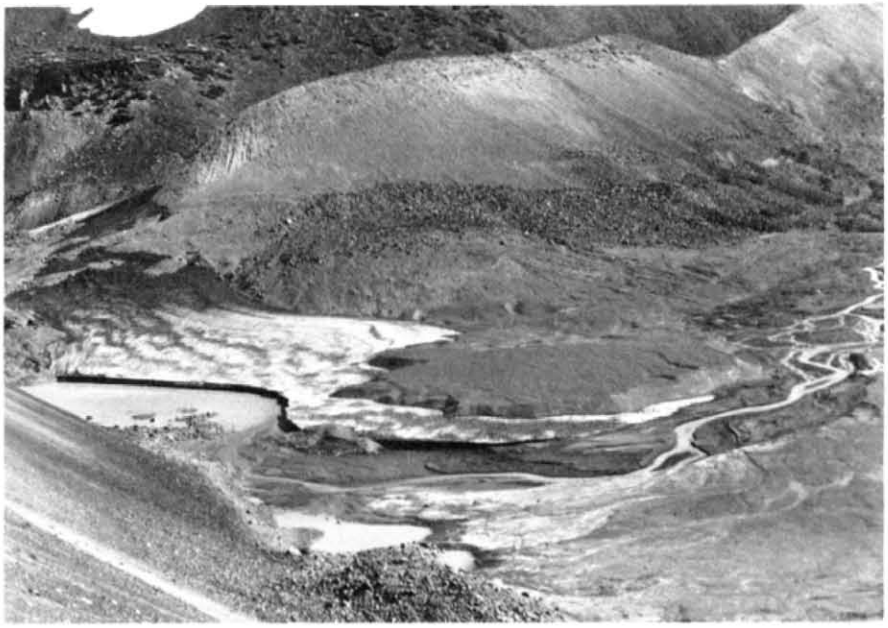
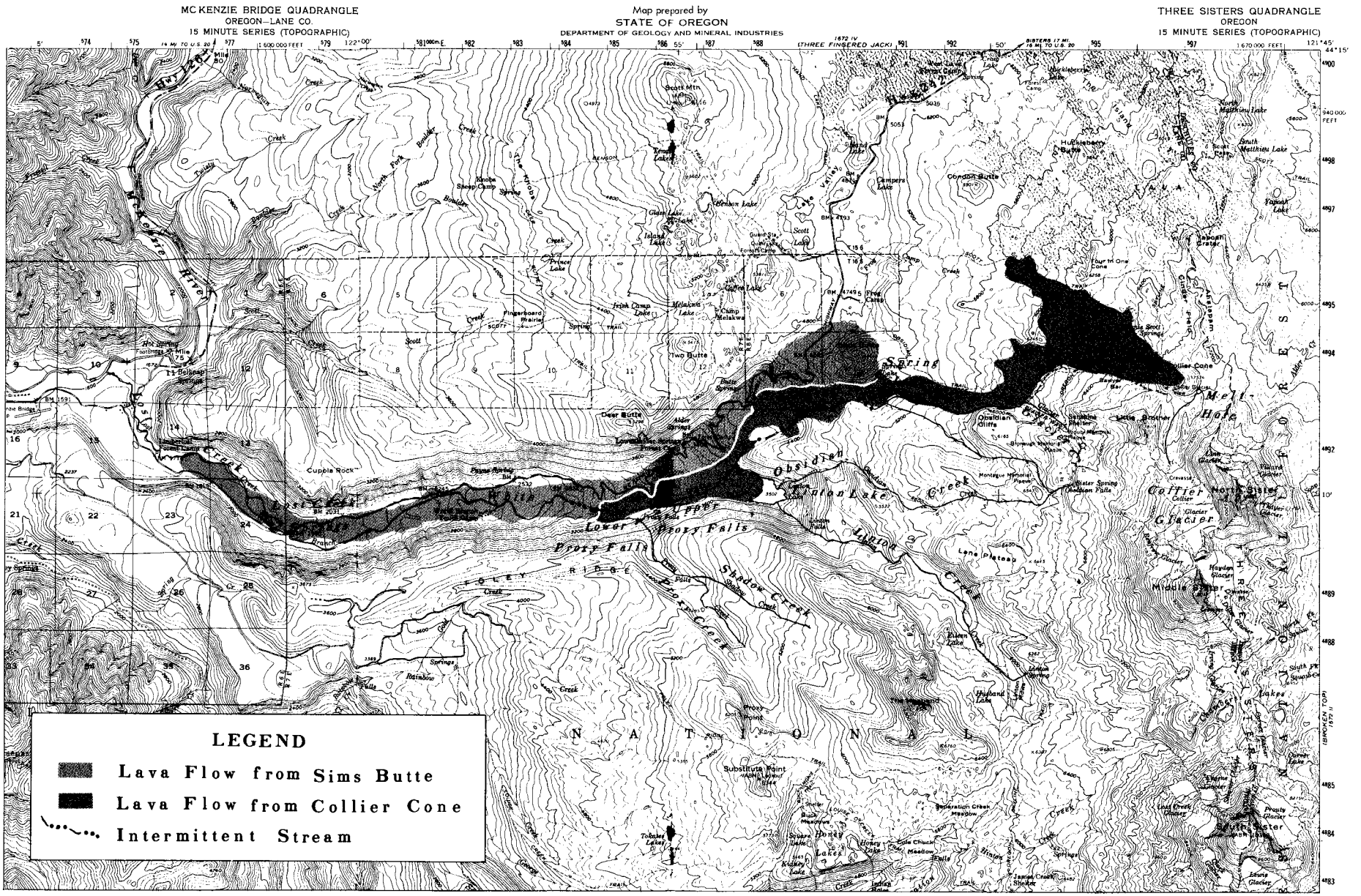


Figure 5. Hole where Collier Glacier meltwater disappears.

Figure 6. Dry White Branch channels at Sawyer Bar viewed from Pacific Crest Trail.



MAP OF LOST CREEK GLACIAL TROUGH, LANE COUNTY, OREGON

Figure 7. Place of capture of Obsidian Creek by an unnamed Creek.

Figure 8. Spring Lake viewed from its south end.

Along much of the way the stream has cut into the sides of the flow and in places through small lobes of the flow. Because the stream bed along this stretch is on older and denser rock, there is little or no loss of water to the subsurface. South of Sims Butte, however, the stream channel moves onto the surface of the flow, where it remains to the end of the flow below Proxy Falls.

Because of the high porosity of the Collier Cone flow, and except for periods when there is a large volume of water from rapid melting of snow, all water is lost to the subsurface within a short distance of the place where the channel comes onto the lava flow. Through most of the year, and in some years all year long, a 4-mile stretch of the stream bed is dry. From the small size of the channel at the trail to Linton Lake and at the trail to Proxy Falls, one would judge that during the time White Branch existed, even at the peak of runoff, only a small volume of water flowed along this part of the watercourse.

Neither Spring Lake nor Linton Lake, both of which are impounded by the Collier Cone flow, has a surface outlet, even though a large volume of water enters Linton Lake through Obsidian and Linton Creeks. Instead, drainage from these lakes is directly into the lava flow.

Spring Lake (Figure 8) is a small lake, a few hundred yards long and about half as wide, located at the base of Sims Butte on its southeast side. It occupies a basin formed where the lava flow dammed a small stream valley and is fed by a number of springs and a small creek. It is accessible by an easy trail that branches off the Obsidian Trail.

Linton Lake is much larger, measuring about half a mile in its longest dimension. It lies a little more than a mile southeast of Alder Springs Forest Camp and is accessible by an easy trail that begins at Lower Alder Springs picnic area. Linton Lake was formed when the lava flow dammed the water of Obsidian and Linton Creeks. The configuration of the terrain around the lake, with the steep valley walls and amphitheater-like form, suggests, however, that the lake does not occupy a stream valley but instead occupies a cirque at the head of a glacial trough.

Two of the most beautiful features of this remarkable drainage system are the Proxy Falls. After a half-mile hike along an easy trail, the visitor's efforts are well rewarded by the sight of white water tumbling down the steep valley wall. There are two main falls, named Upper Proxy Falls (Figure 9) and Lower Proxy Falls (Figure 10), and a number of smaller ones that are so small or secluded that they escape the attention of most visitors. The two main falls are different, both in form and in origin.

Water for Upper Proxy Falls originates in a large group of small springs that emerge from moss-covered lava flows about 600 feet above the valley floor and collects in one of two ravines.

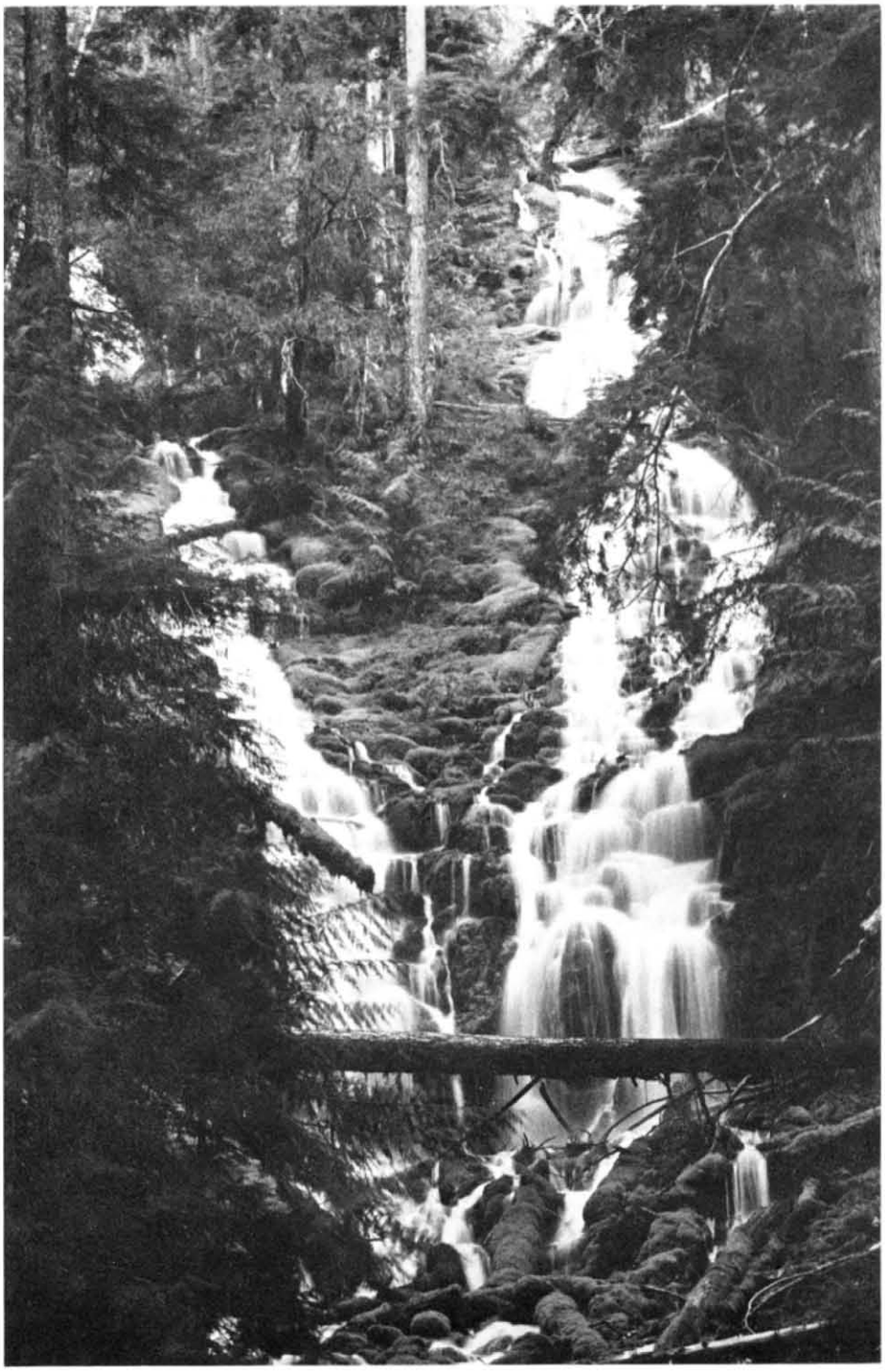


Figure 9. Upper Proxy Falls (Ore. Hwy. Div. photo).

Figure 10. Lower Proxy Falls (Ore. Hwy. Div. photo).

The stream in each ravine flows over the steep slope between borders of moss-covered rock, and the two streams join in the lower part of Upper Proxy Falls, which is actually two falls that come together as one. At the bottom, the water flows into a nearly circular basin (Figure 11) from which there is no surface outlet. Without noticeable eddy motion or an apparent opening in the bottom of the basin, the water percolates into the lava flow and enters the subsurface drainage system.

Some of the water from the springs does not enter either of the ravines that supply water to Upper Proxy Falls but instead comes down over the valley wall in miniature versions of the larger falls. Several of these small waterfalls lie between Upper Proxy and Lower Proxy Falls; others are east of Upper Proxy Falls. Water from some of these small falls flows along the ravine that lies between the Collier Cone flow and the valley wall and enters the pool at the base of Upper Proxy Falls.

The water for Lower Proxy Falls comes from Proxy Creek and its tributary Shadow Creek, which flow out of the mountain area southeast of the falls. Proxy Creek enters the glacial trough through a hanging valley left perched high above the valley floor when the glacier disappeared. In the last 200 feet of its trip toward the valley floor, the stream rushes over a steep, bulging rock surface and then plunges into free fall near the bottom.

Below the falls Proxy Creek follows the ravine between the Collier Cone flow and the valley wall until it reaches the end of the flow. Below that, the stream takes a crooked course, primarily over the Sims Butte flow. Some water is lost to the Sims Butte flow, but generally there is enough water to sustain a surface stream to the junction with Lost Creek. During years when the runoff is low, however, much of the channel below Lower Proxy Falls goes dry. Most of the numerous small streams that originate at springs along the valley walls below Proxy Falls disappear into the lava flow, supplying little water to the creek.

Because White Branch no longer exists, the stream below Lower Proxy Falls, which is still called White Branch, is misnamed. It is questionable whether this name was ever appropriate. Even when there was a White Branch, it supplied water to this part of the watercourse only intermittently, and then in small amounts. Instead, Proxy Creek has supported permanent flow along this part of the channel and, since 1960, has been practically the only stream supplying water to it. However, a large spring about a quarter of a mile below the "White Branch" bridge also feeds water into the channel.

Water from Glacier Creek, the unnamed tributary, Spring and Linton Lakes, Upper Proxy Falls, Proxy Creek, and the many small spring-fed streams along the valley enters the subterranean passages of the lava flows and reappears in many springs that supply water to Lost Creek. Most of the springs are clustered in an area

Figure 11. Basin at base of Upper Proxy Falls.

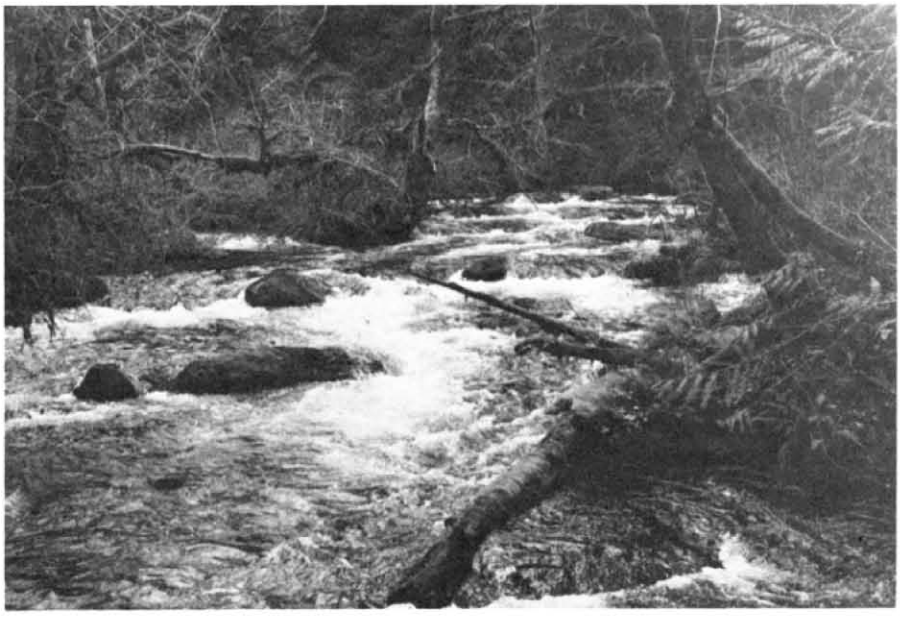


Figure 12. Cascades in Lost Creek near its confluence with the McKenzie River.

about 2 miles above the lower end of the Sims Butte flow and a short distance north of the "White Branch" bridge. The springs in this area form three main groups, each with a pond, and water from the three ponds flows into a larger pond that empties into Lost Creek. Lost Creek is joined by "White Branch" a little more than half a mile below the pond, and the resulting stream, retaining the name Lost Creek, follows a channel along the north edge of the lava flow to its end. Numerous springs emerge from the lava flow along the channel.

Below the Sims Butte flow, the lower 2 miles of Lost Creek's course lie over glacial drift. In its last half mile, Lost Creek plunges and cascades along its channel through a forested glen (Figure 12) and then joins the McKenzie River.

Acknowledgment

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