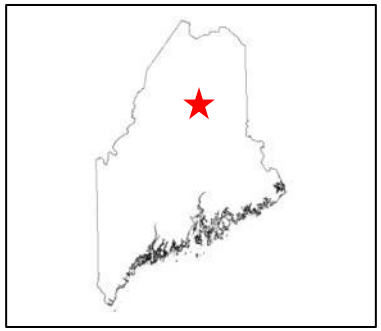
Geologic Site of the Month

May, 2000

A Geological Traverse along South Branch Ponds Brook Baxter State Park



46° 7‘ 32.52“ N, 68° 55‘ 13.60“ W

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Introduction

An area of outstanding natural beauty, Baxter State Park is home to some of Maine's most unique geology. Mount Katahdin's huge granite massif yields northward to lower peaks underlain with volcanic rhyolite and valleys underlain with sandstone and fossiliferous shale. For those willing to put in a little effort, a fabulous cross section of this geology can be toured along South Branch Ponds Brook between South Branch Pond and Trout Brook. To access this part of the Park, enter through the North Gate via Route 159 from Patten. Follow the perimeter road as it winds its way along Trout Brook for about 9 miles where it intersects the South Branch Pond Road. The pond is about 3 miles up this road, but about a mile from the end is a parking area on the right (west) side. From this point a trail leads about ¼ mile downhill to South Branch Ponds Brook and the starting point for this traverse. The best way to see these units is by walking the brook on a hot summer day. Wear a bathing suit so you can take advantage of the deep swimming holes you encounter along the way. If you walk the brook all the way from the trail to the bridge across Trout Brook the distance is about 2.5 miles. It is best to check with a Park Ranger about brook conditions before proceeding.

Introduction

The units you will see are presented on the geologic map of the area and briefly described below from oldest to youngest. They give us a great window in on the events of the Devonian Period, between 360 and 418 million years ago.

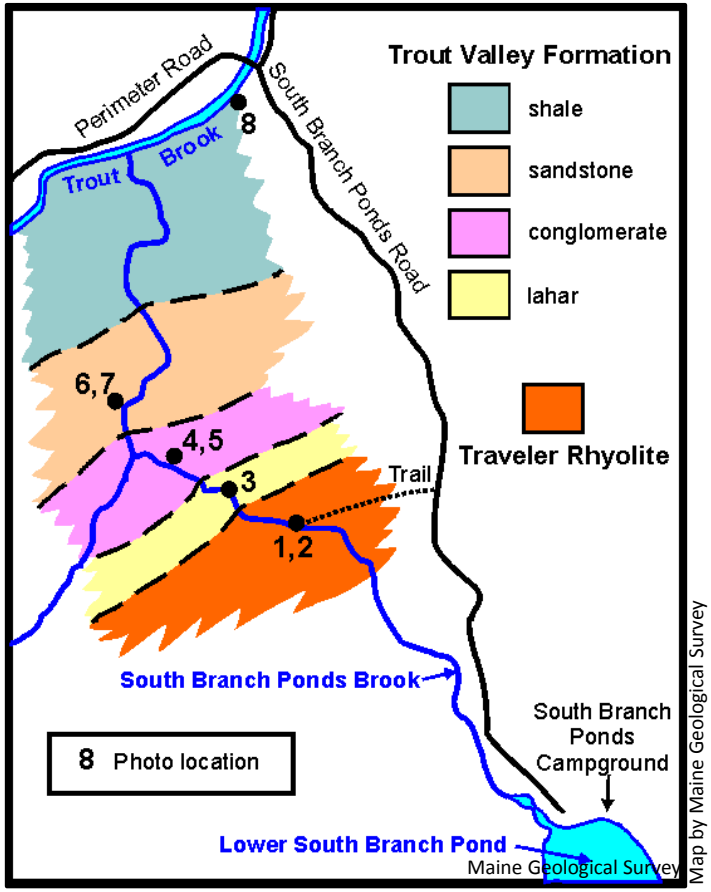

Figure 1. Geologic map of South Branch Ponds Brook showing the Trout Valley Formation and the Traveler Rhyolite.

Traveler Rhyolite and Trout Valley Formation

Much of the northern part of Baxter State Park is underlain with rhyolite, a light-colored volcanic rock that is similar in composition to granite, in this case the Katahdin granite, but that is much finer grained. In many outcrops the grains are too fine to see with the naked eye. Most of the peaks (The Traveler, North Traveler, Black Cat Mountain), the cliffs around Upper and Lower South Branch Ponds, and the mountains you passed on the way into the park (Horse Mountain) are underlain with this rock. Most of the unit formed from large eruptions of volcanic ash rather than by flows of molten magma. The Traveler Rhyolite is probably 3,200 meters thick and tilts northward at a moderate angle.

This formation underlies Trout Valley, the most significant valley in the northern part of the Park. It consists of a variety of rock types, including conglomerates at the base (probably of volcanic origin) followed by sandstone and finally fossiliferous shale along Trout Brook itself. The Trout Valley Formation is about 500 meters thick.

Bedrock Geology

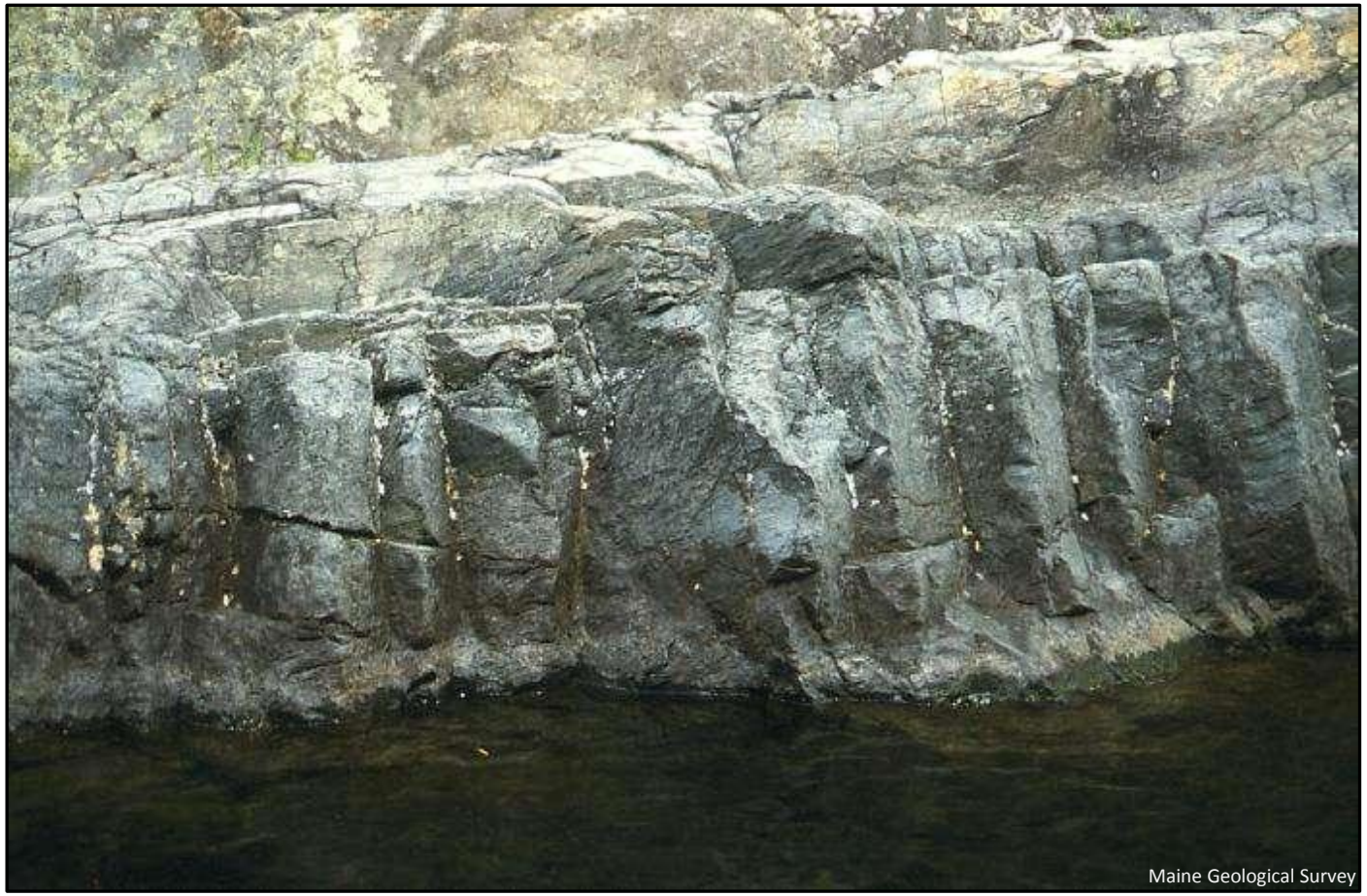

Photo by Maine Geological Survey

Figure 2. Columnar joints in the Traveler Rhyolite. Regularly spaced joints like these developed as the ash flow cooled slowly, causing it to contract. These are seen in a longitudinal view showing the length of the columns to be about a meter. On the upper surface, the columns are nearly hexagonal (like a honeycomb) in cross section.

Bedrock Geology

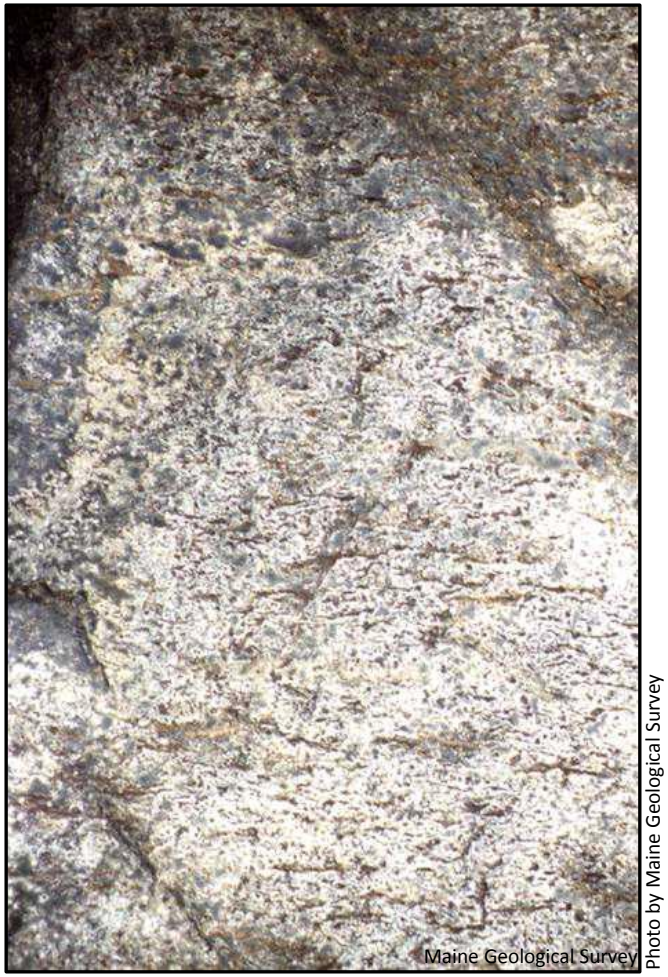

Photo by Maine Geological Survey

Figure 3. A close up of the Traveler Rhyolite. The dark streaks in the rock are flattened pieces of pumice that formed as a rain of volcanic bombs that accompanied the ash eruption.

Bedrock Geology

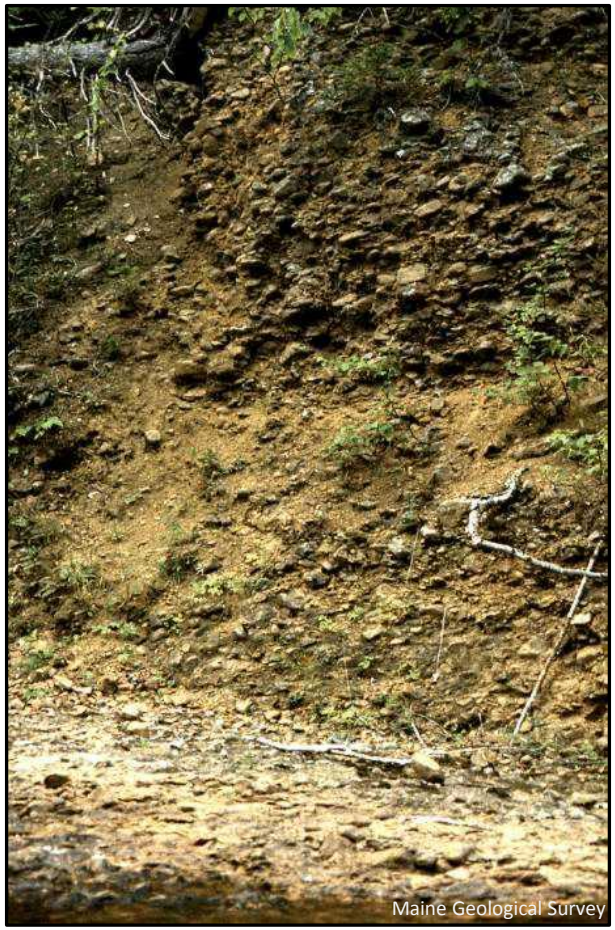

Photo by Maine Geological Survey

Figure 4. Lahar at the base of the Trout Valley Formation. It is made up of angular pieces of the underlying volcanic columns and is cemented by volcanic ash. The rocks were deposited by a lahar, a violent eruption and flow of ash that rips up pieces of the underlying rocks as it travels rapidly down a mountain slope.

Bedrock Geology

Photo by Maine Geological Survey

Figure 5. The basal conglomerate of the Trout Valley Formation. The conglomerate here is quite thick (at least 10 meters) and, amazingly, one layer makes up the entire wall of the valley.

Bedrock Geology

Photo by Maine Geological Survey

Figure 6. Close-up of the conglomerate. The clasts are almost all rhyolite, with some being recognizable as sections of the columns seen farther upstream. Most are sub-angular boulders with a bit of ash between, but many cobbles and boulders lay directly on others rather than being supported by the ash.

Bedrock Geology

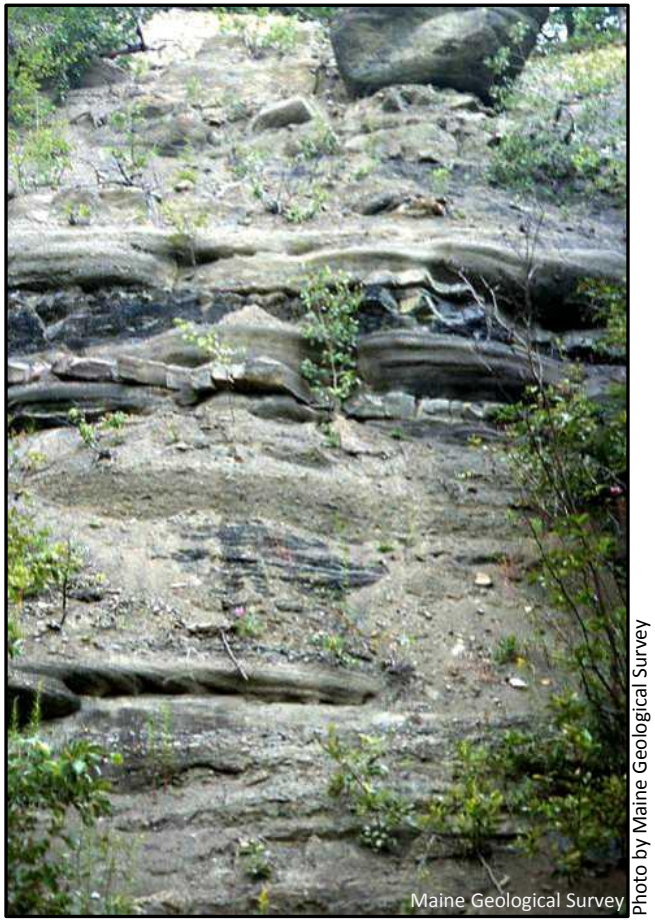

Photo by Maine Geological Survey

Figure 7. High cliffs of sandstone and lenses of conglomerate. This is farther downstream and higher in the section than the previous figures. Here we are a bit farther away from the source of these sediments so there is less of the coarse material and more sandstone. Also, by being higher in the section, these rocks represent a slowing down of the volcanic processes that formed the rhyolite and conglomerates.

Bedrock Geology

Photo by Maine Geological Survey

Figure 8. Some sections of the sandstone contain large (up to one-half meter) black chert nodules. These are thought to have formed from some type of fungus that was later replaced by chert. Some sandstone beds in this section are stained rusty brown and cemented by the mineral siderite, a iron-rich carbonate mineral.

Bedrock Geology

Photo by Maine Geological Survey

Figure 9. Shale of the Trout Valley Formation in Trout Brook. This is a black shale that was deposited in shallow water but near land. It is loaded with fossilized pieces of the Devonian plant, our State fossil. Trout Valley is among the few localities in the world where this primitive plant fossil is found. Please note that it is illegal to remove any fossils (or any other rocks) from Baxter State Park.

References and Additional Information

Caldwell, D.W., 1972, The geology of Baxter State Park and Mt. Katahdin: Maine Geological Survey Bulletin 12, 57p.

Rankin, D.W., 1980, The Traveler Rhyolite and its Devonian setting, Traveler Mountain area, Maine, in Roy, D.C., and Naylor, R.S., eds., A guidebook to the geology of northeastern Maine and neighboring New Brunswick: New England Intercollegiate Geological Conference, Boston College Press, p. 98-113.