

Geologic Site of the Month
July, 2011

North Ridge, Traveler Mountain, Baxter State Park



46° 4' 21.16" N, 68° 50' 48.17" W

Text by
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Introduction

The Traveler Rhyolite is a formation of volcanic rocks that covers a large area in the northern region of Baxter State Park. The rock formation is named for Traveler Mountain, the highest peak underlain by the rhyolite, at 3541 feet above sea level (Figure 1). The Traveler Rhyolite is made up of welded ash-flow sheets that were laid down in a structural depression thought to have been a volcanic caldera 406-407 million years ago (Rankin and Hon, 1987; Bradley and Tucker, 2002).



Photo by Robert A. Johnston

Figure 1. Summit of Traveler Mountain in Baxter State Park (3541 ft), with the Peak of the Ridges and "Little Knife Edge" in the background, all composed of Traveler Rhyolite bedrock.



Introduction

The Traveler Rhyolite is closely related to the large body of Katahdin Granite to its south (Figure 2). The rhyolite and the granite comprise the above-ground and below-ground parts of a large volcanic system that was active in the Early Devonian Period of geologic time.

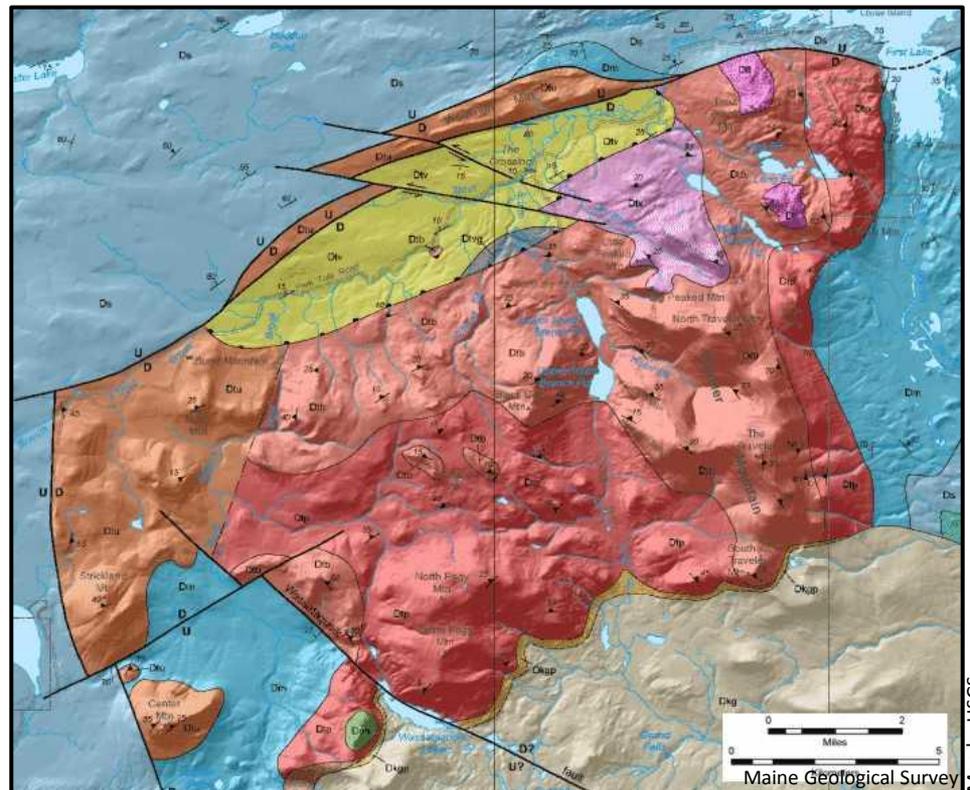


Figure 2. A portion of the bedrock geologic map (Plate 1) from [A Guide to the Geology of Baxter State Park and Katahdin](#) (Rankin and Caldwell, 2010). Traveler Rhyolite is shown in shades of red (Dtu, Dtl, Dtx, Dtb, and Dtp). Dkqp and Dkg are Katahdin Granite.



Katahdin Granite

The Katahdin Granite underlies the southern half of Baxter State Park, including Katahdin. It is a coarse-grained rock with a mineral composition of two parts orthoclase feldspar, one part quartz, one part plagioclase feldspar, and small amounts of black mica (biotite) (Figure 3).

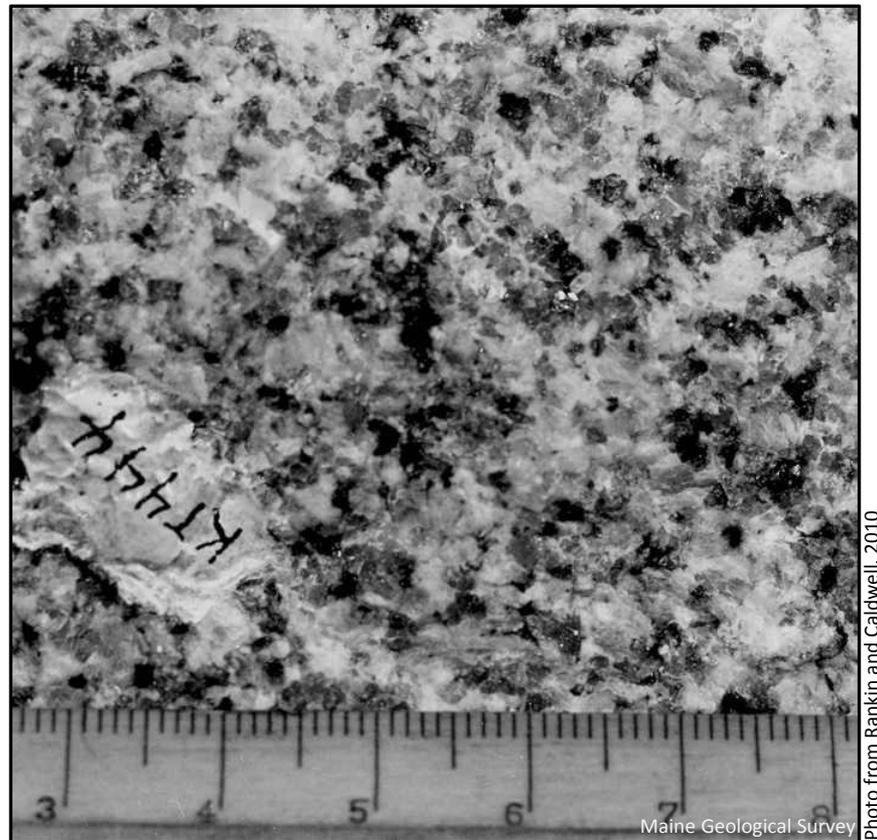


Figure 3. Hand specimen of the Katahdin Granite showing white feldspars, gray quartz, and black mica (biotite).

Traveler Rhyolite

The Traveler Rhyolite has the same composition as the granite, but with a much finer-grained texture of microscopic grains. The rhyolite is typically dark-greenish gray or bluish gray to almost black in color. It breaks with smooth curving surfaces that can be very sharp like glass. Its weathered surfaces, like those found on the top of North Traveler Mountain may be white, light-gray, or stained brown or red by iron (Figure 4).



Photo by Robert A. Johnston

Figure 4. Weathered surfaces on the Traveler Rhyolite as seen at the summit of North Traveler Mountain.



Traveler Rhyolite

Tiny, light-colored crystals called phenocrysts are embedded in the fine-grained rhyolite and make up between 5 and 15 percent of the rock (Figure 5). Most of these phenocrysts are made up of plagioclase (a feldspar mineral), but some are made up of quartz.



Photo from Rankin and Caldwell, 2010

Figure 5. Small, light-colored phenocrysts in compacted welded ash-flow tuff, Traveler Rhyolite. The long, thin lenses are fragments of pumice which were flattened when the ash-flows were compressed by the weight of overlying layers.



Traveler Rhyolite

The most common rock of Traveler Rhyolite is welded tuff, composed of multiple layers of ash flows produced by volcanic eruptions. When deposited, the ash flows were hot enough to fuse together under the weight of overlying ash-flow materials, and pumice fragments within the flows were flattened by the weight of the overlying material (Figure 5). Ash-flow layers can be hundreds of feet thick. The entire Traveler Rhyolite unit is over 10,000 feet thick and a conservative estimate of its volume is 80 cubic miles (Rankin and Caldwell, 2010)!



Columnar Jointing

Sheets of hot igneous rock that cool rapidly (as did volcanic layers in the Traveler Rhyolite) develop shrinkage fractures. The pattern of these fractures (called joints) often produces four-sided to eight-sided columns perpendicular to the surface of the ash flow. Joints that form this pattern are called columnar joints and they are very common in the rocks of the Traveler Rhyolite. The columns of rock range in diameter from about an inch (Figure 6) to as much as six feet (Figure 7).



Photo by Robert A. Johnston

Figure 6. Folded columnar joints in the Traveler Rhyolite as seen on the trail up North Traveler Mountain.



Columnar Jointing



Photo by Robert A. Johnston

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Figure 7. Broken columnar-jointed block (approximately 10 feet long) along the Center Ridge Trail, Traveler Rhyolite.



Columnar Jointing

The columns range in length from inches to tens of feet, in some cases decorating entire cliff faces.



Photo from Rankin and Caldwell, 2010

Maine Geological Survey

Figure 8. Columnar jointing in the Traveler Rhyolite on the lower part of Center Ridge as seen from the opposite shore of Upper South Branch Pond.



Viewing these Rocks

Two short hikes allow Baxter State Park visitors to see fine outcrops of the Traveler Rhyolite. Both hikes begin at the Ranger Station at South Branch Ponds Campground. One hike is to the first overlook on the trail to North Traveler Mountain (3152 ft). Begin on the Pogy Notch Trail and go 0.2 miles to the North Traveler Trail on the left. Take the North Traveler Trail through woods to the crest of North Ridge. Here on North Ridge are fine examples of the Traveler Rhyolite with small columnar joints (see Figure 6). A second, shorter hike, is up the Ledges Trail, to outcrops on the ridge behind the South Branch Pond Campground. Outcrops of the Traveler Rhyolite are found on the open ledges, along with fine views of the South Branch Ponds and Traveler Mountains (see Rankin, 1980).



References and Additional Information

- Bradley, D. C., and Tucker, R., 2002, Emsian synorogenic paleogeography of the Maine Appalachians: *Journal of Geology*, v. 110, no. 4, p. 483-492.
- Rankin, D. W., 1980, The Traveler Rhyolite and its Devonian setting, Traveler Mountain area, Maine, in Roy, D. C., and Naylor, R. S. (editors), 1980, A guidebook to the geology of northeastern Maine and neighboring New Brunswick: New England Intercollegiate Geological Conference, 72nd Annual Meeting, October 10-13, 1980, Presque Isle, Maine, p. 98-113.
- Rankin, D. W., and Hon, R., 1987, Traveler Rhyolite and overlying Trout Valley Formation and the Katahdin pluton; A record of basin sedimentation and Acadian magmatism, north-central Maine, in Roy, D. C. (editor), *Northeastern section of the Geological Society of America: Geological Society of America, Centennial Field Guide*, v. 5, p. 293-302.
- Rankin, D. W. and Caldwell, D. W., 2010, [A Guide to the Geology of Baxter State Park and Katahdin](#): Maine Geological Survey, Bulletin 43, 80 p., 2 geologic maps (scale 1:100,000)

