

Maine Geologic Facts and Localities  
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***Geology of Horse Mountain, Baxter State Park, Maine***



46° 8' 41.43" N, 68° 49' 2.99" W

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## Introduction

Horse Mountain is located in the northeastern corner of Baxter State Park, rising from the western shore of Grand Lake Matagamon (Figure 1).



**Figure 1.** Horse Mountain as seen looking south from the northern shore of Grand Lake Matagamon.

### Introduction

Its spectacular cliffs can be seen from the perimeter road near Baxter Park's northern entrance (Figure 2). The cliffs are composed of the Pogy Member of the Traveler Rhyolite.



Photo Robert A. Johnston

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**Figure 2.** Looking west at Horse Mountain from the point on Matagamon Lake immediately northeast of Grand Lake Dam.



### Bedrock Geology

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. 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).

The Pogy Member is about 3000 feet thick and forms the base of the Traveler Rhyolite. It is named for outcrops on Pogy Mountain in the center of Baxter State Park. The rock is a moderately compacted, welded ash-flow tuff containing about fifteen percent phenocrysts of quartz and plagioclase (Rankin and Caldwell, 2010).

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 visible on the cliffs on the east face of Horse Mountain (Figure 2). Individual columns are as much as 4 feet in diameter and at least 40 feet tall (Rankin and Caldwell, 2010).



### Formation of the cliffs

The spectacular cliffs seen on the east side of Horse Mountain (Figure 2) were formed by a process called glacial plucking. During the last Ice Age, continental glaciers overrode the mountains in Baxter State Park. The ice at the base of the glacier at times required only a slight increase in pressure to cause it to melt. The movement of the ice sheet over Horse Mountain produced a slightly higher pressure on the northern side of the mountain which melted the ice at the bottom of the glacier and allowed water to seep into fractures in the bedrock. This meltwater would freeze again as it moved into zones of lower pressure on the eastern side of the mountain where the ice was no longer riding up over the slope. As the water refroze in rock fractures along columnar joints, it expanded with tremendous pressure and forced the rock apart. After blocks of bedrock were pried loose in this manner, they were then frozen into the glacier and carried away. The eastern side of Horse Mountain shows prominent cliffs that were produced by the plucking process.

After the glaciers receded from Maine, erosion of the cliffs continued. Individual pieces of rock become loosened by frost action. These rocks commonly fall in the spring, when there is a lot of water moving over and between rocks. If it freezes at night, the rock may become unstable and eventually fall, bouncing to some lower place. The accumulation of fallen rocks at the base of a cliff is known as talus.



### Formation of the cliffs

A large accumulation of huge boulders of the Pogy Member of the Traveler Rhyolite on the east side of Horse Mountain is made mostly of fragments of large columnar joints that have broken from the cliff above (Figure 3).



Photo Robert A. Johnston

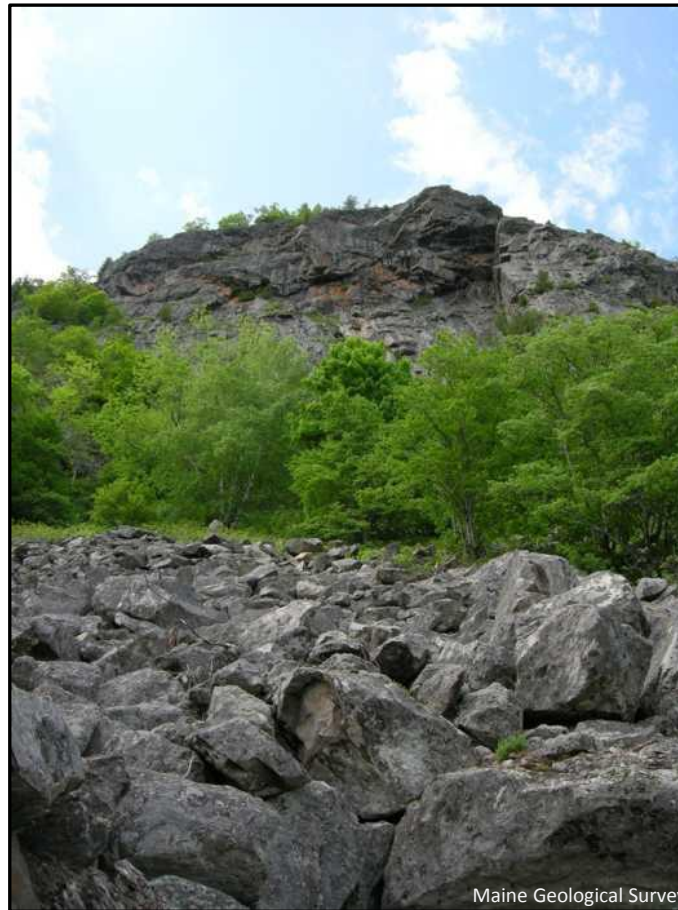
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**Figure 3.** An eroded columnar joint of the Pogy Member, Traveler Rhyolite found on the talus slope of Horse Mountain.



## Formation of the cliffs

The boulders have accumulated into a very large talus pile that is more than 330 feet from its top to bottom (Figure 2, Figure 4).



From Rankin and Caldwell, 2010

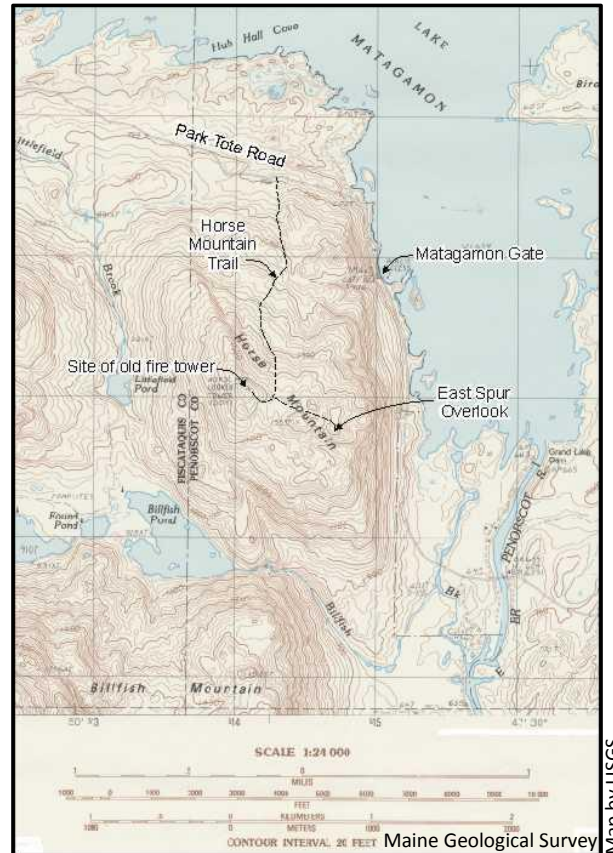
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**Figure 4.** View up the talus slope towards the East Spur of Horse Mountain.



The Horse Mountain Trail

The Horse Mountain Trail (Figure 5) is a moderate hike of a mile and four-tenths to the summit (1589 ft, 484 m), the former site of a Maine Forest Service fire tower (Figure 6). The trail leaves the Baxter Park Tote Road six-tenths of a mile west of the Matagamon Gate.



**Figure 5.** Portion of the U.S. Geological Survey 7.5' topographic map of Trout Brook Mountain showing the trail up Horse Mountain.





The Horse Mountain Trail



**Figure 6.** Summit of Horse Mountain, showing the remains of the Maine Forest Service fire tower.

### The Horse Mountain Trail

A mile and two-tenths up the trail, a side trail leads four-tenths of a mile to the east viewpoint, a fine overlook of Grand Lake Matagamon and Sugarloaf Mountain near Shin Pond. (Figure 7, Nation and Cummings, 2005). The trail is entirely across the Pogy Member of the Traveler Rhyolite.



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**Figure 7.** View at the East Spur Overlook with Grand Lake Matagamon below.



The Horse Mountain Trail

It is also possible to climb the talus pile at the foot of the cliffs on the east side of Horse Mountain (Figure 8). Note that poison ivy is plentiful on the upper talus slope - be careful!



**Figure 8.** View from the talus slope of Horse Mountain with Grand Lake Matagamon in the background.



### The Horse Mountain Trail

The northeast corner of Baxter State Park has both fine hiking trails and spectacular geology. Beautiful views can really be enjoyed after some moderate hiking (Figure 9).



**Figure 9.** Horse Mountain Trail sign on the Baxter State Park Tote Road.

### 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.
- Nation, P., and Cummings, B., 2005, AMC Maine mountain guide (9th edition): Appalachian Mountain Club Books, Boston, 261 p.
- Rankin, D. W., Caldwell, D. W., 2010. [A guide to the geology of Baxter State Park and Katahdin](#): Maine Geological Survey, Bulletin 43, 80 p., 2 maps.
- 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.

