

Maine Geologic Facts and Localities  
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***The Geology of Haystack Mountain, Castle Hill, Maine***



46° 40' 1.97" N, 68° 13' 53.75" W

Text by  
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## Introduction

Haystack Mountain is located in Aroostook County, Maine, in the town of Castle Hill approximately ten miles west of Presque Isle. The elevation of Haystack Mountain is 1,142 feet (348 meters) and a public hiking trail leads to the summit.



Photo by Robert A. Johnston

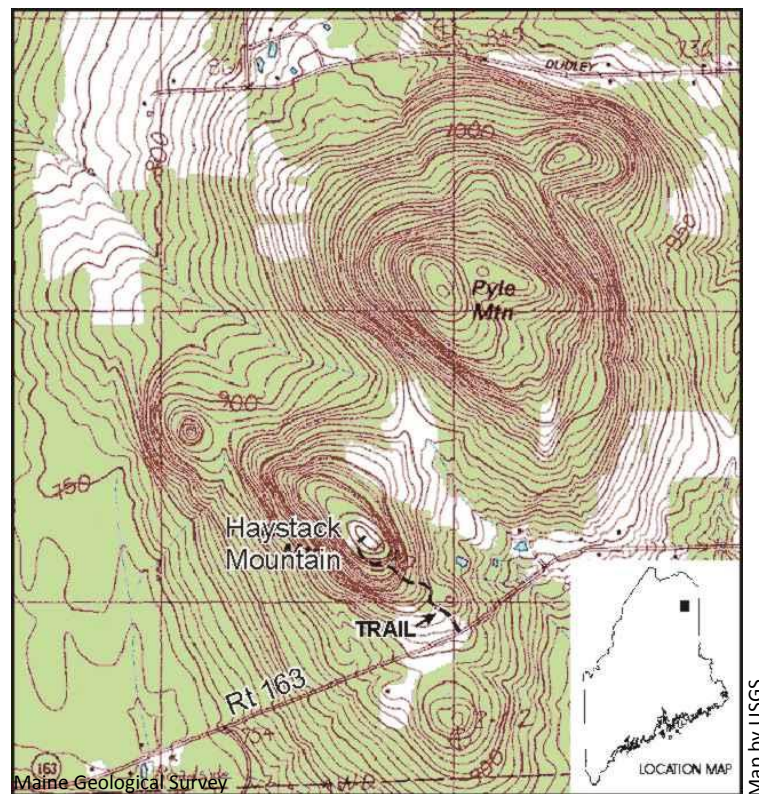
Maine Geological Survey

**Figure 1.** Looking north along the Walker Siding Road toward Haystack Mountain.



## Directions

The hike up Haystack Mountain is a moderate hike, approximately one-third of a mile long. Access into the gravel parking lot for the start of the hiking trail is a right turn (north) off Maine Route 163, at the crest of a hill about four miles west of Mapleton. The 215-acre property is leased to the Town of Castle Hill by the Maine Bureau of Parks and Lands.



**Figure 2.** Location map of Haystack Mountain, Castle Hill, Aroostook County, Maine.

## Regional Bedrock Geology

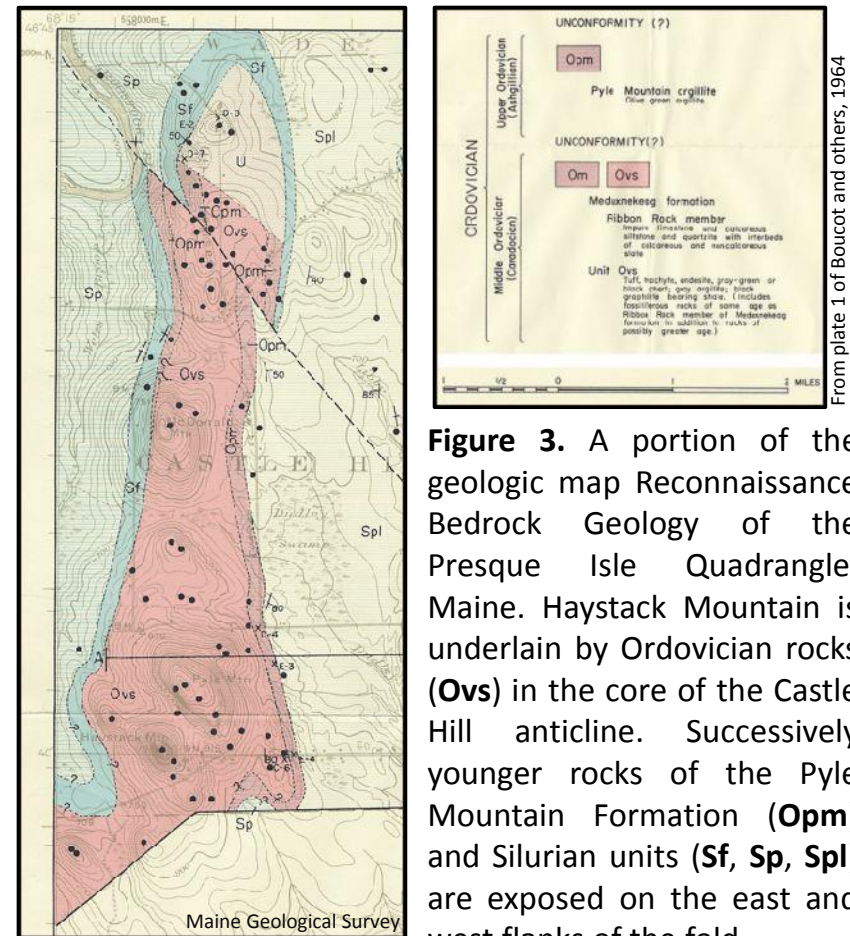
Rocks exposed at the summit of Haystack Mountain are felsic volcanic rocks of the Winterville Formation (Roy, 1987). The Winterville Formation is a widespread unit of sedimentary and volcanic rocks of Late Ordovician age (Roy and Mencher, 1976). These rocks are interpreted to have been deposited by deep-water, submarine sedimentation and volcanism (Churchill-Dickson, 2007). Later mountain-building events and erosion through geologic time have left a complicated pattern of surface exposure.

Central Aroostook County is characterized by gently rolling hills to the east along the border with New Brunswick, Canada, while the topography to the west is more elevated and rugged. This difference in landscape can be attributed in a general way to the underlying geology. The eastern region is underlain by more easily eroded limestone and calcareous shale, while the western region is underlain by more resistant sedimentary and volcanic rocks. The Winterville Formation forms the most northeastern part of the Ordovician volcanic belt in Maine, extending southwest into New Hampshire and probably northeast in the subsurface into New Brunswick where it is covered by younger rocks of Silurian and Devonian age (Roy and Mencher, 1976).



## Local Bedrock Geology

Haystack Mountain is within a narrow belt of the Winterville Formation that is approximately a mile across and over five miles long, extending from Haystack and Pyle Mountains northward to Castle Hill (Figure 3). This belt is in the core of a large fold, the Castle Hill anticline (Boucot and others, 1964), that is convex upward, bringing the older rocks to the surface. The oldest rocks, of the Winterville Formation, are exposed in the center of the fold, overlain in turn by the Late Ordovician Pyle Mountain Argillite, and then by rocks of Silurian age on the flanks of the fold. The Ordovician rocks are now assigned to the Winterville Formation (Roy and Mencher, 1976).

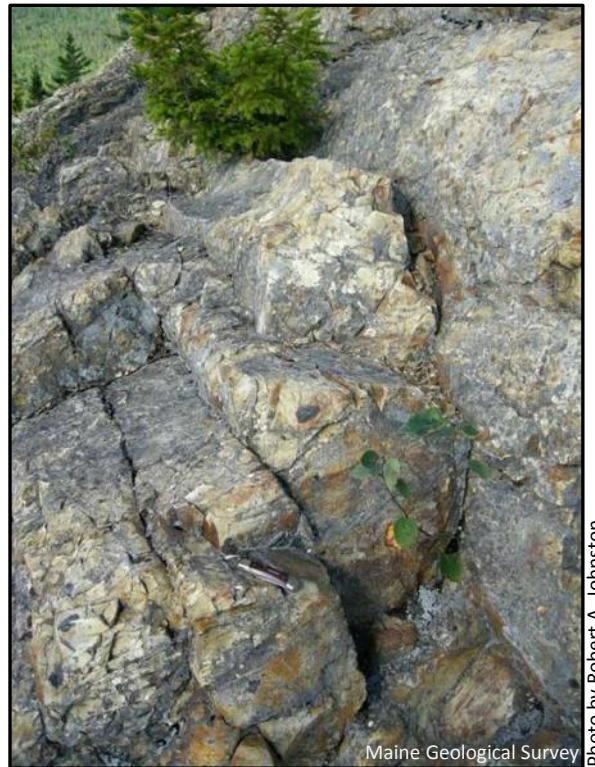


**Figure 3.** A portion of the geologic map Reconnaissance Bedrock Geology of the Presque Isle Quadrangle, Maine. Haystack Mountain is underlain by Ordovician rocks (**Ovs**) in the core of the Castle Hill anticline. Successively younger rocks of the Pyle Mountain Formation (**Opm**) and Silurian units (**Sf**, **Sp**, **Spl**) are exposed on the east and west flanks of the fold.



## Winterville Formation

Across the region, the Winterville Formation contains a variety of volcanic and sedimentary rocks, including basalt, rhyolite, slate, chert, graywacke, and conglomerate. The complicated relationships among these different rocks have not been worked out in detail, though volcanic rocks are probably most abundant followed by dark gray to black slate (Roy, 1987). Fossil graptolites in the slate from several localities show that the formation as a whole spans the Caradocian and Ashgillian stages of the Late Ordovician.



**Figure 4.** Felsic volcanic rocks of the Winterville Formation on the slope near the summit of Haystack Mountain. Long, straight fractures which produce angular fragments are typical of such fine-grained crystalline rocks.

## Winterville Formation

The rock exposed on Haystack Mountain is rhyolite, one of the volcanic rock types of the Winterville. It is a light-colored rock composed predominantly of fine-grained feldspar. In places, it contains coarser mineral grains in a porphyritic texture. Because of its fine-grained crystalline texture, it is difficult to break and resists erosion. This is why Haystack Mountain stands above the surrounding landscape. The age of these felsic volcanic rocks is not known precisely, but fossils from just below the overlying Pyle Mountain Argillite imply that the Winterville Formation in the Castle Hill area dates to the Caradocian stage of the Late Ordovician (Boucot and others, 1964), approximately 450 to 460 million years ago.



Photo by Robert A. Johnston

**Figure 5.** Close-up of the felsic volcanic rocks of the Winterville Formation at the summit of Haystack Mountain, showing the hackly fracture.

## Pyle Mountain Argillite

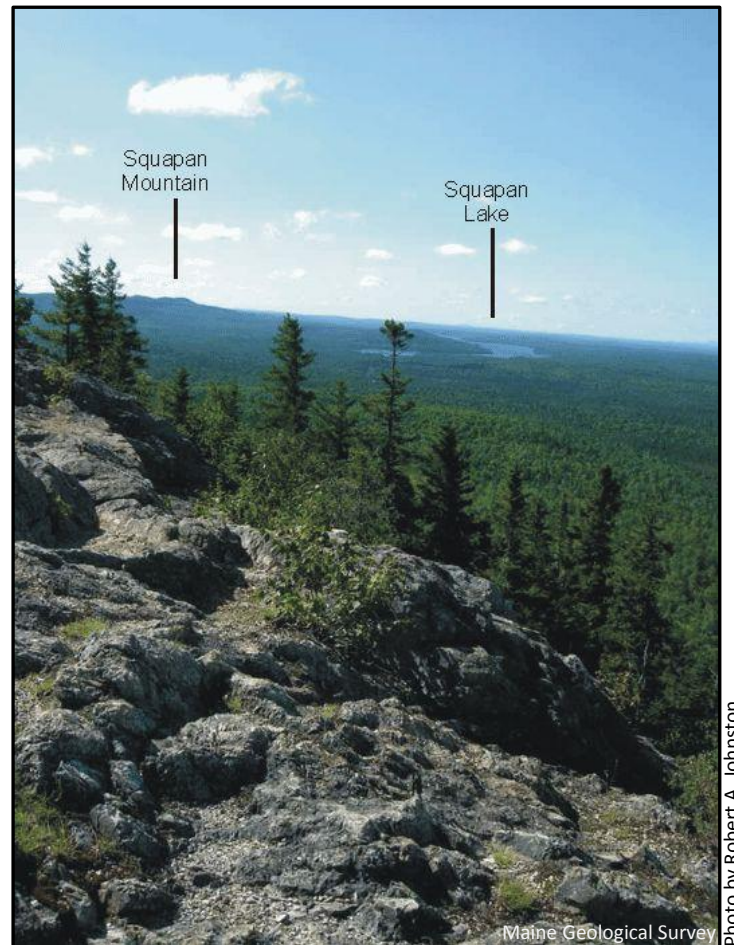
The Pyle Mountain Argillite (Boucot and others, 1964) is a poorly exposed, thin unit of siltstone and slate containing fossil trilobites, brachiopods, ostracodes, and other organisms. It is younger than the Winterville Formation and partly overlies it in the Castle Hill anticline, especially to the east (Figure 3). The Pyle Mountain Argillite contains a *Foliomena* fauna, a Late Ordovician assemblage characterized by very small brachiopods, typically 2 to 4 mm across (Neuman, 1994). The nature of the sediment and the fossils together imply deposition in a cold, deep-water marine environment. The Pyle Mountain Argillite contains the only reported occurrence of the *Foliomena* fauna in North America (Neuman, 1994). Roy (1987) proposed the name of the formation be changed to Pyle Mountain Formation.



**Figure 6.** View looking east from near the summit of Haystack Mountain across the Castle Hill anticline. Outcrops of the Pyle Mountain Formation are found along Route 163 in the foreground, with younger Silurian rocks to the east.



## Pyle Mountain Argillite



**Figure 7.** View from the summit looking south with massive, angular felsic volcanic rocks in the foreground. The next mountain to the south, Squapan Mountain, is in the distance to the left. It is also underlain by volcanic rocks, the Devonian Hedgehog Formation, unrelated to the Winterville volcanics on Haystack Mountain. Squapan Lake, in the middle distance, is underlain by more easily eroded Devonian sedimentary rocks (Roy, 1987).

## References and Additional Information

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