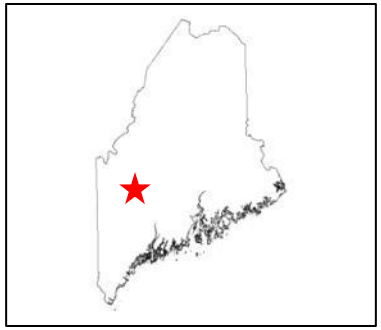
Geologic Site of the Month

August, 2006

Geology of Mount Abraham, Maine



44 58‘ 20.20“ N, 70 19‘ 33.24“ W

Text by
Robert Marvinney

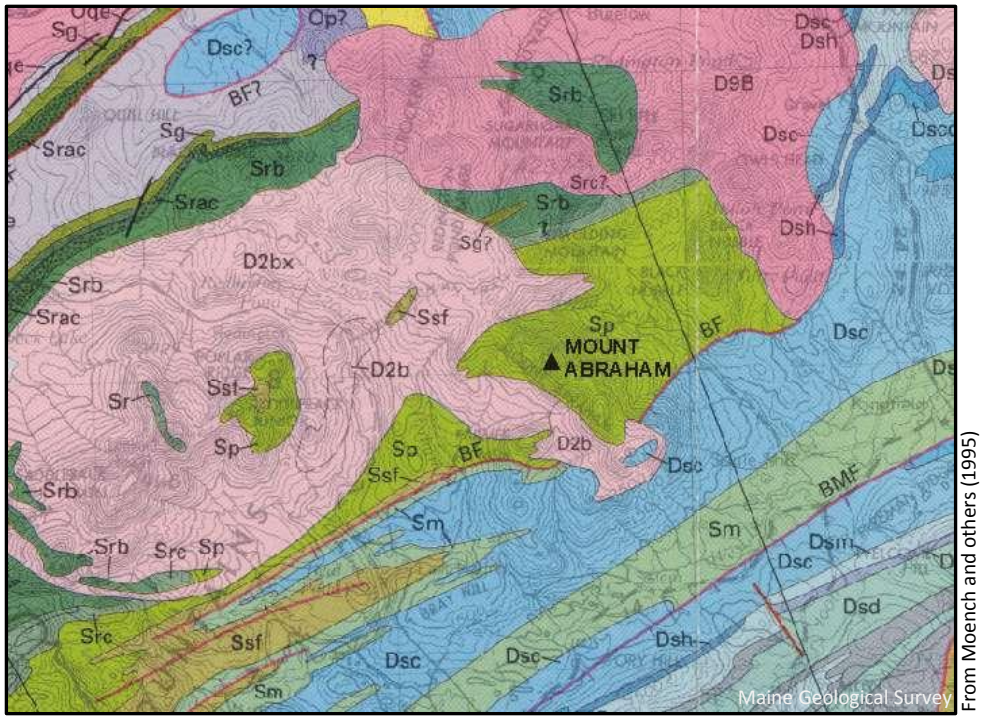
Introduction

At 4,049 feet, Mount Abraham is one of only 13 peaks in Maine higher than 4,000 feet. When weather permits, the summit offers a panoramic view that stretches from Mount Washington to Mount Katahdin. The trail to Mount Abraham from the Appalachian Trail is a popular side trip for hikers on the AT. Mount Abraham is also accessible from a trailhead near Kingfield. The treeless ridgeline offers many opportunities to explore geology, wildlife, and extensive arctic-alpine plant communities.

Photo by R. Marvinney

Regional Geology

This section of western Maine is characterized by metamorphosed sedimentary rocks of Silurian and Devonian age that have been punctured by extensive intrusions of igneous rocks, such as granite. Figure 1 is a geologic map that shows the general distribution of rock units in the area. Rocks of Silurian age are shown in various shades of green with the older rocks generally toward the northwest.



From Moench and others (1995)

Figure 1. A portion of a regional geologic map by Moench and others (1995). Mount Abraham is underlain with the Perry Mountain Formation (Sp), a mix of thick quartzite and schist. Units beginning with Sr are members of the Rangeley Formation. Various Devonian units, younger than the Perry Formation, are shown in blue shades and have labels beginning with D. The pink blobs are younger Devonian intrusions of granite and related rocks.

Regional Geology

Mount Abraham is almost entirely underlain with rocks of the Perry Mountain Formation. This Silurian unit is characterized by well-bedded quartzite. The quartzite is generally in beds that are 10 cm to 1 meter thick. The lower western slope of the mountain is underlain with the Redington pluton, an intrusion of granodiorite of Devonian age. Granodiorite is a coarse-grained igneous rock that is similar to granite in its abundance of quartz, but contains more calcium-rich feldspar instead of potassium-rich feldspar.

Sugarloaf Mountain, just to the north of Mount Abraham, is underlain with gabbro - another type of igneous rock that has abundant calcium-rich feldspar but little quartz. The heat that accompanied the intrusion of these igneous rocks locally metamorphosed the adjacent rocks to high levels, making them more resistant to erosion. Thus, the metamorphic rocks of Mount Abraham, Black Nubble, and the Bigelow Range command much of the high ground in this area of western Maine.

The land bears the distinctive markings of the last glaciation which buried this area under several thousand feet of ice during its peak. Glaciation is responsible for the rounded and streamlined nature of the ridges in this area, numerous cirques around Sugarloaf, numerous lake basins, and spectacular U-shaped valleys, all visible from the peak of Mount Abraham. Glaciation also brought glacial erratics to the summit of Mount Abraham.

Mount Abraham Geology

The lower slopes of Mount Abraham, where the trail up the east side starts, are underlain with a thick bouldery till (Figure 2) deposited by glaciers which retreated from this area about 12,000 years ago.

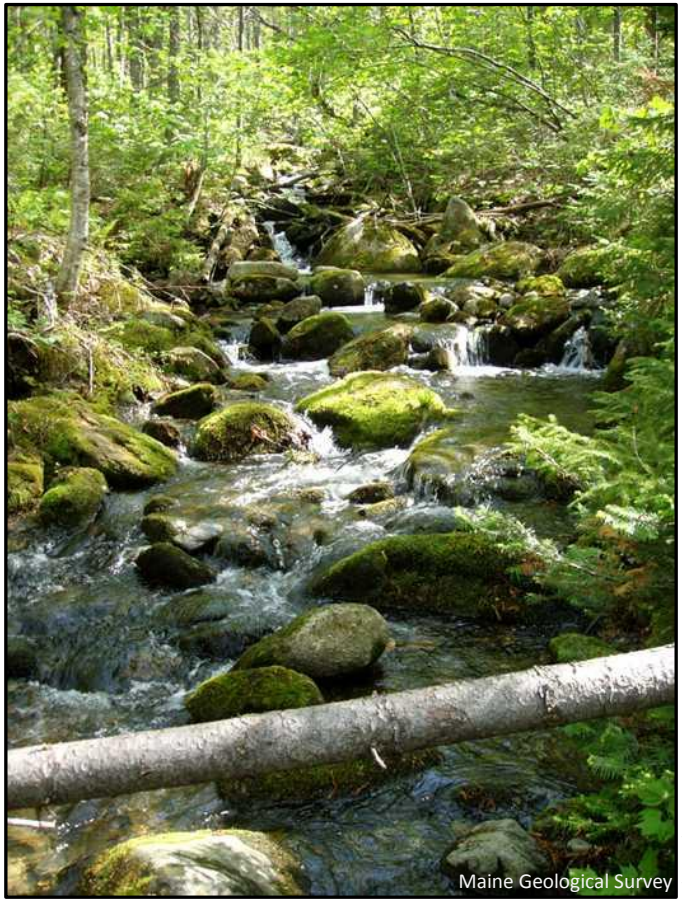


Figure 2. Bouldery till in a stream bed.

Mount Abraham Geology

The higher slopes of Mount Abraham are mantled with a thick layer of scree (Figure 3) composed of large angular boulders of metamorphic rocks. Frequent and severe freeze-thaw cycles at this high altitude exploit the abundant fractures in the rock to create the rubble.

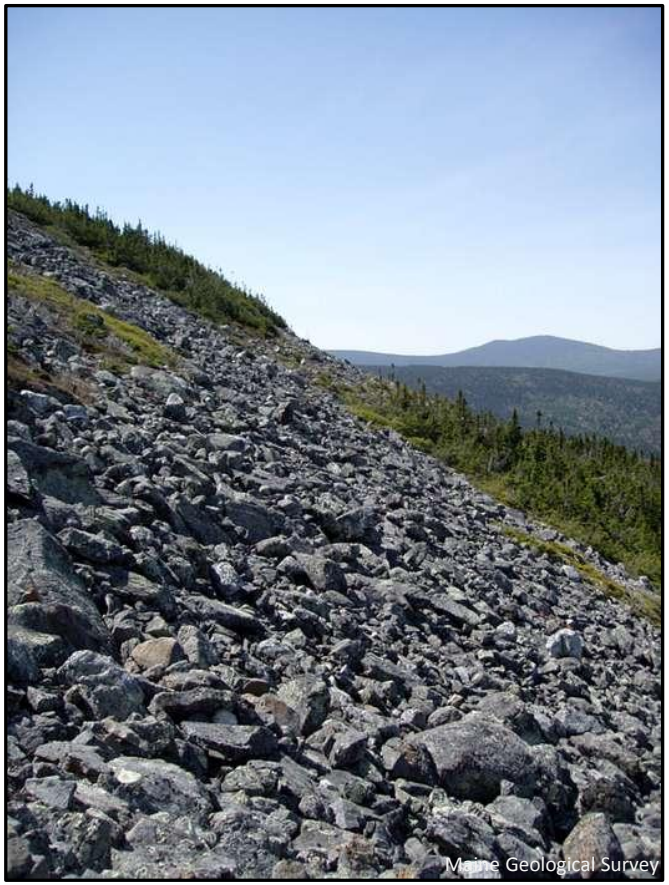


Figure 3. Scree on the higher slopes.

Mount Abraham Geology

Actual bedrock is not exposed until the very top of the mountain, but even here the freeze-thaw process is rapidly turning the peak to rubble. Most of the outcrop here is of well-bedded quartzite. Some of the beds are quite thick, like the one shown in Figure 4 which is about 50 cm thick.

Figure 4. Most of the outcrop at the top of the mountain is of well-bedded quartzite.

Mount Abraham Geology

Figure 5 is a section of several thinner beds of quartzite which show the very angular nature of the blocks that are broken out by freeze-thaw action.

Figure 5. Fractured thin beds of quartzite.

Mount Abraham Geology

The summit of the mountain is sparsely littered with glacial erratics. These are boulders the composition of which differs from the rock type that underlies the mountain. They were transported to the top of the mountain from other areas by glacial ice. Figure 6 is an example of a diorite boulder that came from the area to the northwest underlain by the Redington pluton.

Figure 6. An example of a diorite boulder erratic. The white minerals are plagioclase feldspar, the gray is quartz, and there are angular "books" of mica.

Mount Abraham Geology

Figure 7. A boulder of a white pebble conglomerate that likely came from the Rangeley Formation to the northwest.

Mount Abraham Summit

The remains of the old fire tower (Figure 8) are a magnet for those who want to get a completely unobstructed view of the spectacular landscape of western Maine (Figure 9).

Figure 8. Hikers on the remains of the fire tower.

Mount Abraham Summit

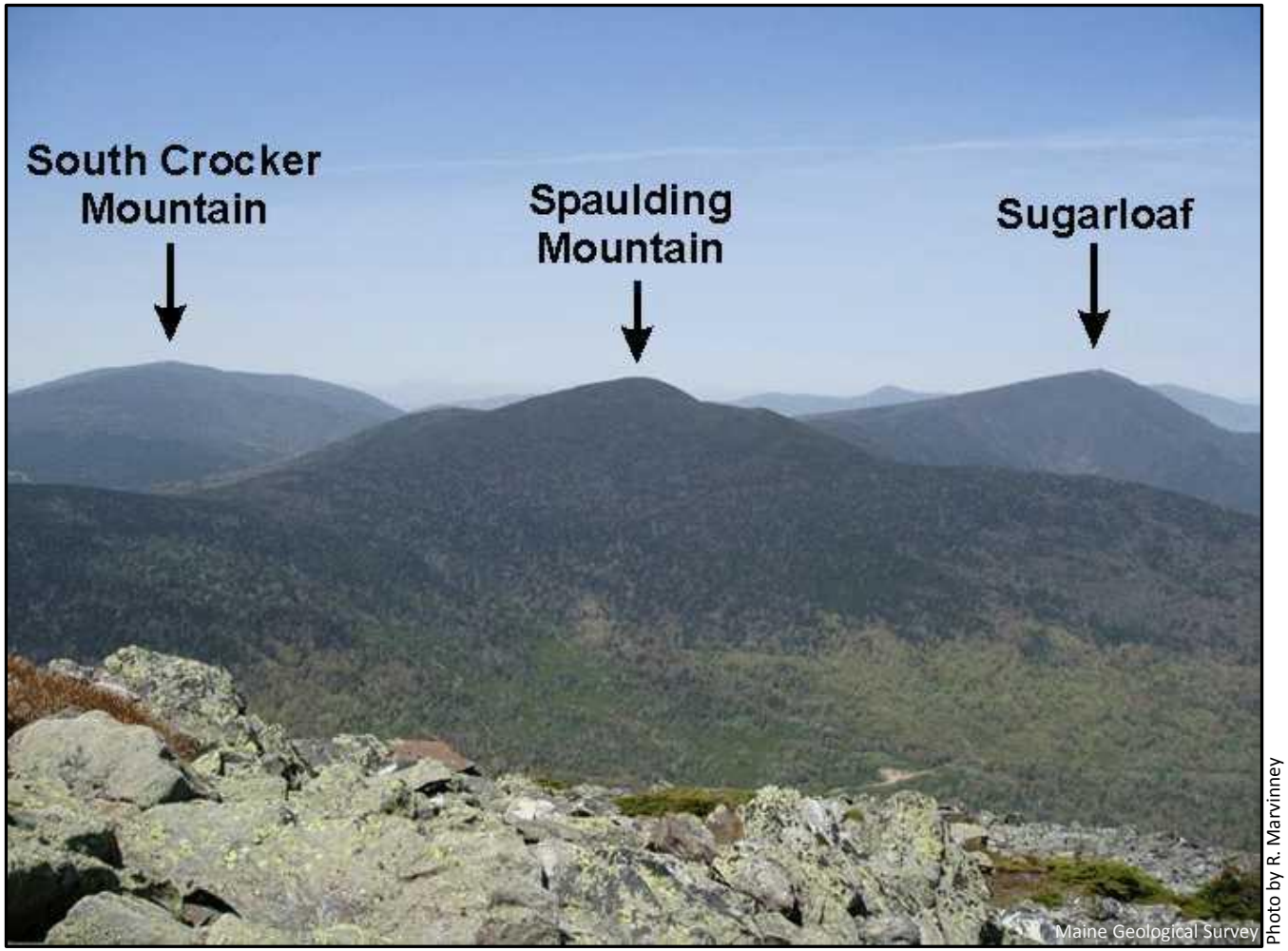


Figure 9. View to the north from the top of the old fire tower.

References and Additional Information

Moench, R. H., Boone, G. M., Bothner, W. A., Boudette, E. L., Hatch, N. L., Jr., Hussey, A. M., II, and Marvinney, R. G., 1995, Geologic map of the Sherbrooke-Lewiston area: U.S. Geological Survey, Miscellaneous Investigations Series, Map I-1898-D, scale 1:250,000.