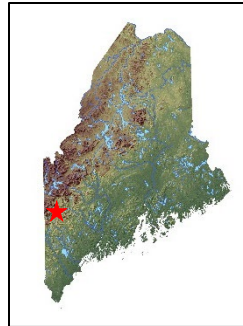


# Maine Geologic Facts and Localities

August 2023

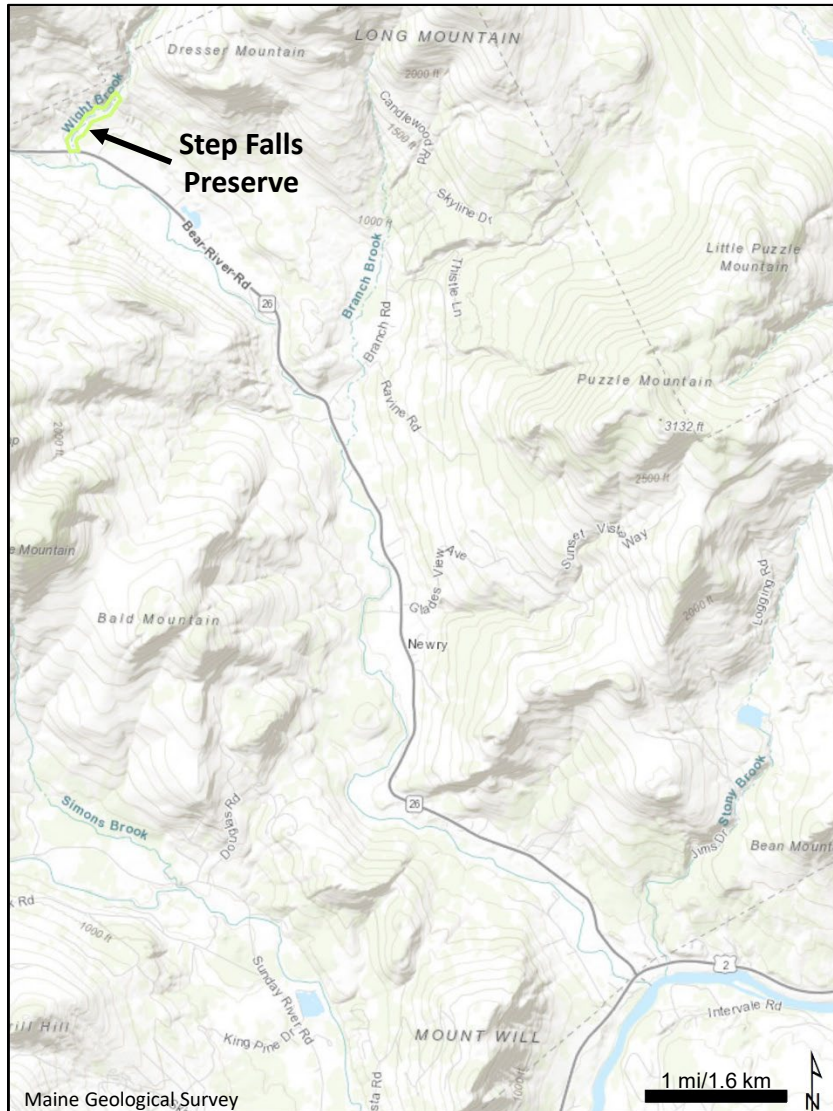
## ***Step Falls Preserve Newry, ME***



44° 34' 16" N, 70° 52' 12" W

Text by:  
Lindsay Theis

## Introduction

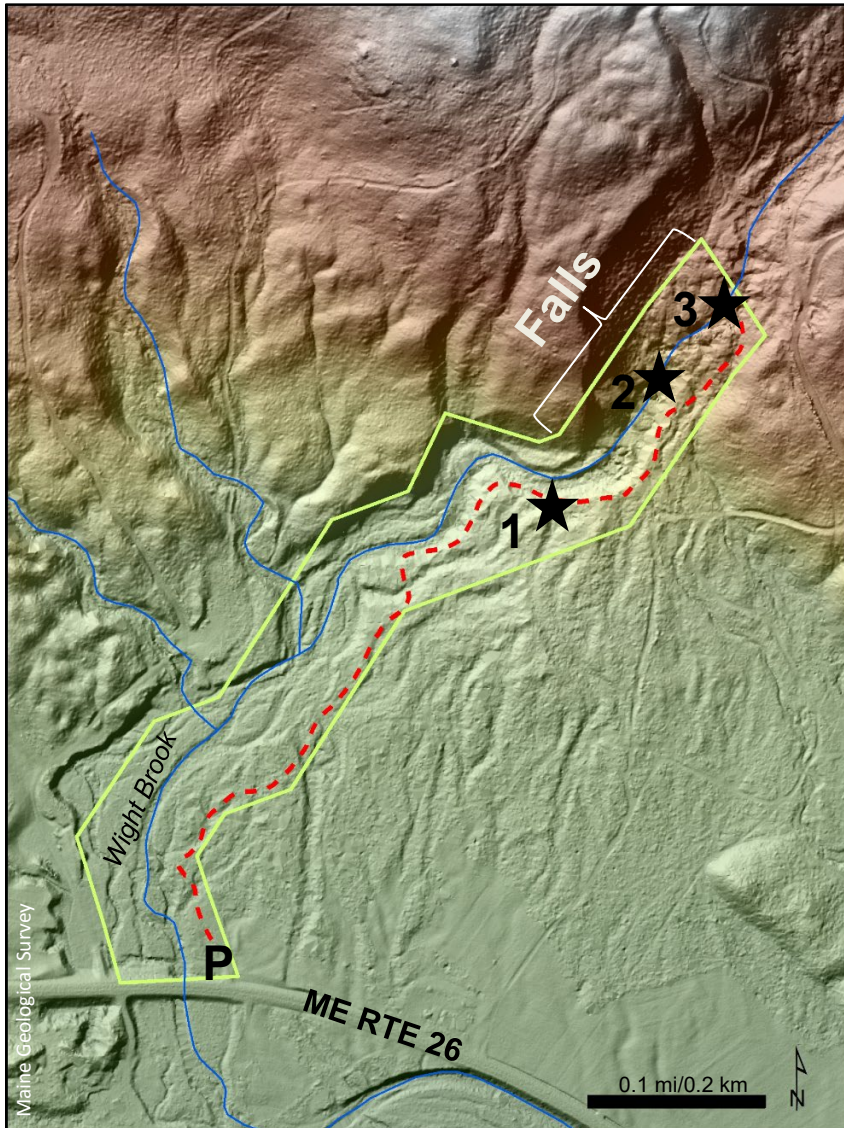


The Step Falls Preserve is a very popular destination for hiking and swimming, with a relatively easy 0.75-mile trail that offers views of scenic Step Falls and Sunday River Whitecap Mountain (Fig. 1). The preserve has been part of the Mahoosuc Land Trust since 2012 – directions and details may be found on their [website](#). ***Please note that in order to keep the falls open to the public, it is very important for visitors to follow all posted guidelines and stay within the preserve boundaries. Please use caution when walking in the falls area as the rocks may be slippery, even when dry.***

**Figure 1.** Location of the Step Falls Preserve in relation to U.S. Route 2.

### Introduction

Lidar topographic hillshade imagery for the Step Falls area shows the local landscape and geologic features in excellent detail. (See [Thompson \(2011\)](#) for more information about lidar and geology.) Suggested stops and geologic features are shown in Figure 2.

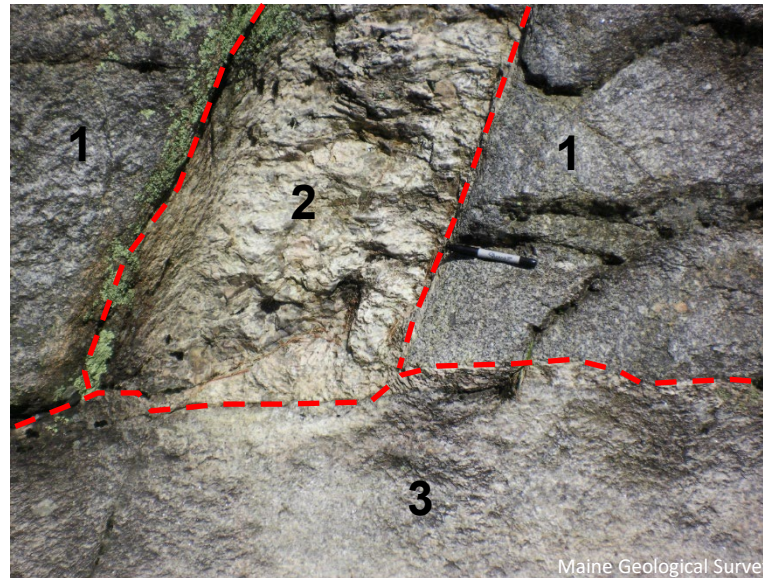


**Figure 2.** Lidar hillshade imagery with elevation color ramp (green = low, white = high) for the Step Falls Preserve. Green line = preserve boundary; red dashed line = trail; stars and numbers = trail stops; P = parking area.



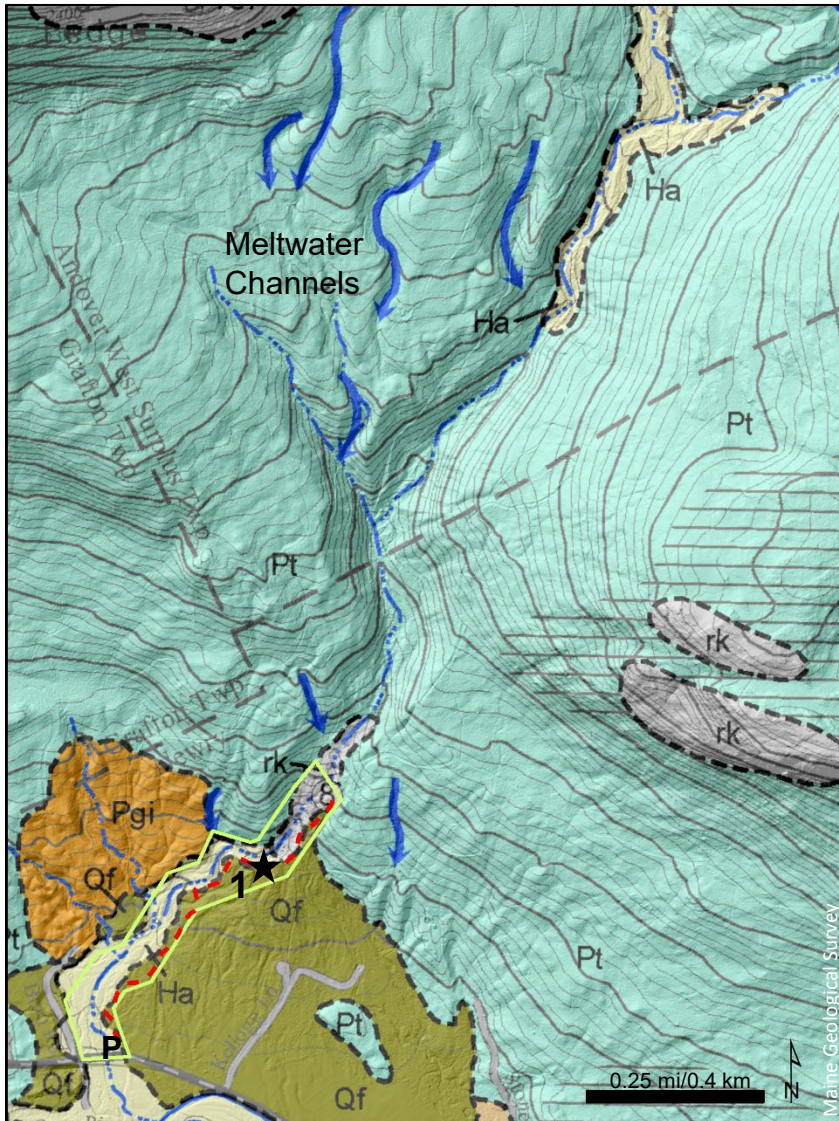
### Introduction

The bedrock exposures at Step Falls are comprised of igneous rocks - granite and pegmatite that formed during the Devonian Period. More specifically, samples taken from an area near Step Falls indicate that these rocks are about 385 million years old ([Koteas, 2022](#)). There are several types of granite at Step Falls but the three most common are: medium-grained biotite granodiorite with feldspar phenocrysts, pegmatitic granite (commonly known as pegmatite), and fine-grained muscovite granodiorite (Fig. 3). The biotite granodiorite formed first and was later intruded by pegmatite dikes. Pegmatite is a very coarse-grained igneous rock with large mineral crystals – the mineral feldspar is most common in Step Falls pegmatite which gives it a massive, white appearance. The fine-grained muscovite granodiorite was last to form, intruding and cutting both the biotite granodiorite and pegmatite.



**Figure 3.** Photo of three types of granite at a location near Step Falls. 1 = medium-grained biotite granodiorite; 2 = pegmatite; 3 = fine-grained muscovite granodiorite. Dashed lines indicate approximate rock type boundaries. Photo modified from [Koteas \(2022\)](#).

## Introduction



The bedrock at Step Falls was exposed and polished by powerful, sediment-laden glacial meltwater flow at the end of the last Ice Age (about 12,000 years ago). Several additional former meltwater paths can be seen on lidar imagery upstream of the preserve (Fig. 4).

After the glacier retreated up the Bear River Valley to Grafton Notch, Wight Brook was still eroding large amounts of sediment from the valley wall, which built up over time on the valley floor and created a sloping, fan-shaped deposit of sand and gravel known as an alluvial fan. Wight Brook had many paths across this area (most visible in Fig. 2) before settling into its modern channel on the west side of the alluvial fan.

**Figure 4.** Trail map with surficial geology from [Spigel \(2021\)](#). Alluvial fan deposits = Qf (green); modern stream deposits = Ha (light tan); bedrock exposures and falls area = rk.; Pt = glacial till; Pgi = miscellaneous sand and gravel deposited near the melting glacier; blue arrows = glacial meltwater channels.



**Stop 1: Alluvial Fan**

As hikers leave the parking lot, they immediately begin a gradual ascent up the alluvial fan deposit. The trail traverses several dips, which are small channels carved by former paths of Wight Brook (Fig. 5A). Depending on its flow, the brook may have occupied several channels at one time as it moved about and built the fan. Cobbles rounded by tumbling along in stream flow also hint that water once flowed across this area (Fig. 5B).



**Figure 5. A.** View of old channel in the alluvial fan deposit along the trail. **B.** Water-rounded cobbles.



**Stop 2: Falls Area**

Once hikers reach the bedrock portion of the falls, there are several areas where it is possible to walk out onto the rocks and get a closer look, especially when water levels are low (Fig. 6). ***Please use extreme caution walking in the falls area – even the dry rocks may be slippery!***



**Figure 6.** Photo of pegmatite (left) and granite (right) at Step Falls.



**Stop 2: Falls Area**

See if you can spot the different types of granite in the falls exposures. Conveniently, it is often easier to see bedrock texture and features when the rocks are wet. Figure 7 shows a close-up view of the medium-grained biotite granodiorite with feldspar phenocrysts. A phenocryst is a mineral crystal that is relatively larger than the other mineral crystals in a rock. The blocky white feldspar phenocrysts are easy to pick out here (one example circled in red).



Photo: C. Koteas

Maine Geological Survey

**Figure 7.** Close-up photo of medium-grained biotite granodiorite with feldspar phenocrysts.



**Stop 2: Falls Area**

Pegmatite is easy to spot due to its very large mineral crystals. Milky white feldspar, quartz, and muscovite mica are most common in Step Falls pegmatite, giving it a bright appearance (Fig. 8A). Platy mica is easier to spot when the rocks are wet (Fig. 8B).



**Figure 8.** Close-up photos of pegmatite at Step Falls. **A.** Large, blocky feldspar crystals are bright and easy to spot. **B.** Platy mica viewed on-end (example circled in red).



**Stop 2: Falls Area**

Biotite granodiorite is easiest to pick out when the rocks are dry. Figure 9 shows a nice example of this rock type with a small area (enclave) of even lighter colored (felsic) granite. Individual mineral crystals that comprise this rock are harder to see with the naked eye due to its finer-grained texture, giving it a salt and pepper appearance.



**Figure 9.** Close-up photo of biotite granodiorite with felsic enclave.



**Stop 2: Falls Area**

Some of the rocks exposed at Step Falls look quite chaotic, with contorted boundaries (contacts) between rock types, xenoliths (Fig. 10A), and deformed areas (Fig. 10B). Xenoliths are chunks of a different rock type within an igneous rock. In this case, when magma intruded the existing older metamorphic bedrock (schist), chunks of the schist fell into the magma chamber and were preserved as the magma cooled to form the younger igneous rock (granite).



Photo: C. Koteles



**Figure 10.** Unique bedrock features at Step Falls – see if you can find these locations as you explore the falls. **A.** Dark colored schist xenoliths in granite (circled in red). **B.** Deformed granite in pegmatite (circled in red); this spot is usually under water.



**Stop 3: Top of the Falls**

Chutes and several potholes (some which are quite deep) are visible at and from the top of the Step Falls Preserve. The bedrock was carved, sculpted, and polished by pressurized, sediment-laden glacial meltwater at the end of the last Ice Age.



**Figure 11.** A chute and potholes near the top of Step Falls Preserve.



**Stop 3: Top of the Falls**

A short walk out into the falls area near the top of the preserve offers excellent views of the water-worn bedrock and of Sunday River Whitecap Mountain.



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**Figure 12.** View from near the top of the Step Falls Preserve. Sunday River Whitecap is the peak in the distance, named for the light-colored pegmatite exposures at its summit.

## **References**

- Koteas, C., 2022, Bedrock geology of the Puzzle Mountain quadrangle, Maine: Maine Geological Survey, Open-File Map 22-18, scale 1:24,000.  
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