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NEW ENGLAND INTERCOLLEGIATE
GEOLOGICAL CONFERENCE
108th Annual Meeting

Guidebook for Field Trips along the Maine Coast
from Maquoit Bay to Muscongus Bay

Edited by

Henry N. Berry IV and
David P. West, Jr.

Hosted by

The Maine Geological Survey and
The Middlebury College Geology Department

October 14-16, 2016

Copies of this guidebook, as long as they last, may be purchased for \$25 from the following address:

Geology Department
Middlebury College
276 Bicentennial Way
Middlebury, VT 05753

Cover Credit

The cover photograph is by Arthur M. Hussey II, to whom this guidebook is dedicated. Arthur Hussey was an accomplished photographer and his numerous photo collections highlighted many aspects of the natural beauty of southwestern Maine. The photo was taken by Arthur at a location about a kilometer south of Lookout Point along the western shore of Harpswell Neck. Arthur first began mapping in this area in 1962, and his 1965 NEIGC field trip visited exposures nearby. The view in the photo is towards the south and the exposures are east-dipping metamorphosed Ordovician volcanic rocks of the Cushing Formation. Arthur's hammer for scale.

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THE HISTORIC CRIBSTONE BRIDGE, BAILEY ISLAND

by

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INTRODUCTION

The bridge that connects Orrs Island to Bailey Island on the east side of Casco Bay is a unique and elegant engineering solution to the harsh conditions of the outer Maine coast. The narrow channel between the islands, called Will's Gut, is known for particularly strong currents during large tides and storms. For this reason, the bridge has to readily allow free water passage, as well as withstand the exposed coastal setting under the most extreme conditions of ice, salt, and surf. Completed in 1928, the bridge is made from 12-foot-long granite slabs laid in an open crib configuration on top of exposed bedrock. The granite was brought by wagon and barge from quarries in Pownal. The minimum of 30 percent void space through the lattice allows the tide free movement through the Gut, while the central span is high enough to accommodate passing fishing vessels. During this stop, we will see the beautiful structure just after high tide, peak through the flooded latticework, see how the granite compares to the metasedimentary and metavolcanic local bedrock, and imagine other potential applications for this singular design.

GEOLOGIC SETTING

Bailey Island is one of the most southerly pieces of land in Harpswell, the continuation of several long, thin peninsulas and islands stretching over 10 miles south from the mainland into the middle of Casco Bay (Figure 1). The passage between Orrs Island, to the north, and Bailey Island, to the south, is less than 1000 feet at high tide, and is mainly shallow water over submerged ledge, with a very narrow passable channel between the rocks. Daily tides as well as seasonal storms create currents that flow strongly through the channel, which is known as Will's Gut.

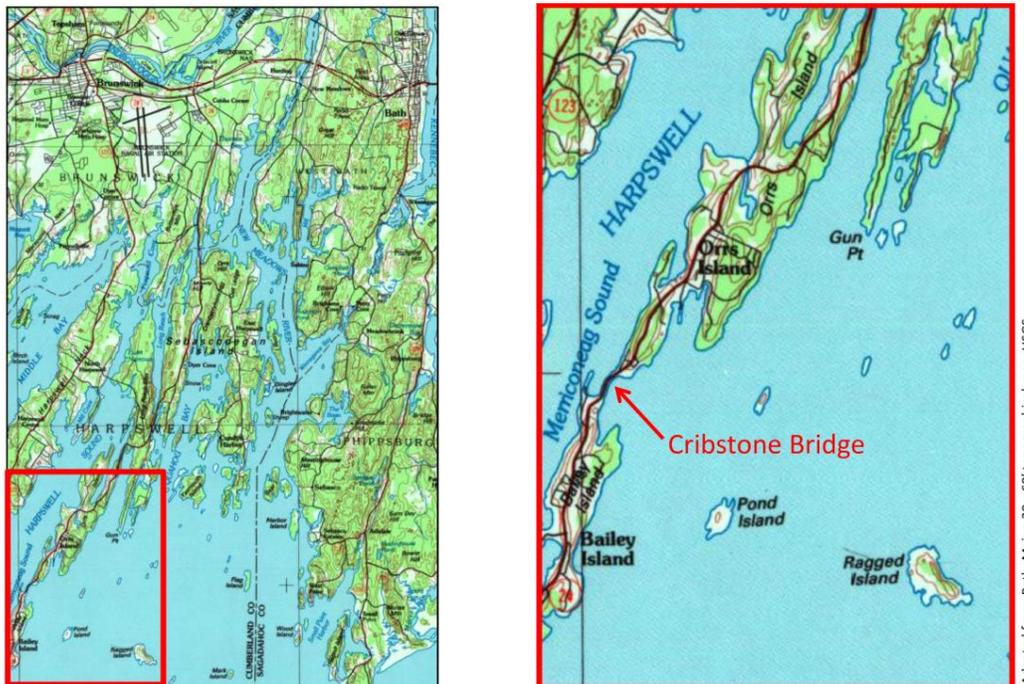


Figure 1. The location of Bailey and Orrs Island, and the Cribstone Bridge between them.

The morphology of the long, thin peninsulas and islands of Harpswell are controlled by the underlying structural geology, which is a series of folded metamorphic rock units. The anticlines and synclines trend north-northeast, parallel to the long necks of land and intervening sounds. Bailey and Orrs Islands are on the eastern limb of a syncline that lies beneath Harpswell Sound (Hussey, 1971). The bedrock that is exposed directly beneath the bridge and its abutments is the lower member of the Spring Point Formation, a sequence of thin beds of metamorphosed volcanics, mainly metapyroclastics (Figure 2). The Spring Point Formation lies conformably on top of the Cape Elizabeth Formation, which is exposed in the rocks and outcrops to the east of the bridge. The Cape Elizabeth is a thin-bedded sequence of quartzose and micaceous schist of pelitic origin (Hussey, 1971). The bridge itself is built along the ridge formed by outcroppings of the Spring Point Formation (Figure 2).

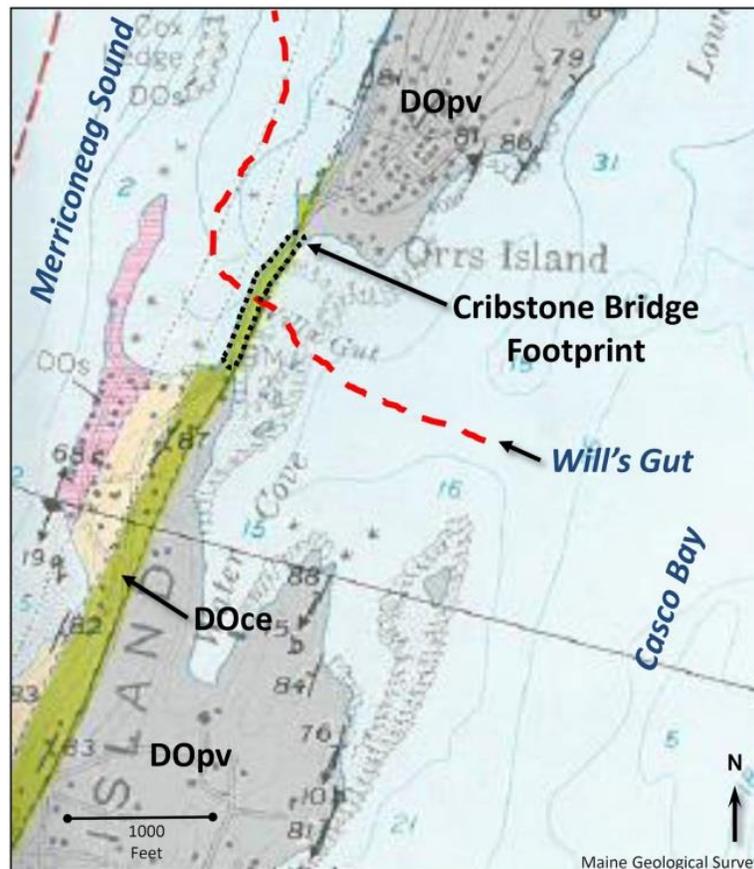


Figure 2. Bedrock geology from Hussey (1971).

HISTORY AND CONSTRUCTION

The bridge was designed in 1926 by engineers Llewellyn N. Edwards and Clarence L. Partridge for the Maine State Highway Commission (now Department of Transportation). The design was conceived by Edwards, a noted bridge designer, and was perhaps inspired by one or more bridges that he had observed in Scotland, although the Bailey Island Bridge is the only known example of its kind in the world. Construction occurred between June 1926 and September 1928.

The bridge has withstood uncounted storms and ocean surges in its 88-year history, and has only closed once during the storm of January 9, 1978, when winds blew at over 75 miles per hour and the tide was pushed to 13 feet above mean sea level (Locke, 2015). The bridge was listed as historic by the National Park Service in 1975, and in

1984 was determined to be an American Society of Civil Engineers Civil Engineering Landmark, one of only 74 bridges worldwide.

The bridge structure is built in an open latticework of split granite stone. The grey, fine-grained granite was taken from quarries in Pownal and North Yarmouth, moved by wagon down Granite Street in Yarmouth to the bank of the Cousins River, then loaded onto barges for the trip to Harpswell (Locke, 2015). Once on site, it was arranged directly on the exposed bedrock by steam-powered cranes that moved adjacent to the bridge on temporary rail track. Finally, reinforcing steel was laid on top and the surface was finished with concrete. In 2009-2010, the Maine Department of Transportation undertook a major repair to the bridge to replace and reset granite slabs that had broken or shifted in place. The repairs were done with attention to the original design and appearance of the bridge, and they went as far as sourcing granite from the original quarries in Pownal. The bridge today appears much as it did in historic photographs after completion (Figures 3 and 4). Further details of the bridge construction, source quarries, and historical plans and photographs can be found in Locke (2015).



Figure 3. Historical photograph of the bridge, looking south. Date unknown.



Figure 4. A closeup view of the bridge in 2016.

ROAD LOG

Mileage

- miles (degrees lat/long WGS84)
- 00.0 (43.905990, -69.916350) **Meeting location:** Cooks Corner Shopping Center, Brunswick, on the southwest corner of Route 24.
- 00.1 Facing east, turn right (south) out of the parking lot onto Route 24. Continue south towards Harpswell.
- 12.7 (43.750560, -69.987000) **Stop 1:** Turn right into the parking lot of the Salt Cod Cafe, 1894 Harpswell Islands Road, Orrs Island, Harpswell.
- 12.7 Turn left (north) out of the parking lot onto Route 24 and continue north.
- 16.1 (43.786660, -69.949200) **Optional lunch stop:** Turn right into Devils Back Trail parking area. If not stopping here, continue north on Route 24.
- 20.6 Turn left (west) onto Long Reach Road.
- 21.1 (43.840670, -69.919640) **Part 2 Stop 1:** The causeway over Doughty Cove, Long Reach Road, Harpswell.
(Continue with the Road Log for Part 2 on page A6-11)

MEETING LOCATION. Participants of this field trip (Cribstone Bridge, A6 Part 1), as well as the following trip (Ecogeomorphology of Marshes, A6 Part 2), will meet at 10:00 a.m. at the Cooks Corner Shopping Center, Brunswick, on the southwest corner of Route 24. We will meet beneath the trees in the TJ Maxx parking lot, near the Subway and Starbucks building, to park and consolidate vehicles. Participants are encouraged to attend both parts of today's field trip, and there will *not* be a general return to Brunswick at the end of Part 1. Because parking at the stops is limited, especially during Part 2, it will be important to car pool and limit the number of vehicles going on the journey.

STOP 1: BAILEY ISLAND CRIBSTONE BRIDGE, HARPSWELL. The first and only stop of Part 1 of today's field trip will be at the north end of the bridge between Orrs Island (to the north) and Bailey Island, (to the south), in Harpswell, Maine. Arrangements have been made specifically for this trip to park in the gravel lot of the Salt Cod Cafe, on the west side of Route 24, the Harpswell Islands Road (43.750560, -69.987000). We will meet on the boat ramp by the water

LUNCH AND PART 2. After seeing the bridge, we will break for lunch (at approximately 11:30 a.m.). There are many nearby places for a lovely picnic, depending on the weather, including the southern tip of Baily Island or the more sheltered Devils Back Trail area on Orrs Island, 10 minutes to the north. (The latter features steep, wooded hiking trails that lead down to the water's edge.)

The first stop of trip Part 2 will be at Long Marsh where it is crossed by Long Reach Road in Harpswell (43.840670, -69.919640). Meet there by 12:30 p.m. in order to begin Part 2. Please see the next field guide for the remainder of this day's stop descriptions and road log (the Part 2 road log begins on page A6-11).

REFERENCES

- Locke, D.B., 2015, The Cribstone Bridge, Harpswell, Maine, and its granite source quarries: Maine Geological Survey web site, December, 2015, <https://www1.maine.gov/dacf/mgs/explore/bedrock/sites/dec15.pdf>.
- Hussey, A.M. II, 1971, Geologic map and cross sections of the Orrs Island 7.5' quadrangle and adjacent area, Maine: Maine Geological Survey, Geologic Map Series GM-2, 18 p., 1 map.