

## Pre-Mesozoic stratigraphy of Grand Manan Island and possible correlation with the Ellsworth terrane in coastal Maine

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The western part of Grand Manan Island is underlain by Mesozoic basaltic flows and sills of the Fundy Group. The Mesozoic rocks are in fault contact to the east with complexly deformed volcanic and sedimentary rocks previously assigned ages ranging from Precambrian to Silurian. Numerous faults transect the pre-Mesozoic sequences and together with polyphase folding and a lack of fossils hamper efforts to establish a reliable stratigraphy. However, lithological similarities have been recognized between some of the fault-bounded blocks during recent mapping. As a result of this work, a preliminary stratigraphic nomenclature for the pre-Mesozoic sequences has been introduced and is summarized below. Radiometric dating of volcanic rocks within the Ingalls Head Formation is in progress to test its proposed Cambrian age. If this age interpretation is confirmed, it will provide convincing evidence that Grand Manan Island is part of the Ellsworth terrane of coastal Maine rather than part of Avalon.

A thick sequence of pre-Mesozoic sedimentary rocks, termed the Grand Manan Group, has been divided into three formations: The Thoroughfare Formation — thick-bedded, white quartzite and dark grey to black carbonaceous shale; Flagg Cove Formation — medium-bedded, greyish pink quartzite and green to grey shale; Great Duck Island Formation — thick-bedded, light grey quartz-pebble conglomerate passing up into medium-bedded, maroon and green silty shale and sandstone. These redbeds suggest some shallowing of the depositional basin just prior to the onset of volcanic activity.

The sequence of sedimentary rocks of the Grand Manan Group is overlain by a sequence of volcanic rocks provisionally assigned to the Ellsworth Group. An apparently conformable stratigraphic contact between the two groups is

exposed on Long Island and at Flagg Cove but the boundary is a thrust on The Thoroughfare Formation. Where unfaulted, maroon silty shale of the Great Duck Island Formation is overlain by tuffaceous rocks of the Ingalls Head Formation. The Ingalls Head Formation is characterized by greyish green crystal tuff and purplish breccia interstratified with thin beds and lenses of maroon iron formation. A Cambrian age is suggested for Ingalls Head Formation on the basis of its similarity to the Ellsworth Formation in coastal Maine. Locally pillowed, hyaloclastic, mafic volcanic flows of the Ross Island and North Head formations, exposed in separate fault blocks, are interpreted as contemporary volcanic facies of the volcanoclastic rocks at Ingalls Head, and are, therefore, also included in the Ellsworth Group.

Generally less deformed rocks of the Long Pond Bay and Priest Cove formations are tentatively correlated with the Mascarene Group. The contact between these two north-facing formations is not exposed. The Long Pond Bay Formation is defined to include a sequence of oxidized, coarsely amygdaloidal mafic volcanic flows and interbedded arkosic grit on Wood Island, and a succession of hyaloclastic mafic flows, laminated siltstone and turbiditic sandstone exposed on the southeast coast of Grand Manan Island, itself. The Priest Cove Formation comprises a thick section of greyish green, bedded mafic tuff and volcanoclastic sandstone and minor felsic crystal tuff, underlying much of the northeastern part of Grand Manan Island. Sparse fossil debris in the volcanoclastic rocks of the Priest Cove Formation has previously been used to suggest an age no older than Ordovician. The Long Pond Bay and Priest Cove formations are interpreted to have been deposited in a deepening basin during Silurian time.