

# Preliminary Bedrock Geology Map of the Antigonish Highlands, Northern Mainland Nova Scotia

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Detailed (1:10 000-scale) bedrock mapping in the Antigonish Highlands began in the summer of 2010 to better understand the geology, economic potential, and significance of the area in the evolution of the Avalon terrane in the northern Appalachian orogen. Although unit names from previous work have been retained where possible, the units have been redefined and their distribution substantially modified. The oldest rocks are those of the Late Neoproterozoic Keppoch formation, which forms much of the southern highlands. It consists of rhyolitic to dacitic flows and tuffs with minor andesitic tuff and cherty siltstone. These rocks grade upward into the James River formation which is located on the northern and southern flanks of the southern part of the highlands and consists of laminated cherty siltstone to sandstone with minor rhyolitic to basaltic tuff. Associated with the James River formation is the Chisholm Brook formation which consists dominantly of basaltic flows and tuff with rare rhyolitic tuff and flows, and laminated cherty siltstone. The Morar Brook and Livingston Cove formations are similar to the James River formation, and may be lateral facies equivalents, but differ in containing significant beds of conglomerate and limestone. The Keppoch, James River, Morar Brook, and Livingston Cove formations are intruded by a suite of ca. 605 Ma calc-alkaline, diorite to syenogranite plutons and by the Ordovician West Barneys River plutonic suite which consists of medium- to coarse-grained syenite to alkali-feldspar granite and gabbro. The plutons and their host rocks are intruded by abundant mafic and felsic dykes and sills. The structural evidence combined with the overall distribution of the older stratigraphic units suggests that the southern Antigonish Highlands form a broad east-west domal feature of which the Ordovician plutonic suite forms the core.

The redefined Arbuckle formation consists of basaltic to dacitic lithic tuffs and flows that on earlier maps were considered Cambrian but are now interpreted to be of Late Neoproterozoic age. The Bears Brook formation, previously included in the basal part of the Ordovician to Devonian Arisaig Group, is also reinterpreted to be Late Neoproterozoic. It consists dominantly of red arkosic sandstone to conglomerate with minor basaltic to rhyolitic tuff and flows, and rare laminated cherty siltstone. As now defined it includes arkosic rocks formerly assigned to the Malignant Cove formation and considered to form the basal part of the Cambrian succession. Minimum detrital zircon ages of ca. 593 and 583 Ma were reported previously from arkosic sandstone samples now included in the redefined Bears Brook formation. These formations are not intruded by the ca. 605 Ma plutonic suite and locally contain clasts derived from the pre-605 Ma formations; hence, they are considered to be Ediacaran in age.

Younger units in the Antigonish Highlands include the Cambrian Iron Brook Group, a fault-bounded package of quartz arenite, sandstone, slate, limestone, and rare ironstone located in the northern highlands. It is intruded by gabbroic dykes and syenitic bodies presumably related to the West Barneys River plutonic suite. The overlying bimodal volcanic rocks of the Ordovician Dunn Point and McGillivray Brook formations, along the Arisaig shore, as well as the older units are unconformably overlain by shallow water fossiliferous siliciclastic rocks of the Silurian to Early Devonian Arisaig Group. Units in the Arisaig Group are devoid of any mafic or felsic sills/dykes. Several Devonian to Carboniferous sedimentary and volcanic units unconformably overlie all older units.

The geology in the Antigonish Highlands contains a more complete stratigraphic record than other parts of Avalonia and, hence, provides a unique opportunity to study Avalonian geological history from latest Neoproterozoic to latest Carboniferous.

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