

The New River terrane revisited: insights into the relationship with the St. Croix and Ellsworth terranes in New Brunswick and Maine

Susan C. Johnson

Department of Natural Resources and Energy, Geological Surveys Branch, P.O. Box 5040, Sussex, NB E4E 5L2

The New River terrane, which contains the westernmost exposures of Neoproterozoic rocks in southern New Brunswick, is separated from the St. Croix terrane of the Gander Zone to the northwest by Siluro-Devonian rocks of the Mascarene cover sequence. In the New River terrane, uppermost Lower Cambrian rocks of the Matthews Lake Formation unconformably overlie the Neoproterozoic granitoid rocks. Traditionally, Cambrian rocks in southern New Brunswick are assigned to the Saint John Group of the classic Avalonian cover sequence. Recently dated ash beds from the Saint John Group has allowed for a more precise temporal correlation between these rocks and the Matthews Lake Formation. However, a lithological correlation between the Matthews Lake Formation and coeval rocks in the Saint John Group could not be established. Considering the remarkable uniformity of the Avalonian cover sequence that allows recognition of identical units from Rhode Island to Britain, these important lithological differences strongly suggest that the Matthews Lake Formation is not part of the Saint John Group.

In contrast, strata of the Matthews Lake Formation display many lithological similarities to rocks in the St. Croix terrane along strike in Maine. The Matthews Lake Formation

and the Megunticook Formation in the St. Croix terrane contain similar lithological successions comprising quartzite, quartzite-pebble conglomerate, calc-silicate rocks, quartzofeldspathic wacke, grey shale and coticule-bearing sandstone. The Megunticook Formation has a minimum age of ca. 503 Ma, comparable to the Matthews Lake Formation. The latter also contains rhyolitic to basaltic volcanic rocks that are not present in the Megunticook Formation, but ca. 509 ± 1 Ma rhyolite tuff in the adjacent Ellsworth terrane in Maine is more or less contemporaneous with ca. 514 ± 2 Ma rhyolite in the Matthews Lake Formation. In Maine, the Ellsworth and St. Croix terranes are presently in separate fault blocks, however the correlation with Matthews Lake strata suggests that they were originally in depositional contact.

It has been suggested that the Avalon Zone of southern New Brunswick may be comprised of more than one peri-Gondwanan terrane, a classic Avalonian terrane with Saint John Group cover and a separate peri-Gondwanan terrane with Gander Zone cover. The correlation of the Matthews Lake Formation with rocks of the St. Croix terrane not only implies that the New River, St. Croix and Ellsworth terranes are a single terrane but provides a candidate for Neoproterozoic basement rocks to the Gander Zone.