



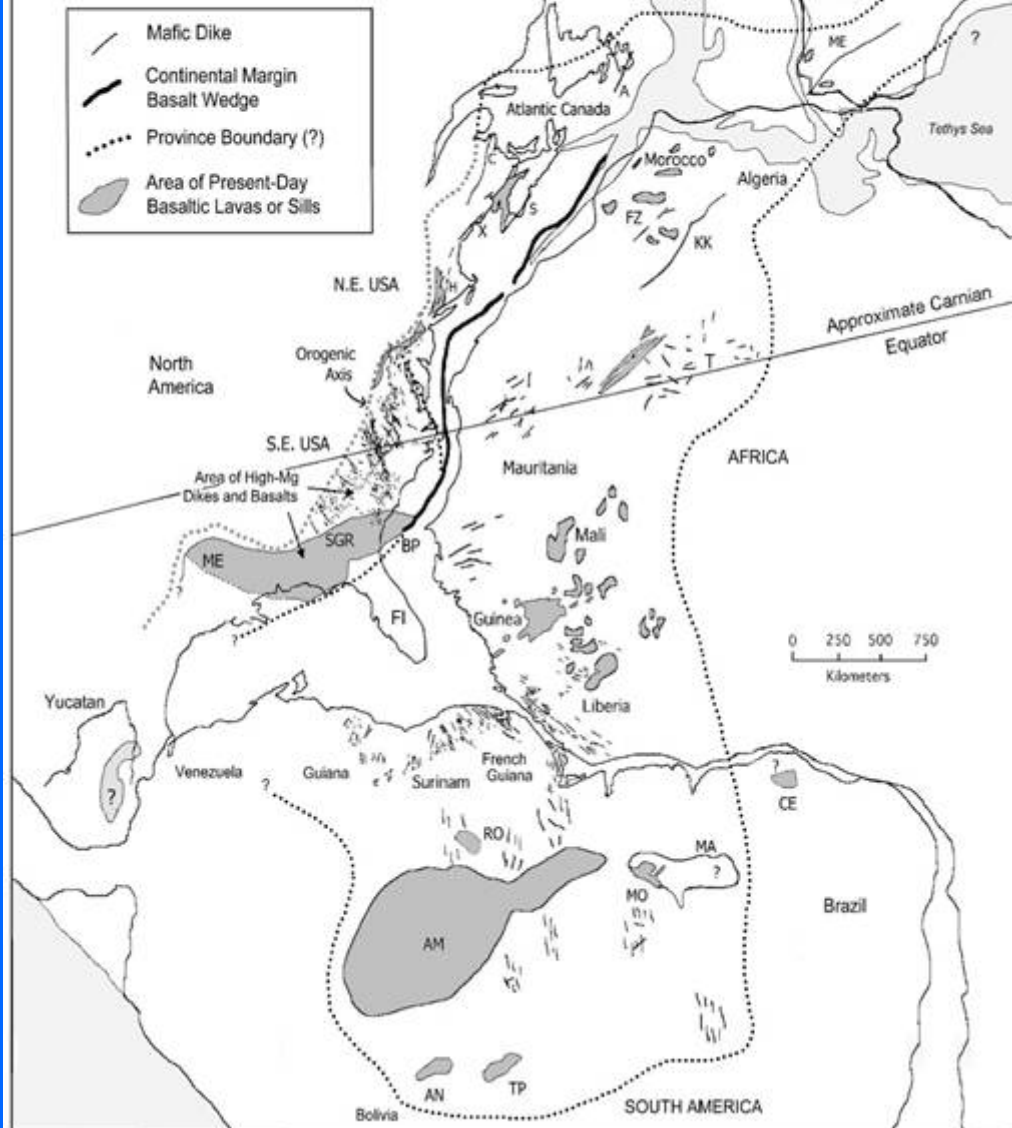
***FISSURE DIKE SOURCE(S) FOR THE
NORTH MOUNTAIN BASALT GROUP,
FUNDY BASIN***

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PROJECT GOALS

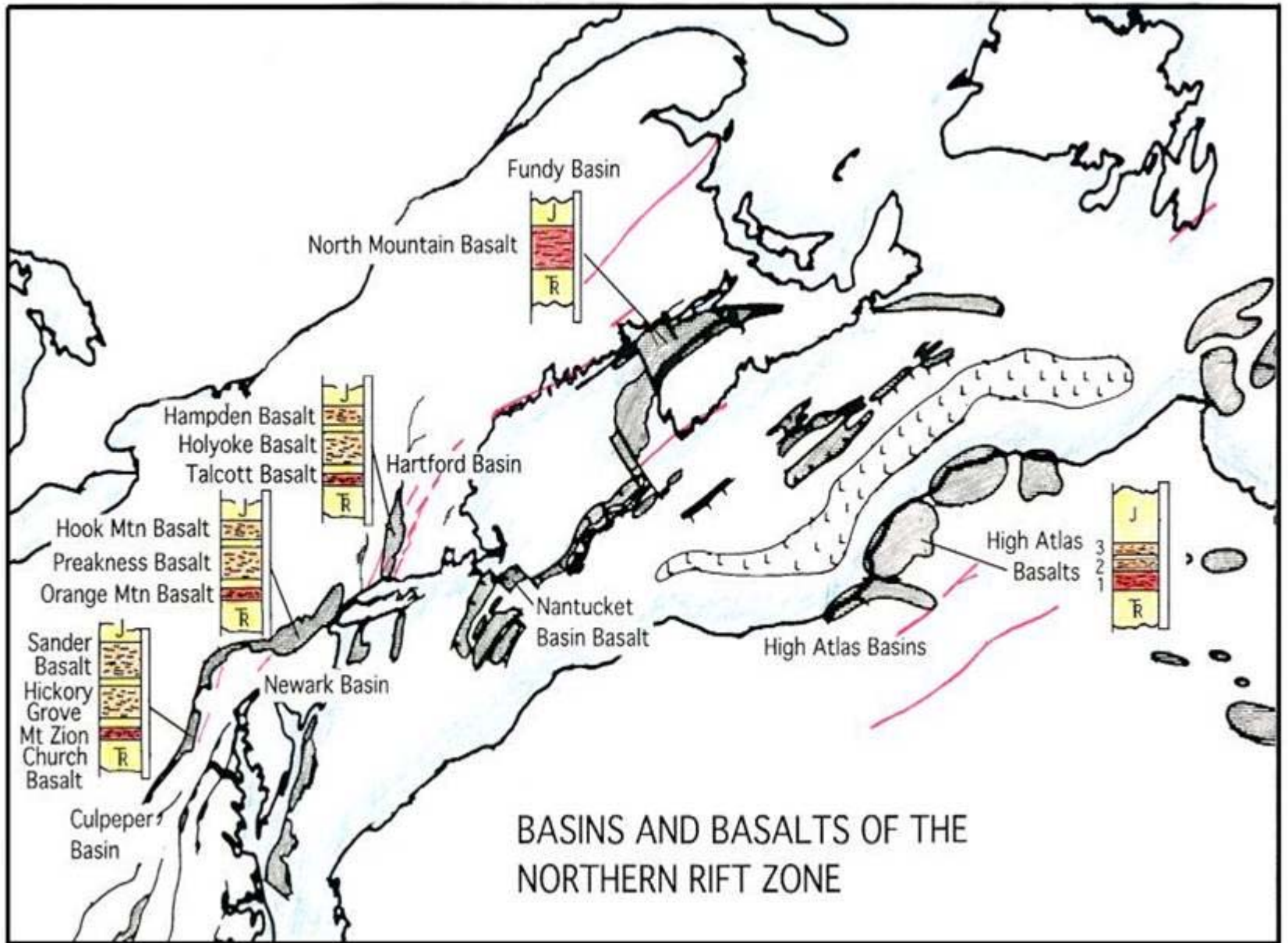
- ➔ Map Mesozoic geology on Grand Manan Island
- ➔ Compile regional map of Tr-J basins, faults, lavas, and dikes
- ➔ Correlate dolerite dikes and basaltic lavas in Atlantic Canada and New England
- ➔ Consider possible dikes as fissure eruption sources for basin lavas.
- ➔ Evaluate models for broad inter-basin regional volcanism vs. local intra-basin events.

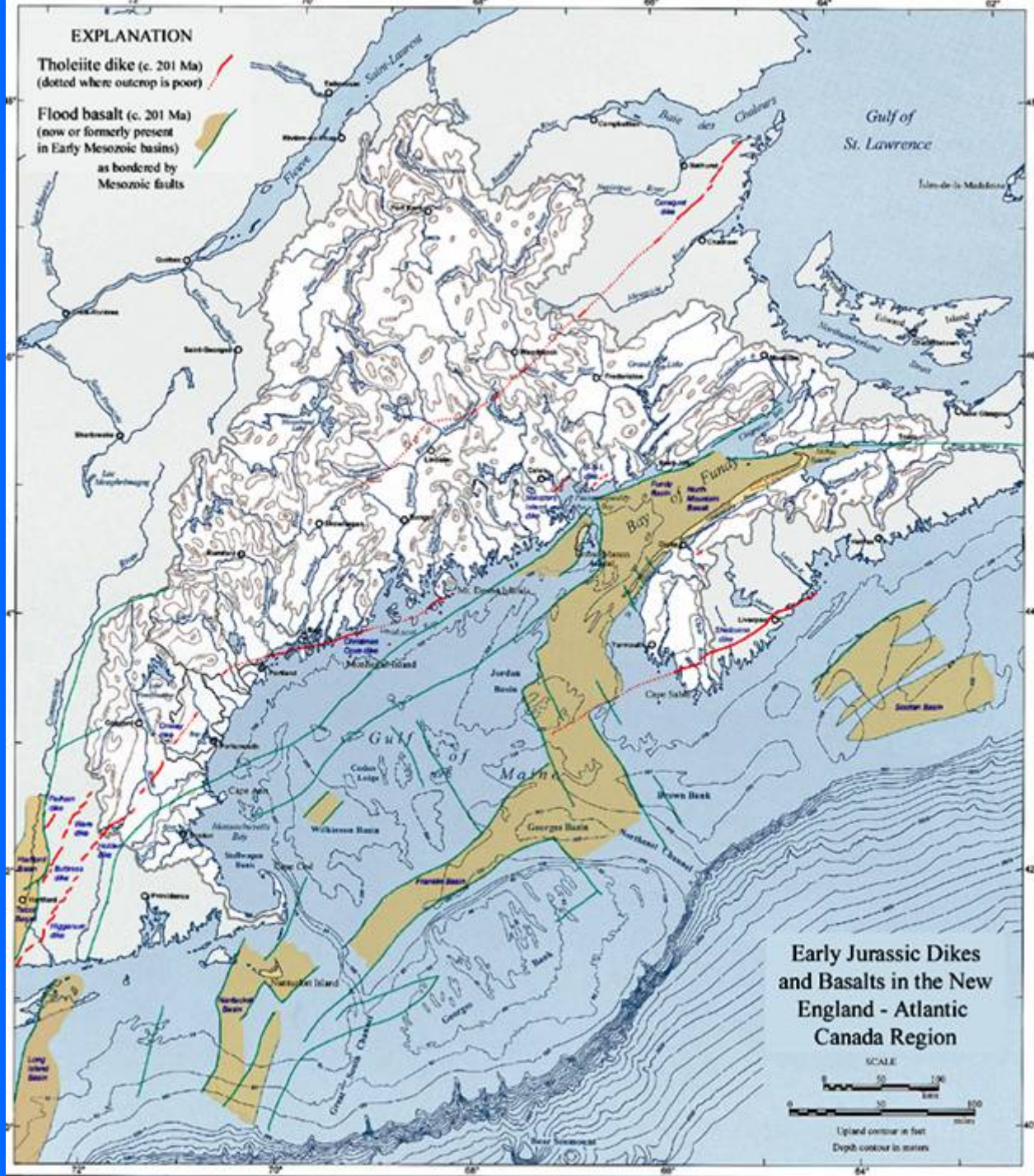
Early Jurassic Basalts of the Central Atlantic Magmatic Province



The enormous central Atlantic magmatic province (CAMP) extended over 11,000,000 square km in central Pangaea, not long before it rifted into two supercontinents.

The basalts of Grand Manan and the Bay of Fundy are part of the CAMP. The accepted U/Pb age of the North Mountain Basalt is close to 202 Ma (200 Ma by the Ar/Ar method).



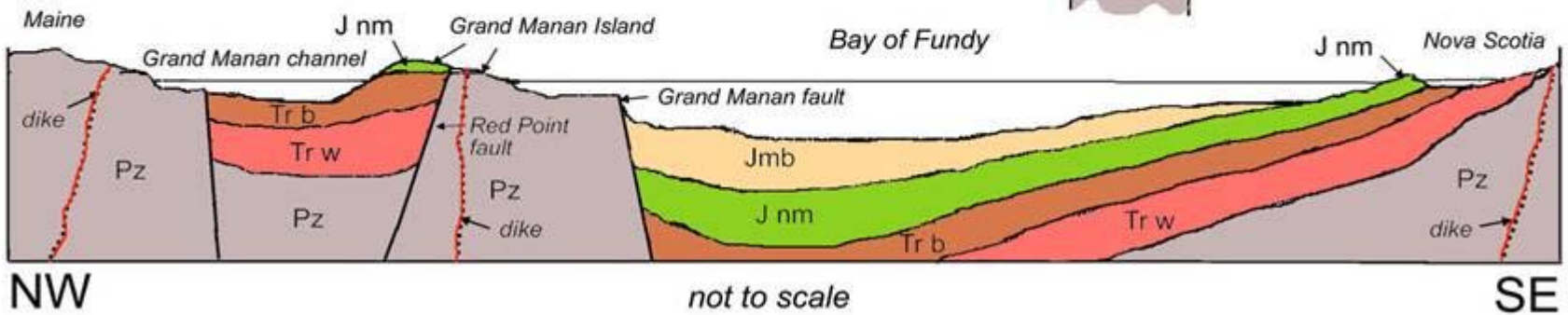
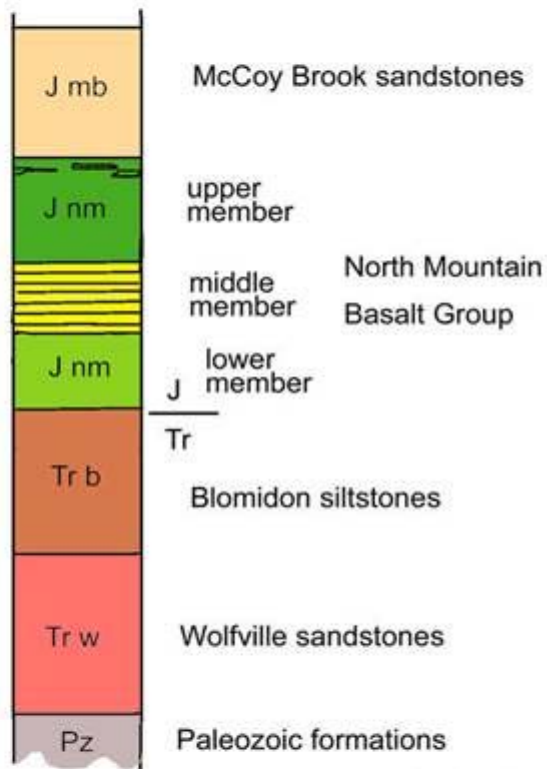
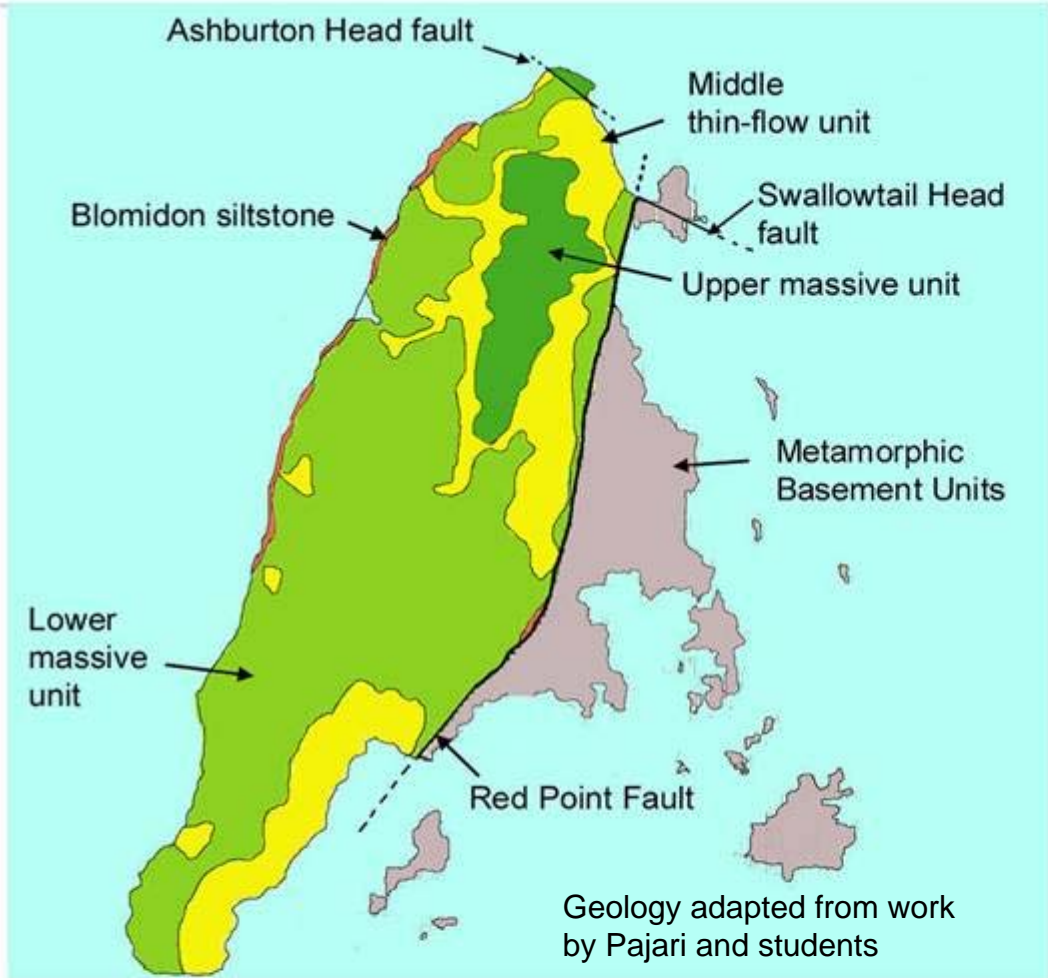


Early Mesozoic basins in this area of North America are now, or once were, filled by CAMP lava flows related to the North Mountain basalt.

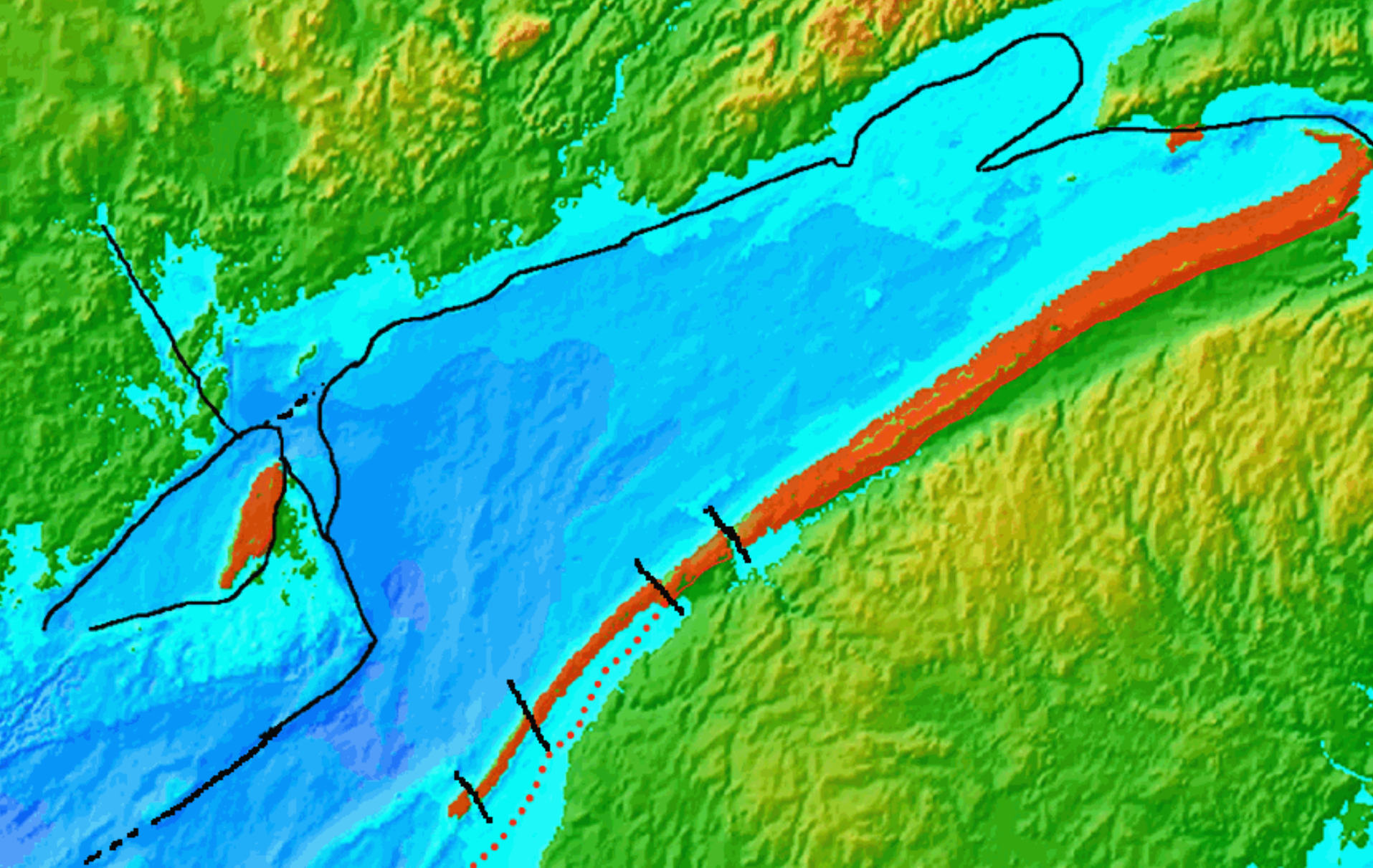
These lavas are tholeiitic flood basalts, fed by fissure volcanoes that are marked by large dikes today (red lines on this map).

Cross-section and stratigraphy of the southwestern Fundy Basin

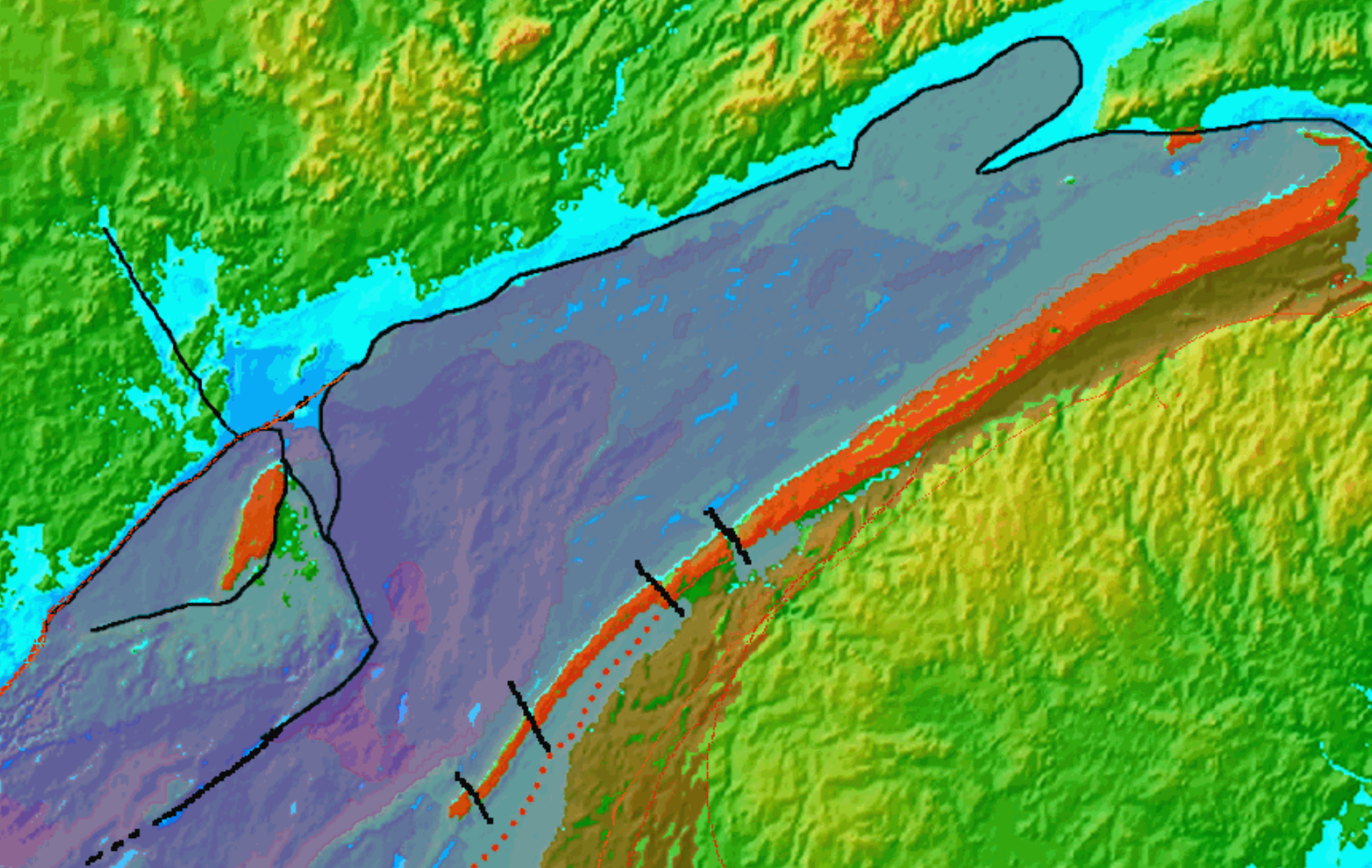
J. G. McHone, September 2001



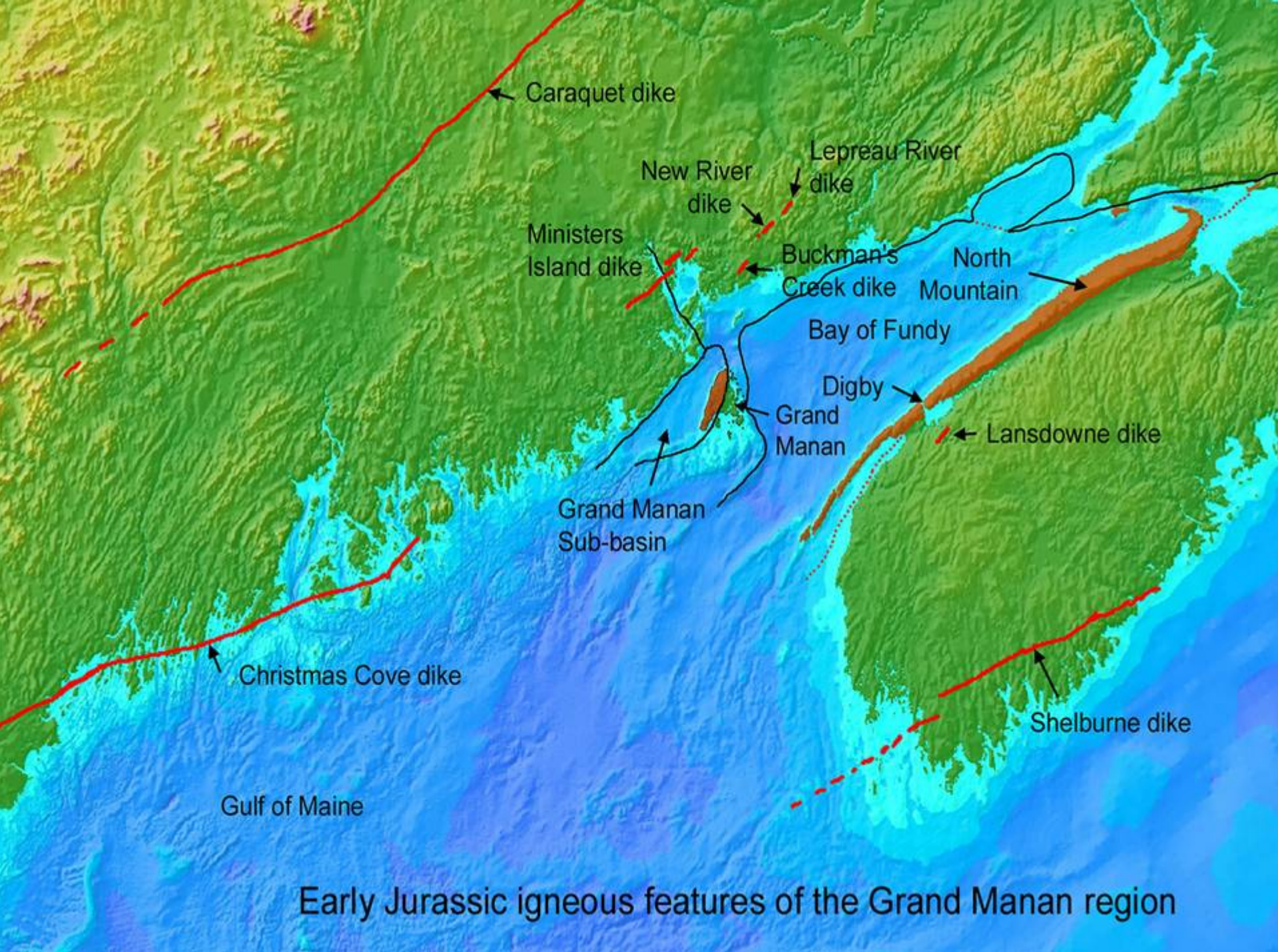
Geology adapted from work by Pajari and students



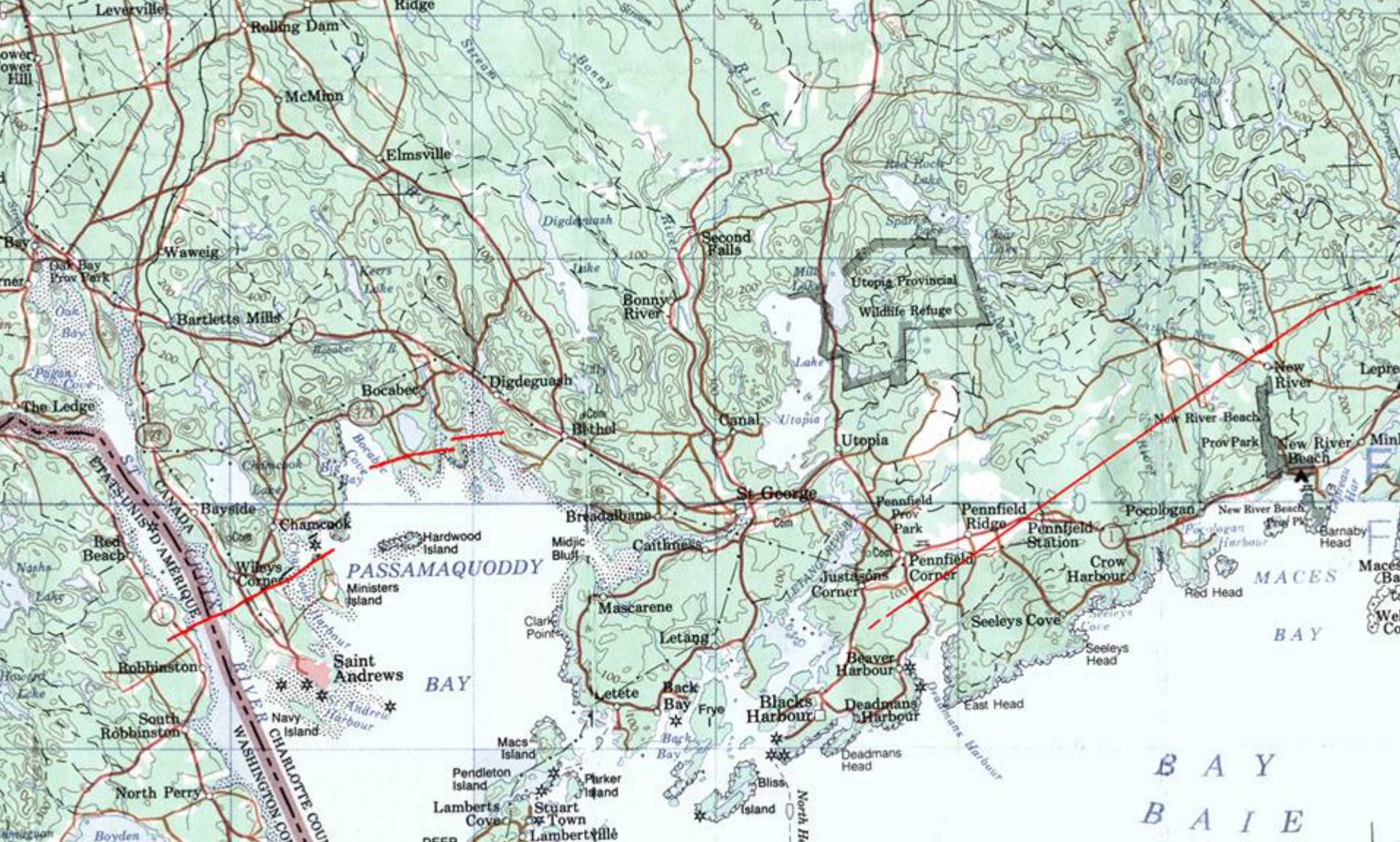
The North Mountain Basalt of the Fundy Basin appears in western Nova Scotia and western Grand Manan, but it is also present under the water.



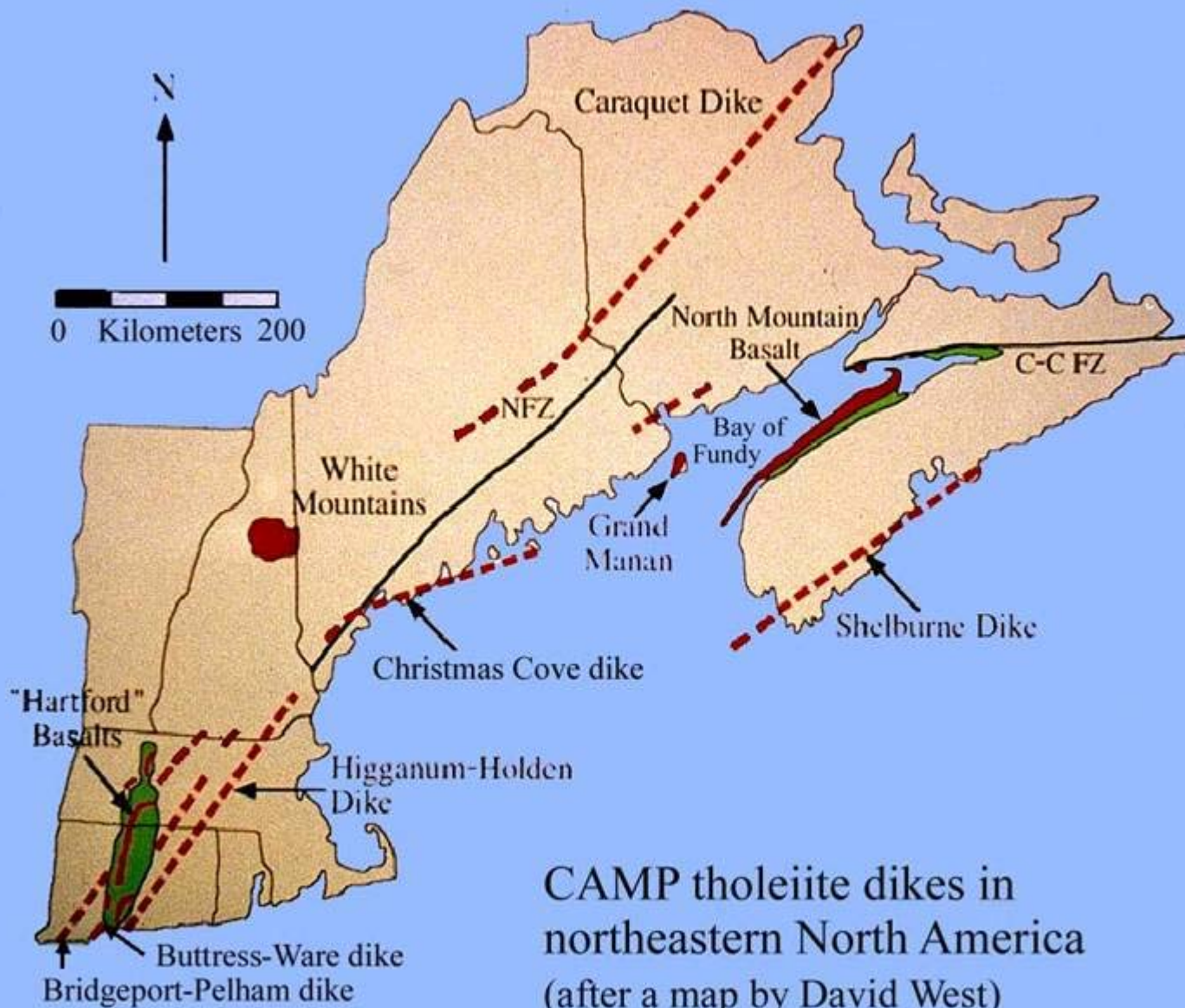
The basalt filled the present basin and Bay (shaded area) but it is cut on all sides by basin border faults and erosion, and so originally extended farther.



Early Jurassic igneous features of the Grand Manan region



Several large dikes of 4 to 30 meters in width are present in southernmost New Brunswick. Their tholeiitic dolerite composition and age are similar to the North Mountain basalt, and thus are logical feeders for those flows.



CAMP tholeiite dikes in northeastern North America (after a map by David West)

Fissure eruptions in Iceland give us a small idea of what our area looked like when the North Mountain Basalt was forming. Dikes are feeding the fissures in segments.



Fissure eruption of the Krafla dike swarm, 1977, Iceland

Massive basalt at
Southwest Head, Grand
Manan lower unit



The massive lower unit is exposed in cliffs 70 to 100 meters high along the western shore

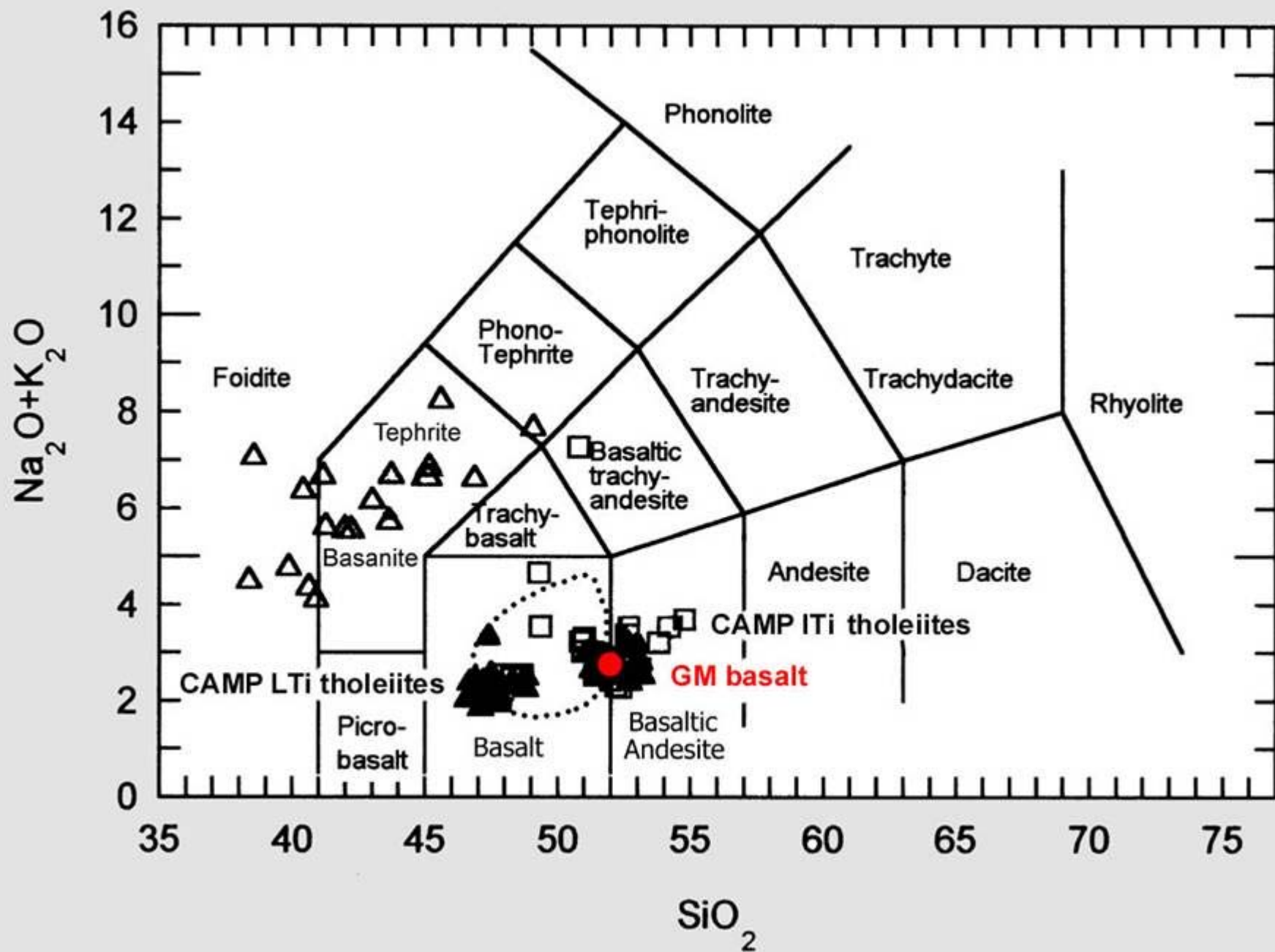


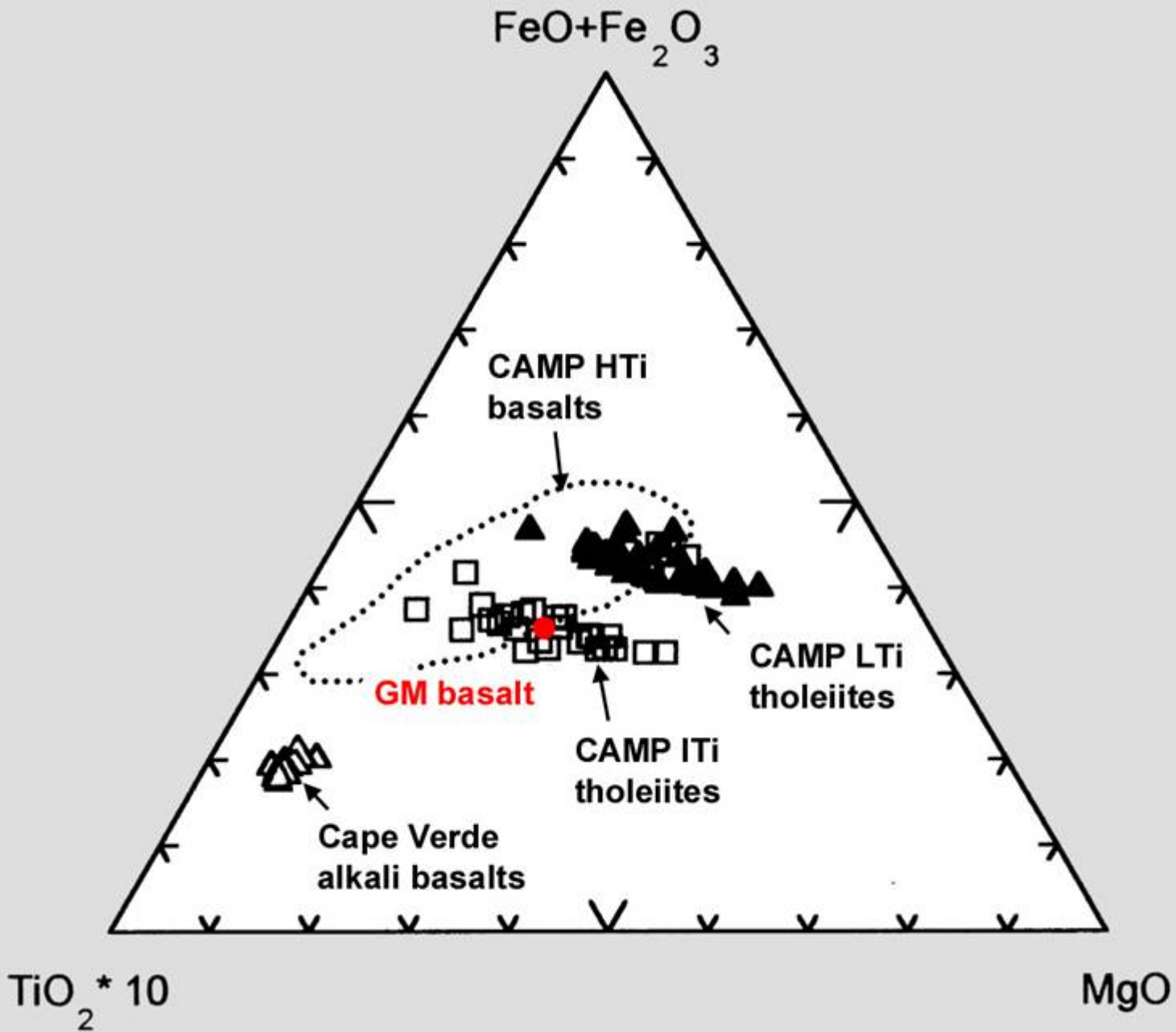
The thin-flow middle unit rests conformably on the massive lower unit at Whale Cove



The “Seven Days Work” cliff shows thin amygdaloidal flows of the middle unit

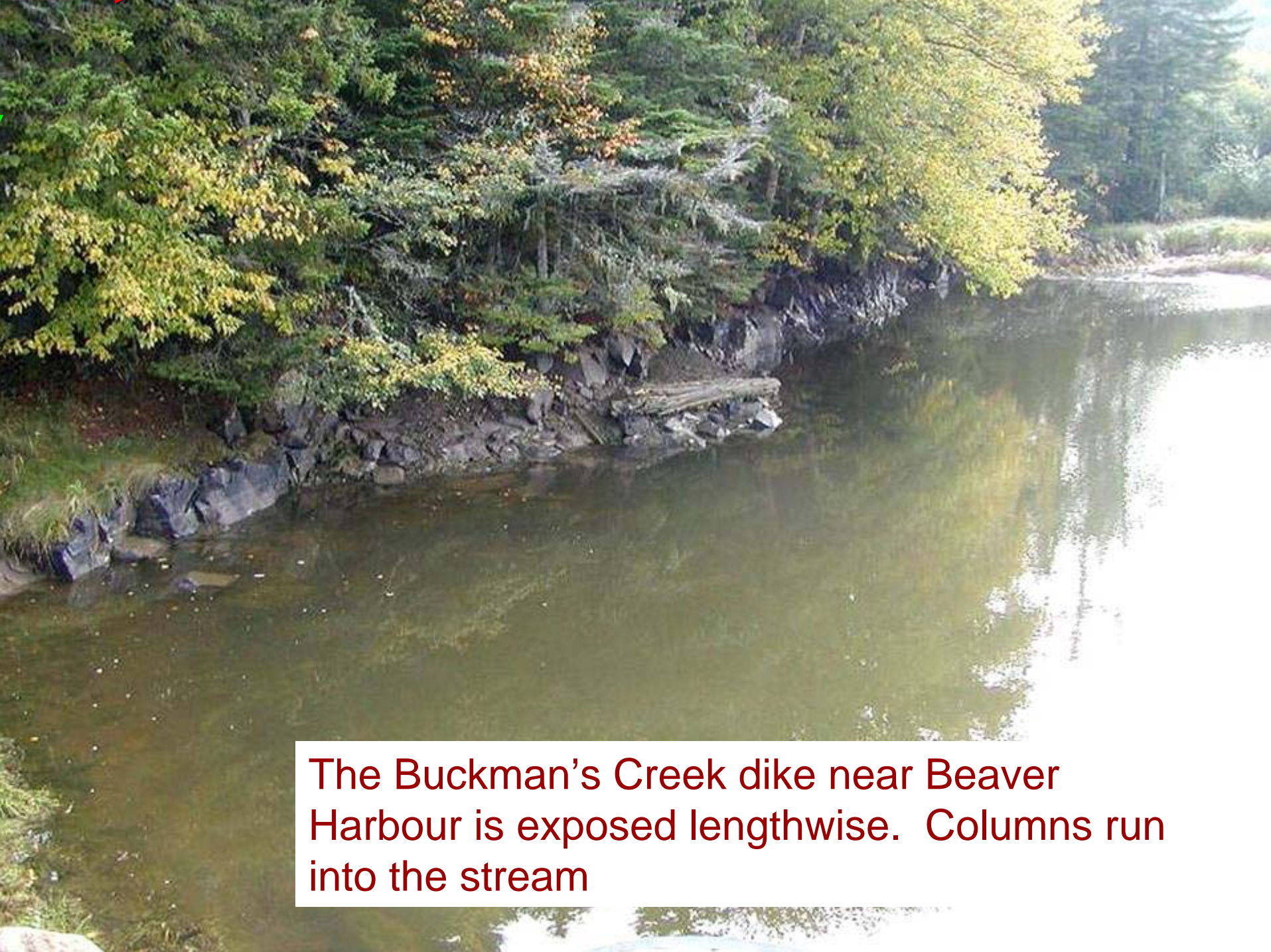








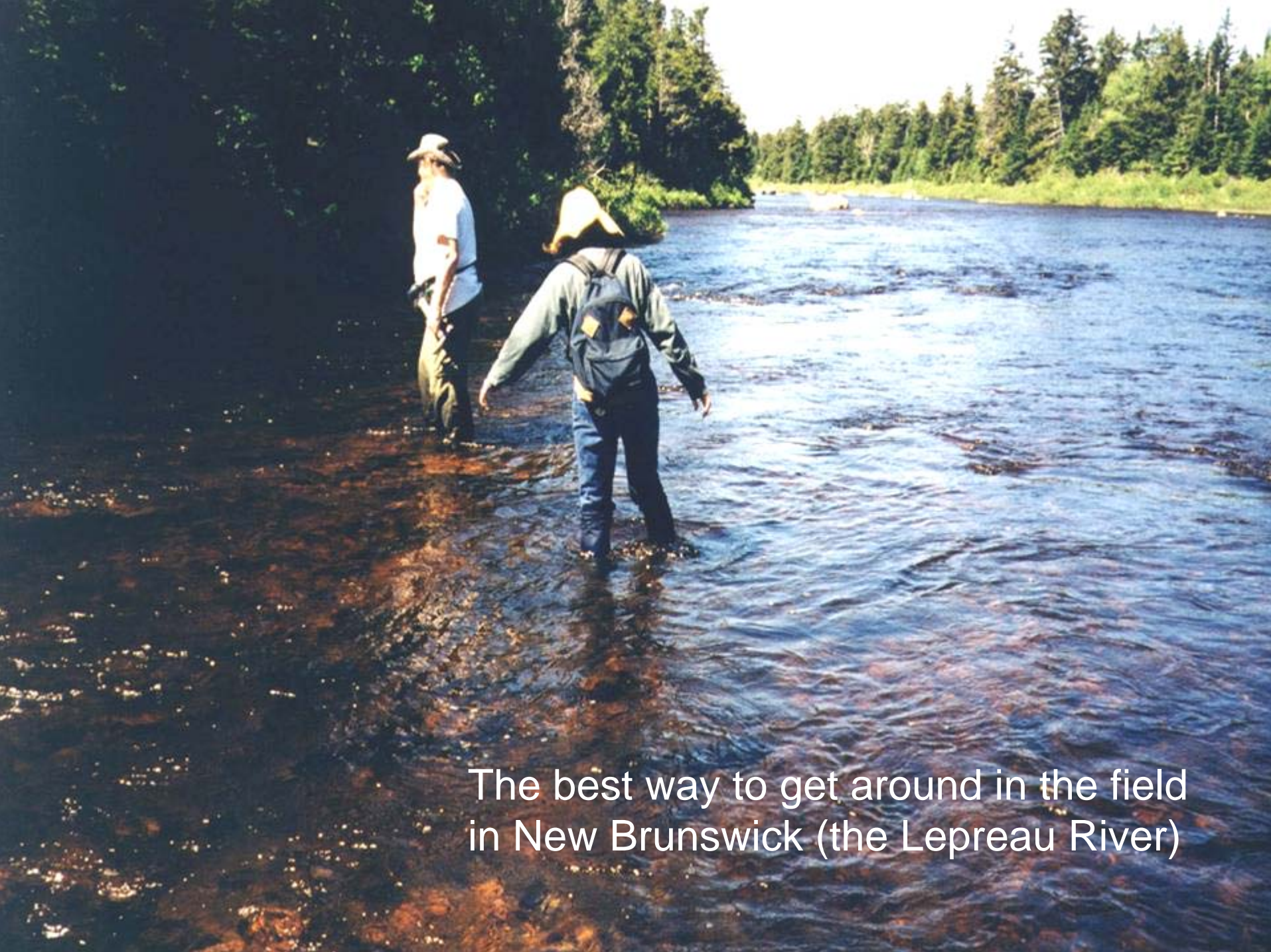
Blomidon siltstone forms a brick-red base that grades upward into soft shale beneath the massive lower basalt, north of Dark Harbour



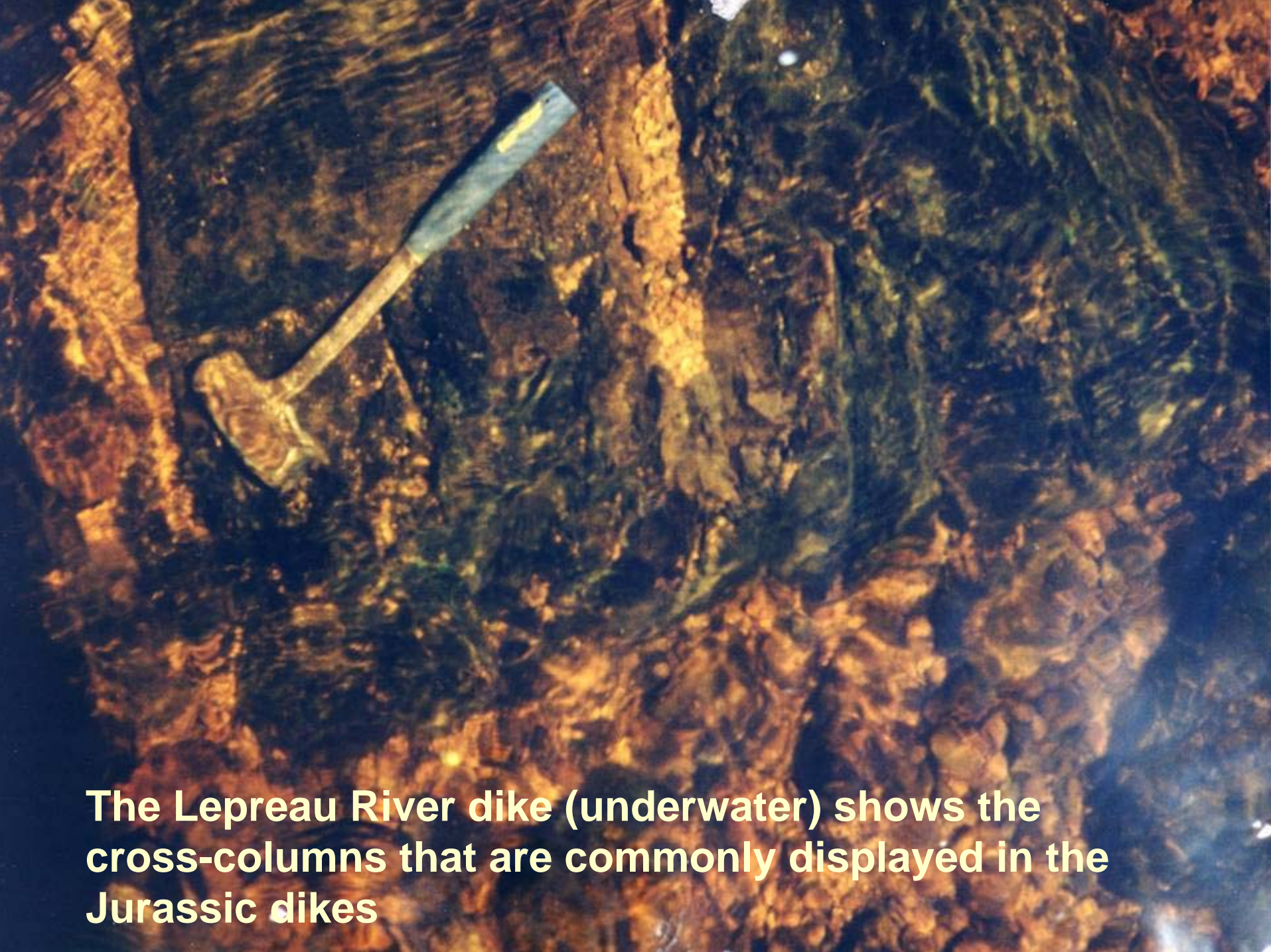
The Buckman's Creek dike near Beaver Harbour is exposed lengthwise. Columns run into the stream



New River dike column, a few meters wide



The best way to get around in the field
in New Brunswick (the Lepreau River)

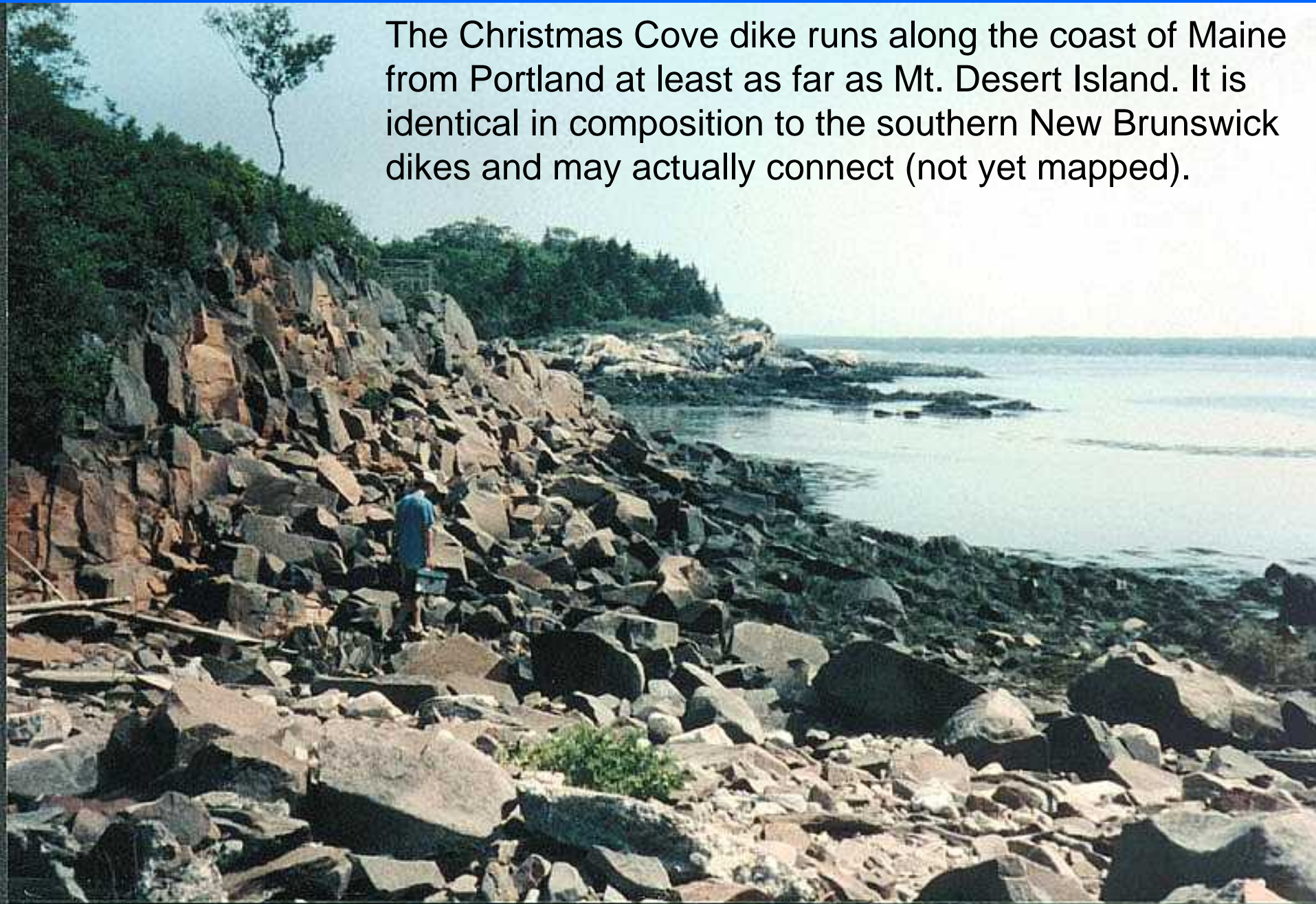


The Lepreau River dike (underwater) shows the cross-columns that are commonly displayed in the Jurassic dikes



Other large dikes in the region include the Caraquet dike, here exposed in Maine.

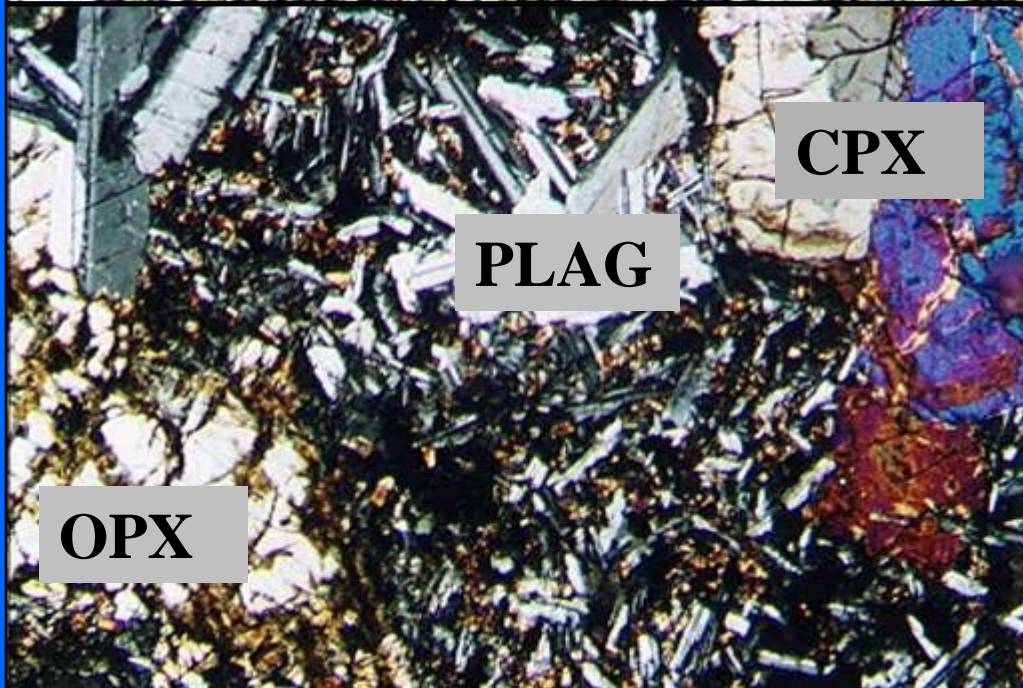
The Christmas Cove dike runs along the coast of Maine from Portland at least as far as Mt. Desert Island. It is identical in composition to the southern New Brunswick dikes and may actually connect (not yet mapped).





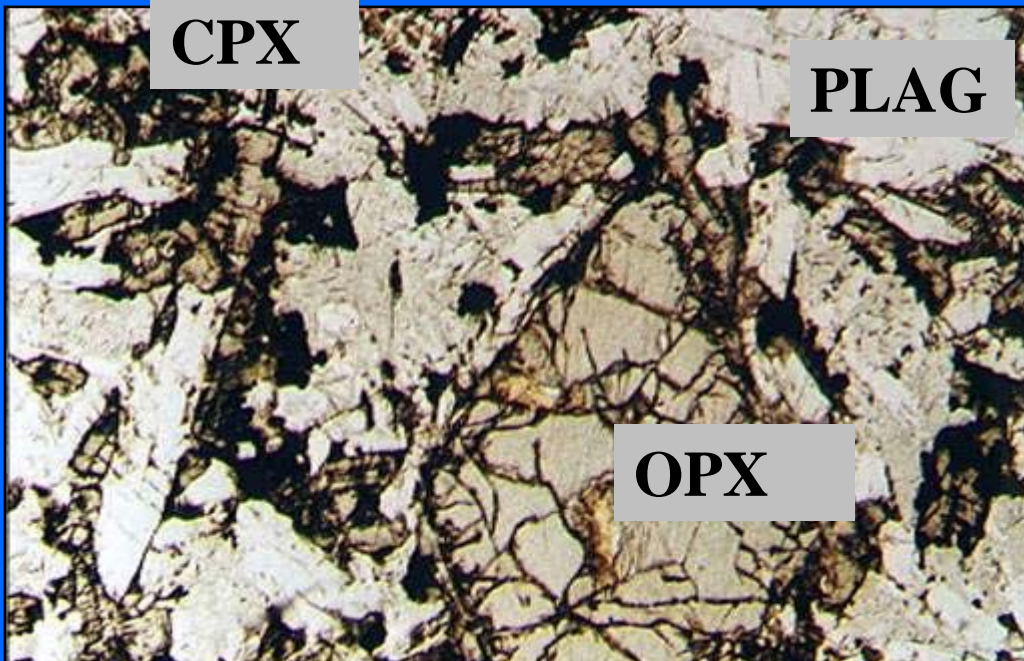
Photomicrographs of basal basalt near Dark Harbour show the same minerals as the mainland coastal dikes --

Planar light



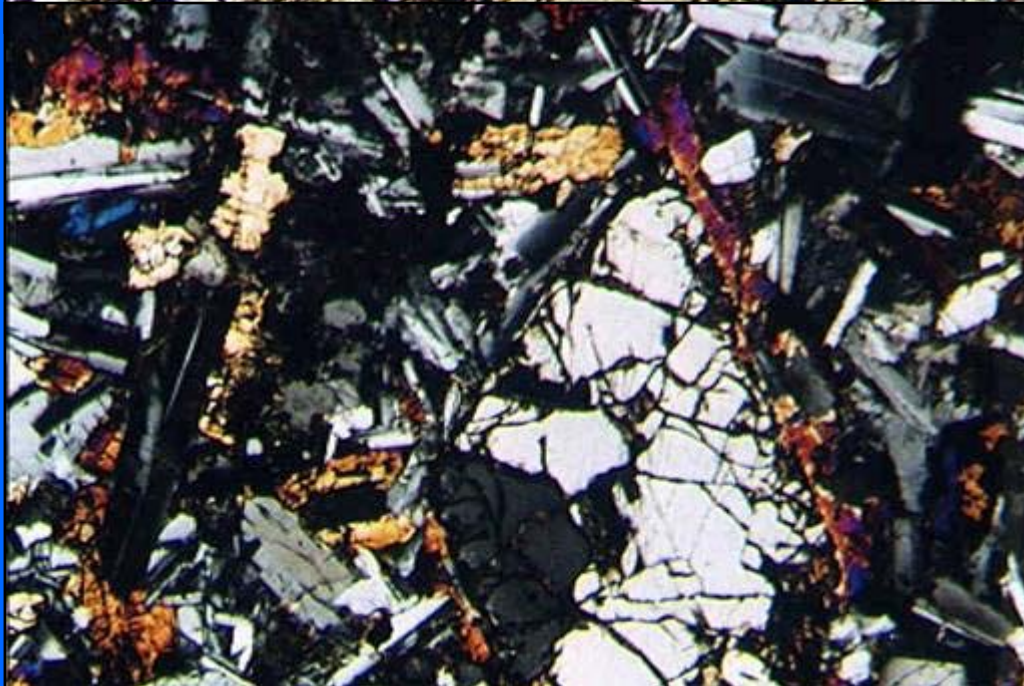
Crossed-planar light

-- except that the basalt minerals are larger and somewhat altered

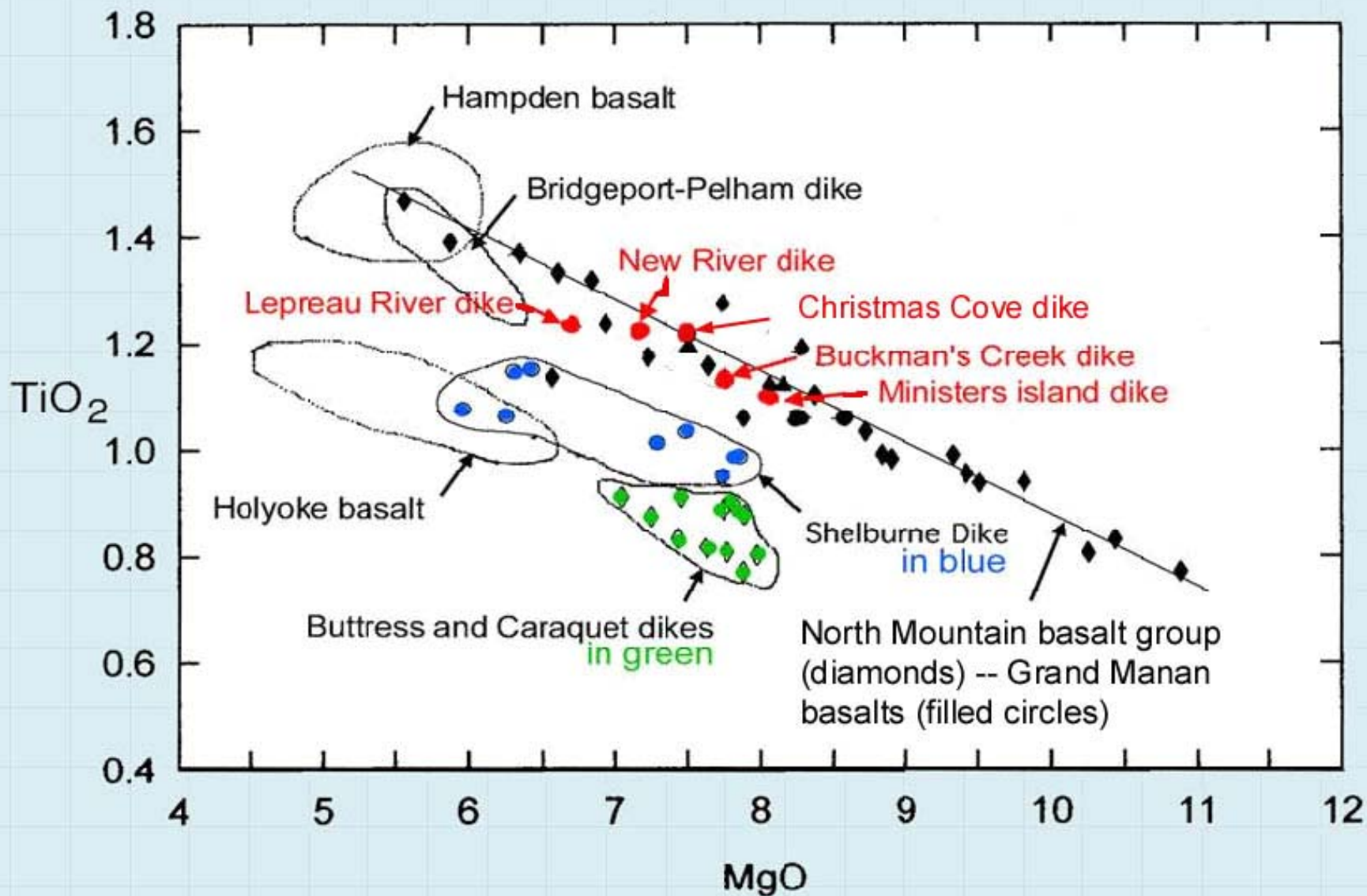


Buckman's Creek dike photomicrographs show large orthopyroxene phenocrysts in a plagioclase-augite matrix

Planar light



Crossed-planar light



SUMMARY

- ➔ Grand Manan basalts are part of the North Mountain Basalt Group, which flowed across the entire Fundy basin and probably the outer Gulf of Maine basins as well.
- ➔ Major faults that define the modern Tr-J basins were active after the volcanism.
- ➔ Lavas from the Caraquet and Shelburne dikes probably did not reach the modern Fundy basin.
- ➔ Tholeiite dikes along the coastal areas of Maine and New Brunswick to the west are good candidates to be fissure sources for the Grand Manan basalts and the North Mountain basalt group. Other fissure dikes may exist.
- ➔ Those dikes and possibly all others in the region produced basaltic lavas outside of the modern basins.