Glacial Drainage Channels Crossing North Mountain, Annapolis County, Nova Scotia*

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Field work embracing both surficial and bedrock geology in parts of Annapolis and Kings Counties, Nova Scotia, was carried out by the author during several seasons in the late 1950's. The project was partially financed by the NOVA SCOTIA RESEARCH FOUNDATION. This report deals with only one aspect of the whole project.

The northwestern portion of the Nova Scotia peninsula, flanking the Bay of Fundy, consists of three petrogenic and topographic zones (Figure 1): South Mountain is a granite-cored upland with a crestline between 700 and 800 feet above sea level, forming the backbone of the peninsula; steeply dipping Paleozoic sediments occur locally along the north flank of this upland (SMITHERINGALE, 1960). The Annapolis Valley, 3 to 6 miles wide, lies north of South Mountain and trends parallel to the Fundy shore. It is a subsequent valley, eroded in Triassic sandstones and shales which dip gently northwards and overlie the Paleozoic rocks with angular unconformity (KLEIN, 1962). The maximum elevation of the valley is 125 feet above sea level at Caribou Bog; from this marshy divide the Annapolis River, 43 miles long, flows into Annapolis basin to the southwest, and the Cornwallis River, 19 miles long, flows eastwards into Minas Basin. North Mountain is a cuesta of multiple basaltic flows, also Triassic, which dip gently northwards to the Fundy shore and under the bay. This upland, 3.6 to 6 miles wide, forms the entire 175-mile coastline of the region. In height it ranges generally up to 750 and 800 feet, but is cut in places by wind gaps.

As early as 1900, HAYCOCK noted that the dry gaps breach the crest of North Mountain opposite most of the major consequent streams which flow northward from South Mountain to join the Annapolis Valley drainage system. He cites, for instance, the gap at Parker's Cove, which lies north of the Allain River (Figure 1), and the gaps at Sandy Cove and Digby Gut corresponding to Sissiboo and Bear Rivers respectively (south west of the area shown in Figure 1).

A channel across the crest of North Mountain can be seen opposite the valley of the Nictaux River, which joins the Annapolis River at Middleton (Figure 1). This channel originates in a deep outwash-mantled re-entrant in the North Mountain escarpment at Spa Springs; it crosses the mountain through a V-shaped valley, the floor of which is either fresh bedrock or bedrock thinly mantled by Recent sediments. The floor is smoothly planed and remarkably uniform in width, averaging about 75 feet. At present day an intermittent underfit stream flows in the channel, and portions have been used recently as commercial cranberry bogs.

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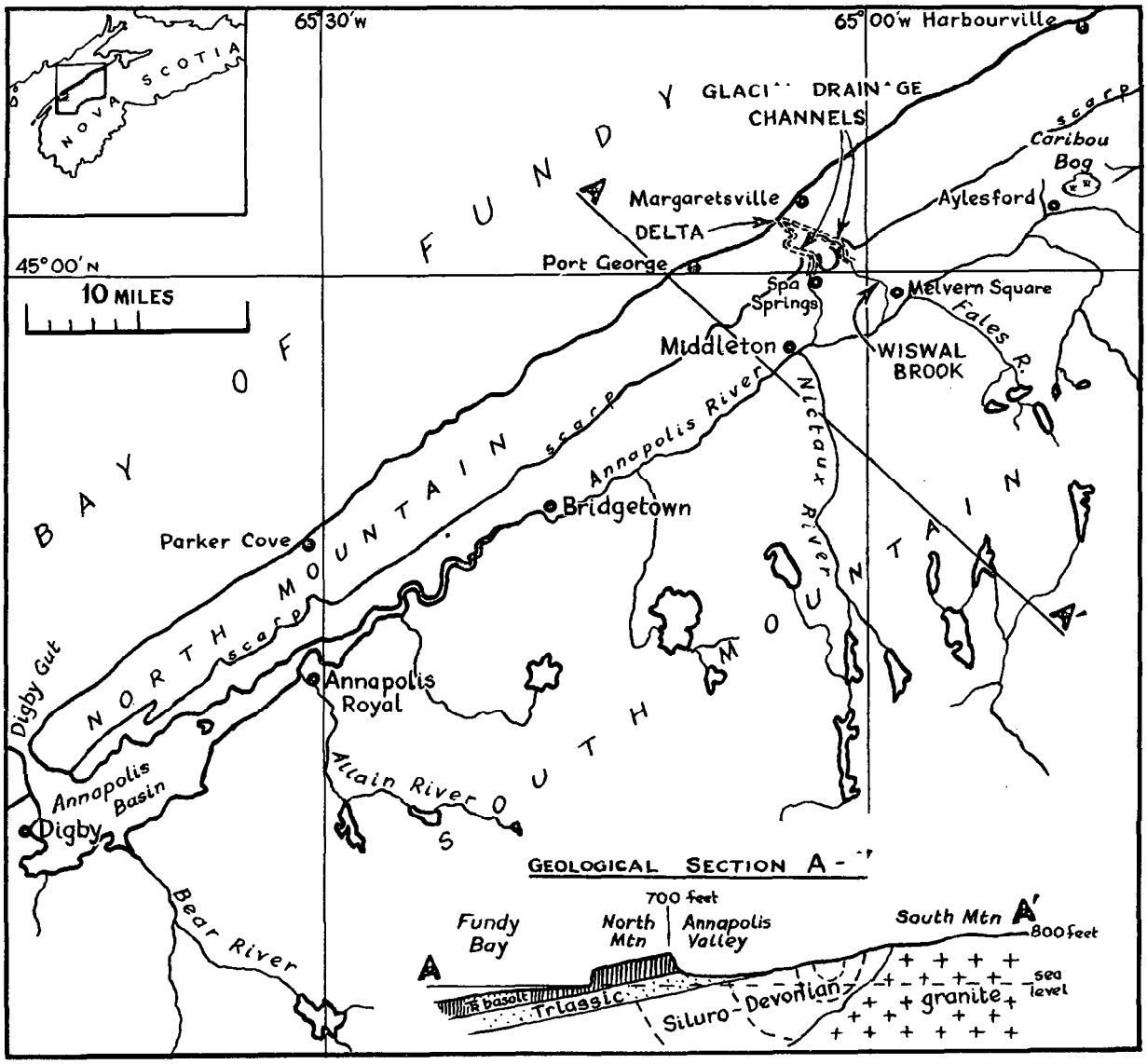

Figure 1 Location of over-crest drainage channels, North Mountain, N.S. The section shows the relationship of the physiographic-geological units.

From the bedrock threshold at Spa Springs, 275 feet above sea level, the channel slopes regularly northward for 4.7 miles, following a rather sinuous course, and emerges on the shore 1.8 miles southeast of Peter's Point, Margaretsville. Here wave erosion is rapidly cutting into a large deposit of cross-bedded, well-sorted medium sand with lenses of fine gravel. The wave-cut front stands 110 feet above the sea and extends for almost two miles along the shore. It appears to fill a re-entrant in the basalt sea cliffs, matching the Spa Springs re-entrant on the landward side of the questa. The surface of the deposit is graded to the slope of the bedrock channel, and thus appears to be a delta formed when the channel was active. The consequent drainage system, including

bedrock channel and delta top, drops 165 feet in 4.7 miles, an average gradient of 35 feet per mile. If this channel were ever to flow bank-full again it would be a roaring little river.

A second gap originates in a re-entrant north of Melvern Square (Figure 1). It trends northwestward across the cuesta and meets the delta at grade 0.6 miles northeast of the mouth of the Spa Springs channel. The bedrock threshold of the gap is approximately 325 feet above sea level, or 55 feet higher than the Spa Springs threshold. This gap could have been cut either by the ancestral Fales River or by the ancestral South Annapolis River. However, neither stream is, today, large enough to do the job, and the sizes of their valleys suggest no greater erosive power in the past. At present day Wiswal Brook flows southeastward from the threshold of the gap to join the Annapolis River, and McNeily Brook flows northward from the threshold to the delta. Because of post-glacial modification by these two streams the Wiswal channel is not as clearly defined as the Spa Springs spillway.

A long narrow kame field extends along the shore for at least 5 miles, from Port George northeastward to one mile short of Margaretsville. The kames are superposed on the basalt sea cliffs and delta top alike, and must post-date deposition of the delta. Cobbles and pebbles of South Mountain granite in the kame deposits indicate transport took place of sediments of southern source northward across the Annapolis Valley and North Mountain.

The stratigraphy and erosional relations suggest the following sequence of events:

1. Erosion of present wind gaps by proto-Nictaux and proto-Fales (?) streams before being beheaded by headward erosion of the Annapolis River. These captures could have occurred as early as the Cretaceous.
2. Normal processes of erosion and mass wasting until area was invaded by continental glaciation.
3. Over-crest drainage through the gaps during ablation of the last two glacial sub-stages. When stagnant ice in the Annapolis Valley thinned sufficiently to cut off ubiquitous flow across North Mountain to the Bay of Fundy, melt water would have been channelled through the lower passes. Simultaneous discharge from both Spa Springs and Wiswal channels could have contributed sediments to the delta. Because of its higher threshold, however, the Wiswal channel would have been abandoned first; all over-crest drainage would have ceased when the Annapolis Valley ice thinned below 270 feet, restoring low-level drainage down the Annapolis Valley.
4. Final advance of thin ice across North Mountain without ploughing up the delta but leaving ice-contact stratified drift on the delta top. This ice may have advanced northward from a local centre on South Mountain (HICKOX, 1962b).
5. Re-establishment of over-crest drainage in the Spa Springs channel - and perhaps in the Wiswal channel also - during ablation, long enough to clear the channel of glacial debris, but not long enough to destroy the kames superposed on the delta top.
6. Cessation of over-crest drainage and establishment of present drainage and erosion.

Bibliography

HAYCOCK, Ernest, 1900, Records of post-Triassic changes in Kings County, Nova Scotia: Proceedings & Trans., Nova Scotia Inst. of Science, p. 287-302.

HICKOX, C.F., 1962a, Pleistocene geology of the Central Annapolis Valley, Nova Scotia: Province of Nova Scotia, Dept. of Mines, Memoir no. 5.

_____, 1962b, Late Pleistocene ice cap centered on Nova Scotia: Geol. Soc. of America, Bull., v. 73, no. 4, p. 505-509.

KLEIN, G. deV., 1962, Triassic sedimentation, Maritime Provinces, Canada: Geol. Soc. of America, Bull., v. 73, no. 9, p. 1127-1146.

SMITHERINGALE, W.G., 1960, Geology of Nictaux-Torbrook map-area, Annapolis and Kings Counties, Nova Scotia: Geol. Survey of Canada, Dept. of Mines and technical Surveys, paper 60-13.

Participation in the International Hydrological Decade in New Brunswick*

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The International Hydrological Decade (I.H.D.) was initiated during the year of 1965. Sixty nations throughout the world are involved in the program; it is essential that most nations take part, since the hydrological cycle is no respector of political boundaries.

The overall objective of an international program in the field of hydrology is to accelerate the study of water resources and the regimen of water with a view to their rational management in the interest of mankind, to make known the need for hydrological research and education in all countries, and to improve their ability to evaluate their resources and use them to the best advantage. Thus the program will focus on science, but will give strong consideration to utilitarian factors.

In order to fulfill this general objective in Canada, each province has a coordinating committee which will propose projects for that province. J.G. LOCKHART of the NEW BRUNSWICK WATER AUTHORITY is the committee chairman for the Province of New Brunswick.

The first task of the committee involved the selection of a "Representative Basin" for New Brunswick. After some investigation,

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