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Late Pleistocene Re-advance of Piedmont Glaciers in Western Newfoundland*

DOUGLAS R. GRANT
Geological Survey of Canada, Ottawa, Ont.

Air-photo reconnaissance of most of Canada by the writer in 1965 for the Glacial Map of Canada (Prest et al. 1968) disclosed the occurrence of major end-moraines on the coastal lowlands of the Northern Peninsula, Newfoundland. After the completion of investigations of the surficial deposits and geomorphic features of the northern half of the peninsula in 1969, it was reported (Grant 1970a, 1970b) that the first Laurentide ice from Labrador crossed the Strait of Belle Isle and overwhelmed the northern lowlands. It then retreated, calving back under the influence of marine waters standing more than 300 feet deep over the still isostatically depressed lowlands, to a divide centered along the median line of the Long Range plateau. Later, ice from the plateau re-advanced down onto the lowlands and, shortly after 10,900 years B. P., built an end-moraine into the sea around a basin now occupied by Ten Mile Lake.

Further detailed air-photo examination of the southern half of the peninsula, undertaken to map the recession of the Long Range ice cap, reveals instead that Long Range ice had expanded also westward through troughs between nunataks, and spread out into the sea over the western lowlands as several piedmont glaciers which produced a whole series of interlobate and recessional moraines.

This event can be interpreted four ways: as a correlative of the Ten Mile Lake re-advance (ca 10,900 yr. B. P.), as some other Wisconsin re-advance, simply as a result of re-oriented ice-flow after the hypothetically present Laurentide ice sheet withdrew from western Newfoundland and allowed island ice to disperse more radially, or finally, it may even constitute the only glaciation of the lowlands in Wisconsin time. For the present, it seems wiser to regard the event as a late Wisconsin re-advance of unknown significance like that at Ten Mile Lake or like that which deposited the Robinson's Head Drift at St. George's Bay around 13,000 years ago, simply because the summits that seem to have been nunataks during this event bear 'fresh-looking' igneous erratics that were probably emplaced during Wisconsin time by either Labradorian or Long Range ice.

The features depicted in Figure 1 can be described in terms of the sequence of events interpreted from them. Ice spread from a divide located at an elevation of about 1,500 feet along the median line of the Long Range plateau and moved eastward downslope, scouring the bedrock and removing most debris. Westward flow to the Gulf of St. Lawrence, on the other hand, was impeded as it moved upslope toward the trough passes through the high western summits. As a result, scouring was concentrated in the valleys while debris on the hilltops tended to lodge and become drumlinized. Allowed easy passage through the many large troughs, the ice was not constrained to overtop the intervening summits which thereby escaped glaciation (or rather, "glacierization"). These nunataks are characterized by prairie-like expanses of patterned felsenmeer, the boundaries of which are delineated by short but distinct morainal segments, swaths of stripped bedrock, and side-hill meltwater channels. The upper surface of the former ice-tongues can be traced down through the troughs by a study of the moraines and channels, as well as by the occurrences of patches of dead-ice moraine lodged on the thresholds of hanging tributaries.

Escaping the confines of the troughs, the ice tongues spread out onto the lowland as piedmont glaciers which produced thick morainal belts that are best developed in interlobate positions and where the ice abutted against the escarpment. Above the limit of postglacial marine action, the moraines usually appear as unforested belts of either knob-and-kettle topography or anastomosing ridges that locally display steep, scalloped, ice-contact faces and distal ramps of outwash. Where the moraines represent interlobate deposits at the junction of abutting ice lobes, they show reticulate and circular ridges, or "ablation-slide moraines", that indicate inwash amongst stagnant ice-blocks. In a few places inwash has almost obscured the hummocks and ridges.

At the marine limit, the sharp glacial relief is abruptly truncated, thus permitting positive and precise measurement of the marine limit by optical projection of the photo-mapped demarcation onto topographic maps with a 50-foot contour interval. At lower levels, the

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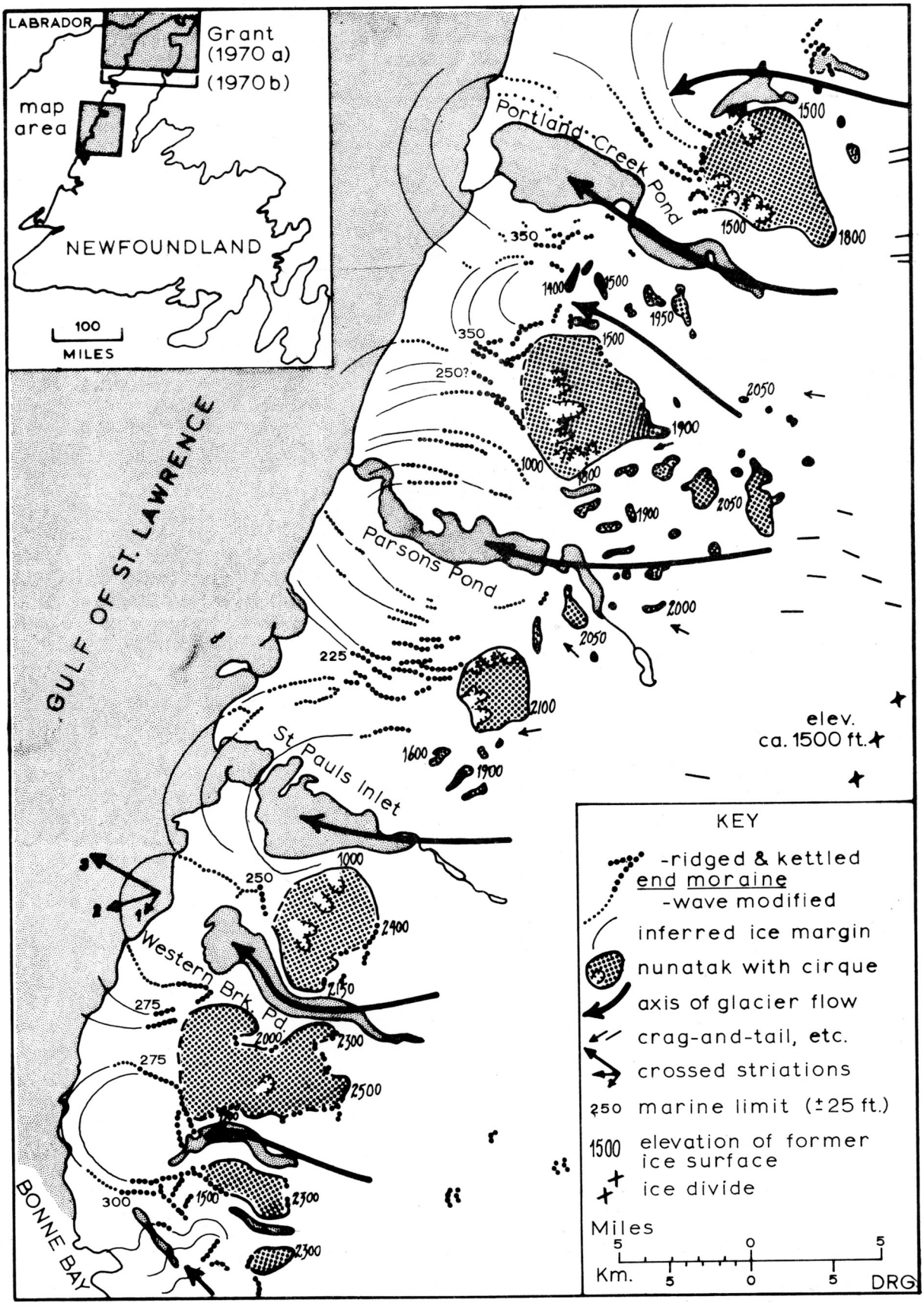

FIGURE 1 - Late Pleistocene ice limits in western Newfoundland.

moraine ridges become progressively more subdued, reflecting longer exposure to falling sea levels, deeper burial beneath offlap sediments, and probably also the smaller original size of the submarine extensions that were built in 300-500 feet of water. For these reasons, in only a few cases are the moraines discernible near sea level at the present coast. Finally, from a combination of the continuity, curvature, directional asymmetry, and sequence of the visible moraine segments, certain reasonably inferred extensions and additional hypothetical ice-marginal positions have been added that illustrate distinct recessional stages.

Retreat took place by spasmodic shortening and narrowing of the ice tongues, and was probably a rapid process judging by the relatively small changes in marine levels recorded on successively abandoned moraines. In this regard, the variation in the marine limit within the area probably reflects more the timing and speed of ice retreat than any variations in ice load inferred from the thickness and extent of individual ice tongues. Diminution of the lowland tongues was, of course, matched by a lowering of the ice-field surface as suggested by subordinate trimlines below the maximum. Successively higher moraine-dammed lakes along the major troughs and patches of dead-ice deposits in cols trace the retreat back onto the plateau where final shrinkage proceeded back toward the initial ice divide, as indicated by consistent ice-flow indicators such as crag-and-tail, stoss-and-lee, and roches moutonnées. Meanwhile small cirque glaciers occupying corries on the escarpment side of the nunataks gradually shrank; even today the corries are sites for semi-permanent ice patches.

At present the final postglacial changes are movements of relative sea level. The west coast of Newfoundland, south of the study area, around Port-au-Port Bay, is now submerging judging by intertidal tree stumps and peat bogs. Supporting evidence is provided by large barrier beaches and the truncation of emerged marine strandlines. Farther north, in the study area, although drowned terrestrial vegetation has not been noted, the latter two indications are common as far north as Hawke Bay near Port au Choix. Furthermore, a few radiocarbon dates (ca 5,000 years B. P.), on shell and whale bone in emerged beaches only a few metres above present high tide point to a considerable slowing in the rate of emergence, if not actually suggesting recent stability or even submergence.

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