TRIP C-6

WISCONSINAN GLACIATION OF EASTERN AROOSTOOK COUNTY, MAINE

Andrew N. Genes, William A. Newman, and Thomas B. Brewer *
Boston State College, Northeastern University, Boston State College, Boston

Introduction

The purpose of this trip is to examine the Van Buren and Mars Hill Drifts which constitute the surface glacial deposits of eastern Aroostook County and relate them to models of late Wisconsinan glaciation. In addition, moraines extending from St. Francis through Caribou to Fort Fairfield, and moraine complexes at Mars Hill and Lower Macwahoc will be examined (Fig. 1). We will use the field evidence that relates to the problem of the origin of the drifts and the moraines to suggest deglaciation models.

Maps: Mattawamkeag, Wytopitlock, Sherman, Mars Hill, Caribou, Presque Isle, 15 minute series.

Late Wisconsinan Glaciation

The late Wisconsinan ice advance had reached its maximum extent onto the continental shelf and had begun to retreat by 17,000 years BP. (Connally and Sirkin, 1973). Between 13,500 and 12,500 years BP. the active ice margin had retreated from the present coastal position leaving a belt of submarine moraines (Borns, 1966, 1967, 1973; Stuiver and Borns, 1967; Stuiver and Borns, unpub. data). The general recession that produced the coastal moraine complex was interrupted by a major readvance in eastern Maine that culminated in the sea at Pineo Ridge approximately 12,700 years ago (Borns, 1967).

While the receding ice margin was depositing submarine moraines along the present coast of Maine, the Champlain Sea transgressed up the St. Lawrence Lowland from the Gulf of St. Lawrence reaching the vicinity of Ottawa, Ontario, by 12,800 years BP. (Richard, 1978). This Champlain Sea penetration cleaved the Laurentide Ice Sheet along the trend of the St. Lawrence Lowland. The cleaved ice sheet to the south of the Champlain Sea formed a residual ice cap over southern Quebec, Maine, and New Bruns-

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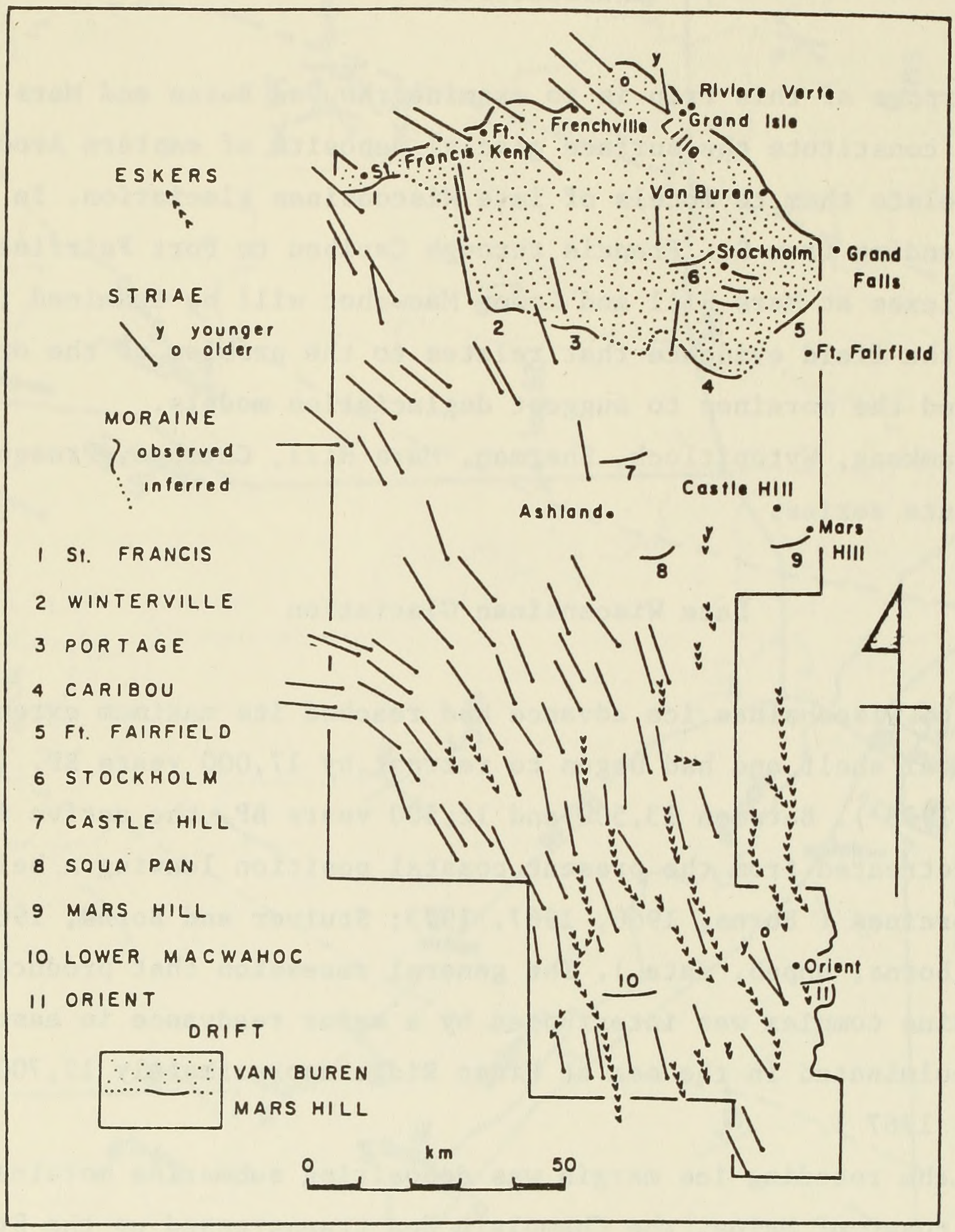

Fig. 1. Generalized surficial geology of Aroostook County.

wick after 12,800 years BP. (Borns and Hughes, 1977). This represents the minimum date at which the Laurentide ice in Maine became detached from the Laurentide ice north of the St. Lawrence River.

Deglaciation of the newly separated ice cap proceeded through down-wasting and recession. Residual ice cap conditions in northern Maine, and probably adjacent New Brunswick, lead to the formation of occassional moraine complexes, outwash deposits, and eskers. Peat overlying till along the Green River in New Brunswick suggests that northern Maine was deglaciated sometime before 10,200 years BP. (Kite, 1979).

Glacial Drifts

Two distinct late Wisconsinan glacial drifts mantle eastern Aroostook County (Genesand Newman, 1978, 1979). The Van Buren Drift, covering the very northern portion of the county (Fig. 1), includes a compact, silty, buff to dark brown till containing 3-5% clasts of Precambrian granite gneiss. The Mars Hill Drift covering southern Aroostook County and beyond, includes a loose, sandy, brown till. Clasts in this drift include DeBoullie Grano-diorite, Chapman Sandstone, and Mapleton Sandstone - lithologies character-istic of regions immediately to the northwest. Granite gneiss inclusions have yet to be observed in this till by the authors.

Directional indicators point to emplacement of both tills by ice moving in a southeasterly direction but no areal or stratigraphic contact between these tills have been found.

Moraines

The moraines of Aroostook County are generally low, narrow, undulating structures that are indestinguishable at times from bedrock controlled topography and irregularities of dense forest canopy. The Lower Macwahoc Moraine was discovered only after a clear cutting operation permitted a view of the surface morphology. The moraine complex at Caribou closely approximates the southern margin of the Van Buren Drift and consists of Van Buren Till.

The orientation and position of the moraines, meltwater channels, outwash, and eskers indicate that glacial recession was accomplished by

downwasting and recession from central Maine to northern Aroostook County.

Glaciation Models

In light of the available data, two distinct models for the late Wisconsinan history of northern Maine are proposed to explain the observed relationship between the Van Buren and Mars Hill Drifts:

a) Separate Ice Cap Model: A separate ice cap developed in central Maine during mid Wisconsinan time which eventually expanded and interacted with the advancing Laurentide Ice Sheet from north of the present St. Lawrence Valley. Eventually they coalesced and the Maine ice cap was displaced to the southeast. The Van Buren Till was lodged beneath the Laurentide ice and the Mars Hill Till was lodged beneath the Maine ice.

b) Frozen Bed - Melted Bed Model: The late Wisconsinan Laurentide ice cap extended across Maine and onto the continental shelf. Both the Van Buren and Mars Hill Tills were lodged by this ice advance. The presence of tills containing Canadian Shield erratics (Van Buren) or local rock types (Mars Hill) was a function of the thermal regime that existed at the ice-bedrock interface.

References

Borns, H.W., Jr., 1966, An end moraine complex in southeastern Maine (abs.): Geol. Soc. America Abs. for 1966, Spec. Paper 101, p. 485.

----------, 1967, Guidebook, Friends of the Pleistocene, 30th Ann. Reunion, Machias, Maine: Orono, Maine, Maine Univ. Press, 19 p.

----------, 1973, Late Wisconsinan fluctuations of the Laurentide Ice Sheet in southern and eastern New England: Geol. Soc. America Mem. 136, p. 37-45.

Borns, H.w., Jr., and Hughes, T.J., 1977, The implications of the Pineo

Ridge readvance in Maine: Geogr. phys. Quat., v.XXX1, no. 3-4, p.203-206.

Connally, G.G., and Sirkin, L.A., 1973, Wisconsinan history of the Hudson-Champlain Lobe: Geol. Soc. America Mem. 136, p52-53.

Genes, A.N., and Newman, W.A., 1978, Two late Wisconsinan ice frontal positions, northeast Maine: Geol. Soc. America, Abs. for 1978.

Genes, A.N., and Newman, W.A., 1979, Late Wisconsinan glaciation of Aroostook County, Maine: Geol. Soc. America, Abs. for 1979.

Kite, J.S., 1979, Postglacial geologic history of the middle St. John River Valley: Unpub. M.S. Thesis, Univ. of Maine, Orono.

Richard, B.H., 1978, Age of Champlain Sea and "Lampsilis Lake" episode in the Ottawa-St. Lawrence; in Current Research, Part C, Geol. Surv. Canada, Paper 78-1C, p. 23-28.

Stuiver, M., and Borns, H.W., Jr., 1967, Deglaciation and early postglacial submergence in Maine (abs): Geol. Soc. America, Abs. for 1967, Spec. Paper 115, p. 59-60.

Itinerary

Mileage

0 Assembly point is parking lot at Keddys Motor Inn, Presque Isle. Starting time 8:00 A.M. Go north on route 1. Follow signs to Caribou.

9.6 Take left on 161 north and continue on route 161.

18.9 Take right off 161 and head up hill.

19.6 Stop 1. Caribou Moraine. Here, gravel pit operations have exposed a section 10-12 meters high permitting us to examine the morphology and geographic relationship of the moraine to bedrock hills. Note the approximately 3-5% occurrence of granite gneiss clasts

in the exposure. These erratics are derived from the Laurentide region of Quebec. South of this locality we have yet to find granite gneiss in tills. This moraine, is part of a discontinuous moraine complex which extends from St. Francis through Caribou and Fort Fairfield, and into New Brunswick where it is correlated with the Grand Falls Moraine.

Return to cars promptly and return the same way as entered.

20.2 At foot of hill take left onto route 161 south.

22.9 Turn left into Caribou Country Club off 161 south.

Stop 2. Caribou Country Club. Drive to the top of the ridge by the club. From this vantage point we have a good view of the morphology of the moraine. Low undulating ridges extend northerly toward the cut seen on stop 1. Although the ridge has been smoothed it is a natural feature in excess of 12 meters thickness. Cuts behind the locality expose granite gneiss inclusions within the till comprising the moraine.

Return to cars.

23.4 Return to 161 south and turn left. The bedrock ridges are perpendicular to the drift ridges in this region. From this point southward no granite gneiss inclusions have been found in Aroostook County tills.

26.3 Take right on route 161. Head toward Presque Isle.

27.0 Take left onto route 1.

27.2 Take right to Presque Isle on route 1. We will follow the beautiful Aroostook River Valley. Once we leave Caribou and head south toward Presque Isle the topography is smooth and regular reflecting bedrock control. Note the clumps of boulders in the fields. These are purposely left by the farmers so that they can identify or locate areas where bedrock is close to the surface and thus avoid damage to their plows.

38.3 Cross the Aroostook River.

39.8 Northland Hotel on left.

40.6 University of Maine at Presque Isle on right.

48.7 Turn left off route 1 south toward Westfield. We are observing a change from bedrock controlled topography to hummocky constructional topography. This is the beginning of the Mars Hill Moraine complex.

50.3 Note the cut into the pit on the right as we swing left.

50.5 Turn right. We have entered the Mars Hill Moraine complex.

50.8 Note Carry's Mills bedrock exposure on right. This is one of the few bedrock exposures in the area. Mars Hill is seen directly ahead.

51.9 Turn right at the "T". All topography in this region is constructional. As we continue south note the increased frequency of moraines being cut by rills and meltwater stream channels. On the right is Green Mountain Ridge. Mars Hill and Green Mountain Ridge funneled late Wisconsinan ice thus constricting its flow resulting in the formation of the Mars Hill Moraine complex.

55.3 To the right is a former glacial meltwater channel.

55.7 Take left on secondary road by large partially dissected moraine ridge.

55.8 Cross route 1A onto road directly across highway.

55.9 Stop 3. Mars Hill Moraine Complex. Park cars along the road. The thickness of the moraine ridges varies from 0-30 meters. The complex is an irregular, hummocky sheet consisting of outwash, kames, kettles, and smaller till hummocks. All of these forms have been dissected by outwash streams that flowed directly from a receding ice margin. Clasts in this drift include the DeBoullie Granodiorite,Chapman Sandstone, and Mapleton Sandstone-all local lithologies. Clasts of Mars Hill Conglomerate within the till appear only at the southern end of the till complex and indicates lodgement by till with a southern flow. An extensive moraine complex characterized by distant moraine ridges rises above the general level of the drift surface. At Mars Hill, Squa Pan Lake, Macwahoc, and Orient these ridges take the form of frontal moraines, some of which are associated with outwash. The Mars Hill Moraine complex is the most striking. It extends from Mars Hill(495m elevation) westward to Green Mountain Ridge (360m elevation) and thence northward approximately 16-24 kilometers to Easton and Phair.

Return to cars and go straight ahead.

56.5 Take right fork. Cemetary on left. We crossed a large former meltwater channel just prior to the road intersection.

57.3 T-junction. Take right fork. Note possible lateral moraine flanking Mars Hill.

60.2 Left off main road.

60.6 Take left onto L.L. Boyd and Son's Farm.

Stop 4. Boyd Pit.

This exposure in the Mars Hill Moraine is near the distal terminus of the moraine. To the south of this ridge the region is characterized by outwash (stratified drift). The Mars Hill Conglomerate derived from Mars Hillcomprises many of the clasts in this pit.

Turn right out of the pit and farm. The hill to the left is in New Brunswick.

61.2 Turn right at junction. Travel north along Mars Hill noting Green Mountain Ridge to the left. As you approach Mars Hill bedrock approaches the surface.

64.0 Turn left and follow dirt road.

64.9 Continue on asphalt road.

65.6 Turn left on route 1A and head for the town of Mars Hill. Note that the topography begins to level out toward the south.

66.6 1A joins route 1 south. Continue down route 1 to route 95. You are now entering a pitted outwash plain. From Mars Hill to route 95 is a dangerous road with frequent accidents involving trucks. Be aware.

93.7 Take right onto 95 south at Houlton.

132.0 Take Sherman exit off 95 south.

132.3 Turn left on route 158 toward Sherman Mills. Striation locality.

133.8 Bear right beyond Gulf station. Stay on route 158 heading toward Macwahoc.

136.6 Take right on route 2.

142.7 Take left by old shingle shack off route 2. This dirt logging road is designated 06-20-10.

145.6 Take right onto dirt road 6.

148.4 Bridge over the Lower Macwahoc River. Park the cars along the road. Be certain that your car is well off the road as this is a main logging road with the trucks really rolling.

Stop 5. The Lower Macwahoc Till. This is a weathered, silty till very similiar in texture to the St. Francis Till, which underlies Van Buren Till, at localities along the St. John River. This stop is approximately 2.7 miles southeast of the Lower Macwahoc Moraine, which will be our next locality.

Return to cars and continue on road 6.

148.9 Junction with road 6 and 7. Take left onto 7.

150.0 Junction with road 7 and 8. Take left onto 8.

150.3 Junction with road 8 and 8.1. Continue on road 8.

150.8 Junction with road 8 and 8.2. Take a left onto road 8.2.

151.2 Stop 6. Lower Macwahoc Moraine. This moraine was exposed during salvage operations of a spruce budworm infested forest. The moraine has been traced for approximately two miles before becoming obscured by dense vegetation. The fabric of the imbrecated clasts indicates lodgement by ice flowing south.

Return to cars and return to route 2.

160.2 Take left onto to route 2 and head toward Macwahoc.

167.6 Molunkus Stream picnic area. The road now follows an esker dipping on and off for a short distance.

169.9 At Molunkus take right on route 2.

178.7 Mattawamkeag. Take right on route 157 and head toward Millinocket.

186.9 Crossing the Salmon River.

187.3 Take left into cut of the Penobscot Esker.

Stop 7. Penobscot Esker gravel pit. This locality is at the approximate latitude where the esker systems of northern Maine begin. To the north, only small and insignificant esker forms are encountered.

Return to cars and head back to road.

188.7 Take left onto route 151 upon leaving the pit.

190.4 Junction with route 95 Interstate.

End of Trip