

## TRIP D

# LATE-GLACIAL STRATIGRAPHY OF THE KENNEBEC RIVER VALLEY FROM NORRIDGEWOCK TO SOLON, MAINE

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### INTRODUCTION

As the last ice sheet that covered this area (Cary?) dissipated, the early post-glacial sea transgressed to form an estuary of the Kennebec River valley at least as far north as Bingham, Maine. At times the glacial ice stood in or close to the sea. The transgressing sea reached its highest position approximately 12,930 Yrs. B. P. The Presumpscot Fm. (marine silt-clay) was deposited primarily during the marine transgression while the dissipating ice sheet was still able to contribute large volumes of melt-water and rock flour to the sea. As the region emerged, sandy outwash of the Embden Fm., derived from the dissipating ice sheet, aggraded over the surface of the Presumpscot Fm. As emergence continued, with the source of outwash possibly removed, the early Kennebec River incised the Embden and Presumpscot Fms. The regimen of the river changed and the coarse gravel of the North Anson Fm., possibly outwash from a late Pleistocene ice cap, aggraded unconformably on the Presumpscot Fm. At present the Kennebec River is degrading the North Anson Fm. (See the geologic cross-section presented in Fig. 1)

The geologic sequence of events, radiocarbon dates in the area and correlation of events of the Maine, Quebec, New Brunswick and Nova Scotia region suggest that the last extensive ice sheet to cover the region dissipated more rapidly in eastern Maine and New Brunswick than in the highlands of New Hampshire and western Maine. The data also suggest that ice persisted in the highlands during the Cary-Port Huron Interstade, perhaps dissipating during the Port Huron-Valders Interstade. These highlands probably later became a center for ice accumulation and radial outflow. This ice cap probably grew synchronously with the main Valders ice sheet to the north, with cirque glaciers on Mt. Katahdin, Maine, and with the ice cap in southwestern Nova Scotia.

Literature dealing with the surficial geology of this region includes Stone (1899), Leavitt and Perkins (1935), Trefethen (1944), Goldthwait (1949), Caldwell (1959), Borns (1963), and Borns and Hagar (in press).

## QUADRANGLE MAPS NEEDED

Waterville, Norridgewock, Anson and Skowhegan.  
Stops are in the Anson quadrangle.

## ASSEMBLY POINT

In Waterville at the Elmwood Hotel.

## TIME

Trip will leave by bus at 8 a. m. sharp.

## ROAD LOG

### Mileage

- 0.0 Elmwood Hotel. Proceed north on Route 104.
- 4.3 Fairfield Center
- 6.4 At Holway Corner go left on Route 139.
- 10.3 Beginning of "The Plains." Gray-blue marine silt and clay (Presumpscot Fm.) overlain by fluvial sand (Embden Fm.).
- 13.6 Buffalos in pasture on right.
- 14.4 Sand dunes, derived from the Embden Fm. by westerly winds, on slope of hill to the right.
- 14.5 Intersection of Routes 139 and 2. Follow Route 2 to the right through Norridgewock.
- 15.0 Intersection of Routes 201A and 2. Follow 201A to right across the Kennebec River. This route post-dates the map. It crosses kame terraces, till and bedrock in this section at an altitude of approximately 260-280 feet. A large esker parallels the river on the opposite side.
- 21.0 Stop #1. "Esker-delta" at Old Point, Madison. This esker can be traced, as a series of segments, from Norridgewock, up the Kennebec River valley to Bingham, a distance of at least 25 miles. It is doubtful that these

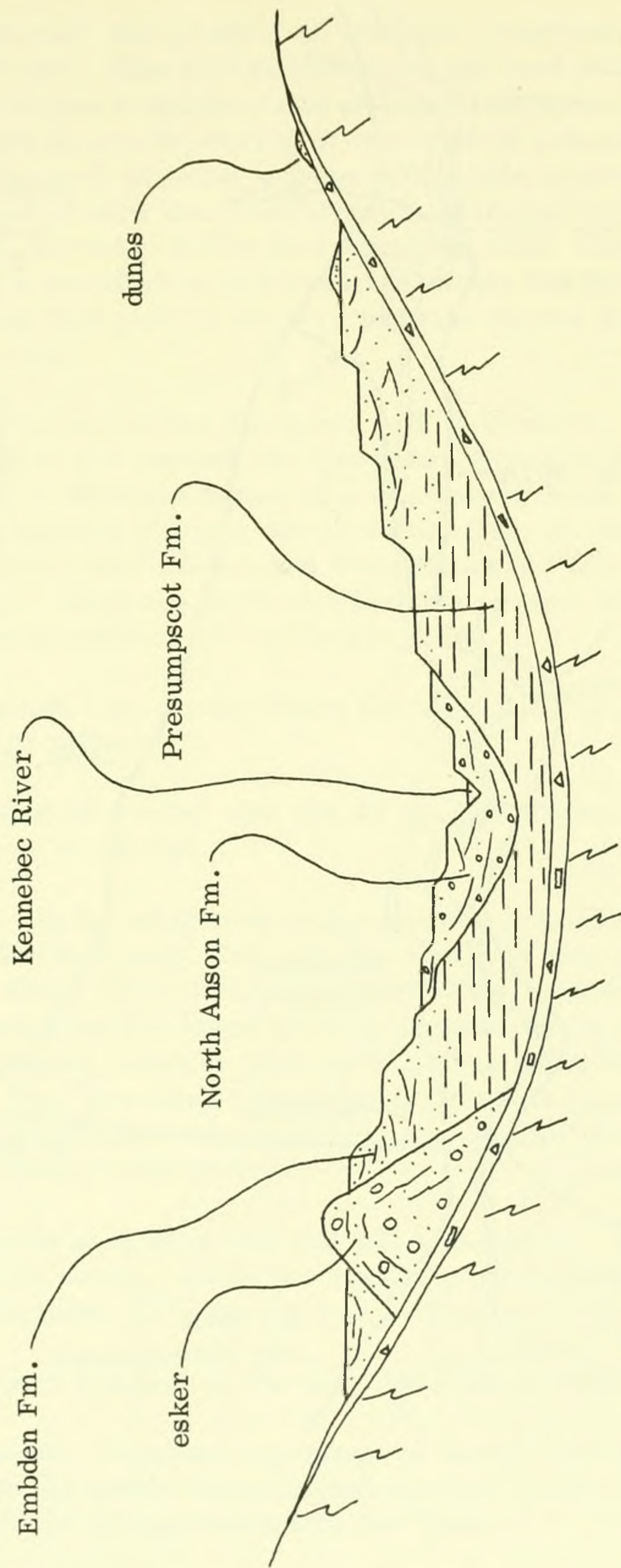


Fig. 1 Generalized geological cross-section of the northern Kennebec River valley, Maine.

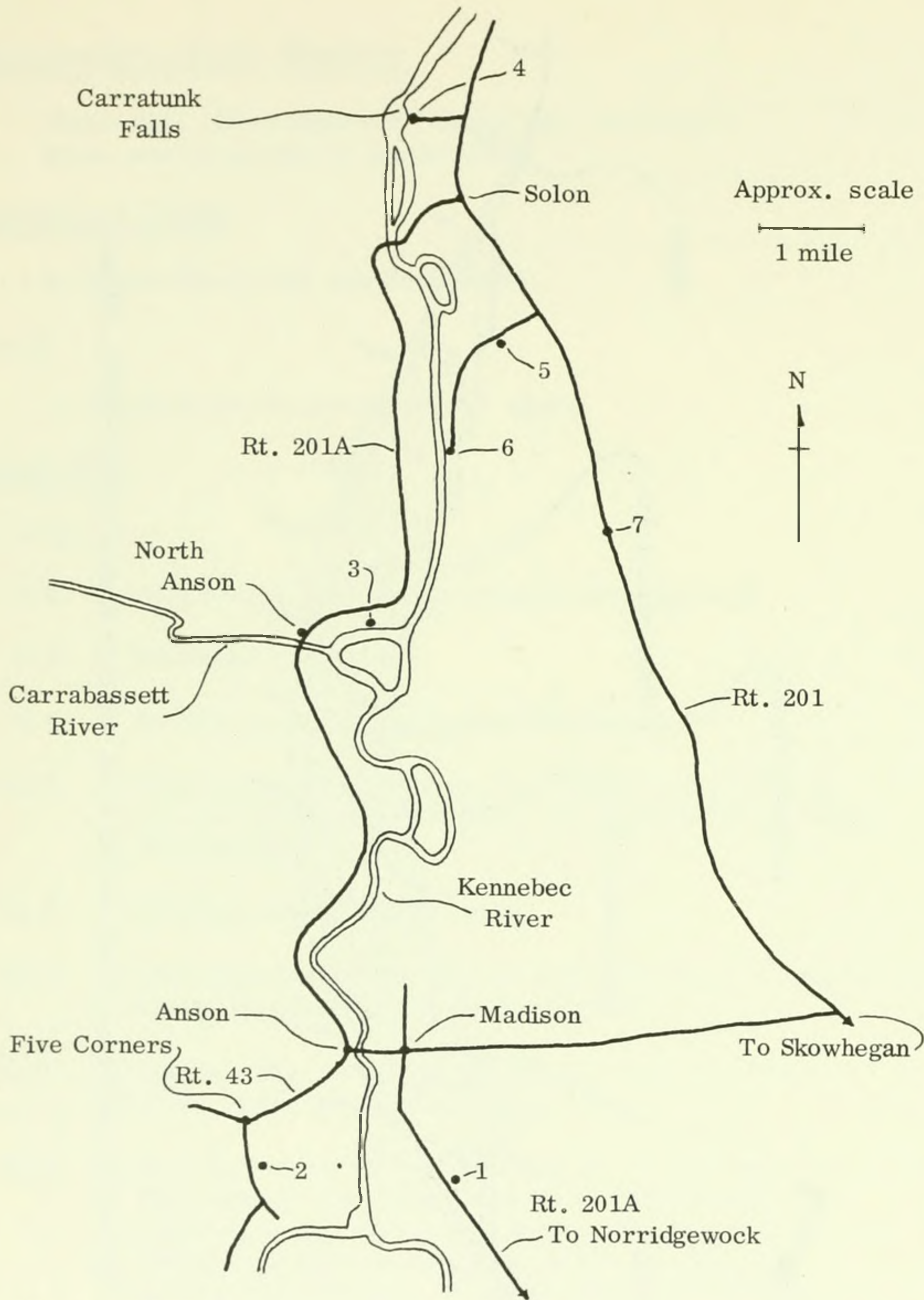


Fig. 2 Index map

segments were the product of a single, continuous glacial river. The gravel mound on the east side of the road has a thickness of at least 180 feet. The mound on the west side of the road is a marine delta composed of sand, cobble and pebble gravel interfingered with the fossiliferous (Macoma calcarea Gmelin ) silt-clay of the Presumpscot Fm. Good exposures would show deformation within the delta suggesting that glacial ice was present during its construction.

- 23.0 Intersection of Routes 201A and 148 at Madison. Follow Route 148 to left across the Kennebec River to Anson. The falls at Madison acted as a temporary base level which controlled the pre-North Anson Fm. depth of incision into the Embden and Presumpscot Fms. upstream. Continue to Five Corners. Route is on depositional surface of the Embden Fm.
- 24.7 Presumpscot Fm., underlying the Embden Fm., exposed on right in valley.
- 24.9 Intersection of Routes 148 and 43 at Five Corners. Take Route 43 to left.
- 25.4 Stop #2 . In the exposure under the powerline, the marine Presumpscot Fm. grades upwards into the fluvial Embden Fm. This transition represents a withdrawal of the sea from its upper limit accompanied by an influx of sandy outwash into the shoaling estuary. The Embden Fm. has been traced upstream into ice-contact heads. The barn on the opposite side of the road rests on till. Back track to Anson.
- 27.2 Intersection of Routes 148 and 201A in Anson. Follow Route 201A north. Benedict Arnold portaged these falls in October 1775 on his way to Quebec.
- 30.9 Note pirated channel of the Carrabassett River on left.
- 32.0 North Anson. Continue up-river on Route 201A. The route travels on the depositional surface of the Embden Fm. at an altitude of approximately 340 feet.
- 32.9 Stop #3 . Follow the power line to the right. This offers a marvelous panorama of the Kennebec River

and its valley. The Embden Fm. at the top of the escarpment grades downward into the Presumpscot Fm. at the base. The upper marine limit in this area is at an altitude of approximately 400 feet and fossil shells (Portlandia glacialis Gray) collected on the shore of Embden Pond were dated at 12,930 200 years B. P. (Y-1477). Proceed up-river on Route 201A.

- 34.8 Note river-cut terrace on right. Proceed up-river upon the Embden Fm. through the town of Embden.
- 39.3 Follow Route 201A across the Kennebec River and into Solon.
- 40.4 Intersection of Routes 201A and 201. Follow Route 201 to the right.
- 41.1 Turn left at Tewkbury's house to Carratunk Falls.
- 41.6 Stop #4 . Lunch. Carratunk Falls. The falls acted as a base level which controlled the pre-North Anson Fm. depth of incision of the Embden and Presumpscot Fms. upstream. Return to Solon and continue downstream along Route 201 on the depositional surface of the Embden Fm.
- 44.2 Follow road to right past cemetery to gravel pit on right.
- 44.6 Stop #5 . Pit in the upper part of the Embden Fm. exposing good fluvial cut-and-fill structure. Leave pit, turn left toward the Kennebec River.
- 45.8 Stop #6 . Coarse gravel of the North Anson Fm. resting unconformably upon the Presumpscot Fm. This is best seen in the riverbank exposure. Backtrack to Route 201.
- 47.6 Turn right on Route 201.
- 47.7 Embden Fm. exposed at top of hill and the Presumpscot Fm. in stream at the base of the slope.
- 50.3 Stop #7 . Aeolian sand, derived by westerly winds from the Embden Fm., deposited upon till. Ventifacts are common in cuts on both sides of the road. Don't take them all! Note dune topography in the field to the left (east) of the road. Proceed south on Route 201.

- 60.2 Beginning of the Skowhegan "plains." The stratigraphy here is the same as "The Plains" in Norridgewock. Follow Route 201 into Skowhegan, across the Kennebec River to the Elmwood Hotel in Waterville.
- 82.6 Elmwood Hotel, Waterville.

#### REFERENCES CITED

- Borns, H. W., 1963, Preliminary report on the age and distribution of the late Pleistocene ice in north central Maine: Am. Jour. Sci., v. 261, p. 738-740
- \_\_\_\_\_, and Hagar, D. J., in press, Late-glacial stratigraphy of a portion of the Kennebec River valley, northwestern Maine
- Caldwell, D. W., 1959, Glacial lake and glacial marine clays of the Farmington area, Maine: Maine Geol. Survey, Spec. Geol. Studies, Ser. No. 3, 48 p.
- Goldthwait, L., 1949, Clay survey: Maine Devel. Comm., Rept. State Geol., 1947-1949, p. 63-69
- Leavitt, H. W., and Perkins, E. H., 1935, Glacial geology of Maine, v. 2: Maine Technol. Expt. Sta. Bull. 30, 232 p.
- Stone, G. H., 1899, The glacial gravels of Maine and their associated deposits: U. S. Geol. Survey, Mon. 34, 499 p.
- Trefethen, J. M., and Trefethen, H. B., 1944, Lithology of the Kennebec valley esker: Am. Jour. Sci., v. 242, p. 521-527