DEGLACIAL EVENTS IN THE EASTERN MOHAWK - NORTHERN HUDSON LOWLAND

by

Robert G. LaFleur
Department of Geology
Rensselaer Polytechnic Institute
Troy, New York 12181

Introduction

The Mohawk Lowland extends some 90 miles east from Rome to the modern Mohawk's junction with the Hudson River at Cohoes (Figure 1). Woodfordian ice advancing south and westward through the Hudson-Mohawk Lowland emplaced the Mohawk till and formed an extensive drumlin field on older drift. A variety of deglacial events included lake development, glacial readvances, large-scale Great Lakes through-drainage, and subdued river flow. This history becomes complex to the east because pulses of the Oneida lobe alternating with lake outbursts in the western Mohawk basin influenced discharges into Lakes Albany and Vermont in the Hudson Lowland (LaFleur, 1975; Hanson, 1977).

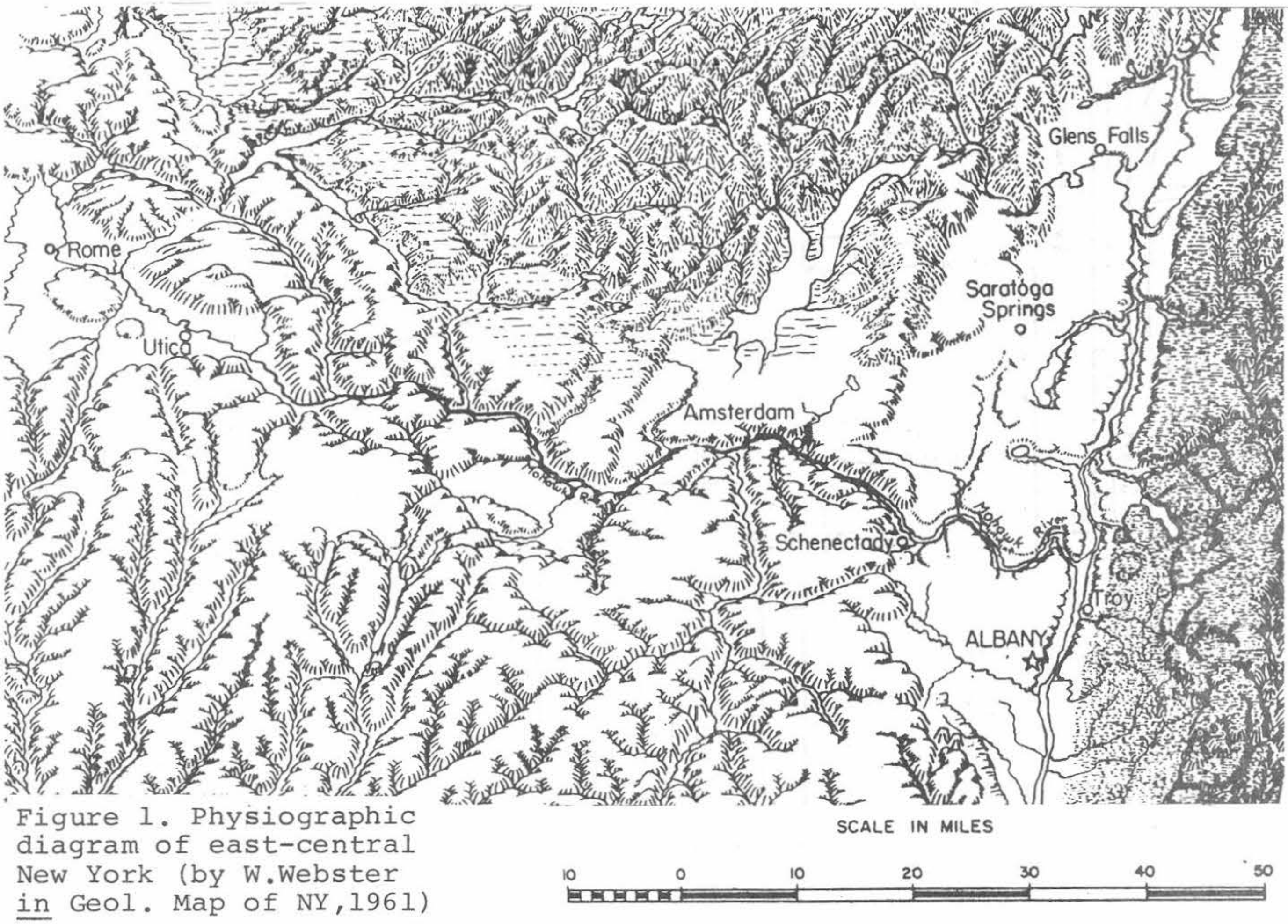


Figure 1. Physiographic diagram of east-central New York (by W.Webster in Geol. Map of NY,1961)

FIELD TRIP 6B

Tribes Hill
Fort Hunter
South Amsterdam
Stone Arabia
Nelliston
Fonda Reservoir
Fultonville
Palatine Bridge
MOHAWK
RIVER
Randall
Minaville
Marshville
Rural Grove
Charleston
Ames
Creek
Browns Hollow
Oak Ridge
Burtonsville
Leesville
Sharon Springs
Charleston Four Corners
Braman Corners
Duanesburg Reservoir
Bear Swamp
Sharon
Carlisle
VALLEY
TURNPIKE
Esperance
Central Bridge
SCHENECTADY COUNTY
SCHOHARIE COUNTY
King Creek
Seward
Hyndsville
Cobleskill
West Richmondville
PETERSBURG MT
Schoharie
Breakabeen
West Berne
WEST MT
Triangle Lake
Crystal Lake
Broome Center
BLENHEIM MT
Gilboa
Conesville

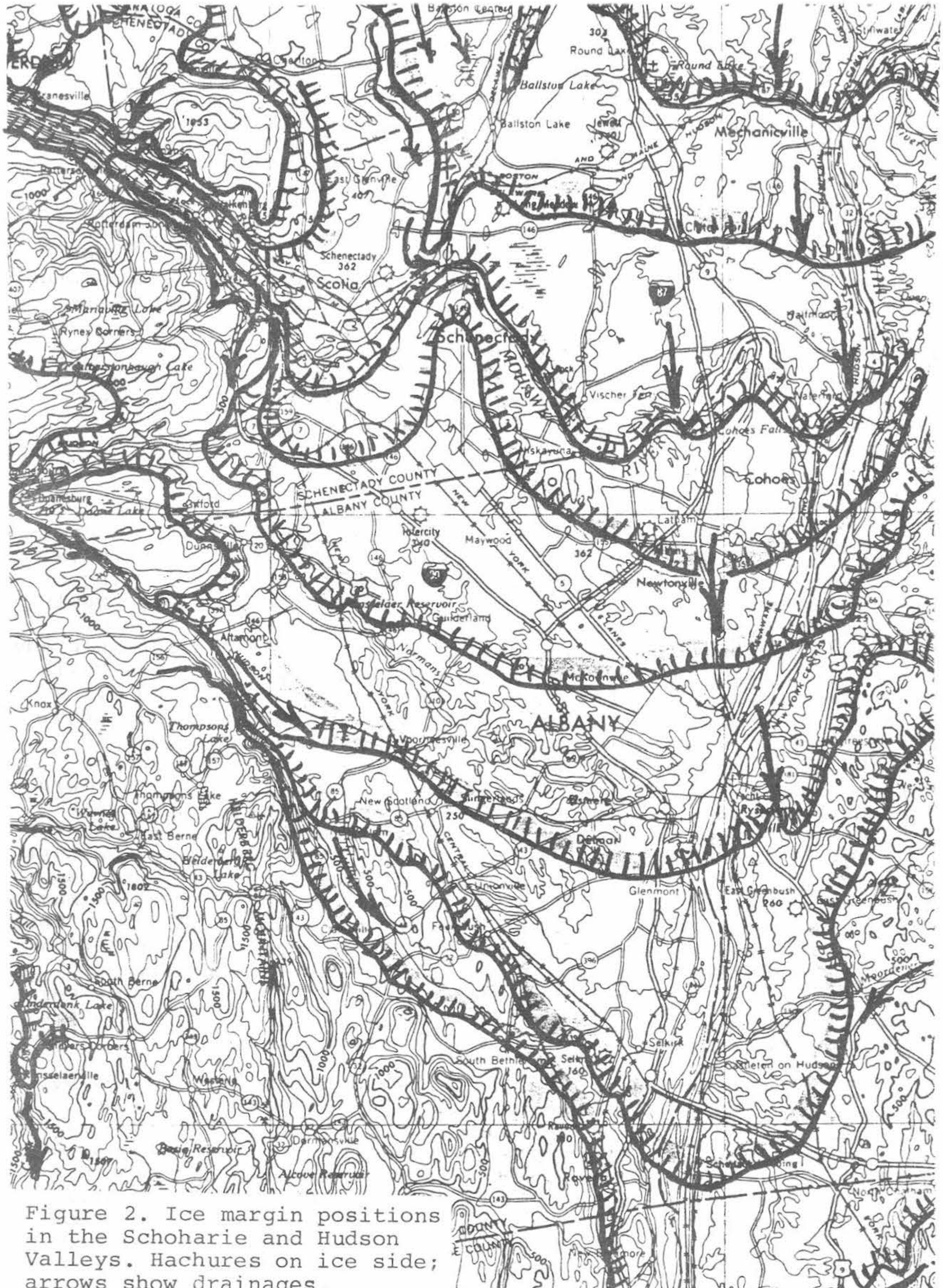


Figure 2. Ice margin positions in the Schoharie and Hudson Valleys. Hachures on ice side; arrows show drainages.

A series of active ice-margin positions, recognized in the Schoharie Valley, are associated with the development of glacial Lake Schoharie (LaFleur, 1969). See Figure 2. In the Hudson Lowland, well-defined, progressively younger ice margins defended northward-expanding Lake Albany which maintained an elevation of about 330 feet at the latitude of Troy. However, tracing of ice-border positions westward through the Mohawk Lowland has proven difficult. Because the broad interfluve of the Helderberg upland did not receive ice-contact deposits in abundance, it is even difficult to secure correlations over short distances between Hudson and Schoharie valley ice margins. Rather than try to achieve a regional synthesis by using ice-front positions, our purpose here is to suggest relationships between high and low Mohawk discharges and lake stages, based on channel and terrace development and lacustrine stratigraphy.

Lake Amsterdam

At many localities west of Amsterdam, Mohawk till is overlain by up to 50 feet of limy silt and clay rhythmites. There is no evidence that the Mohawk till was eroded by eastward-flowing water or subaerially exposed prior to clay deposition. Presumably Lake Amsterdam accompanied deglaciation of the axial portion of the Mohawk Lowland while ice dammed its eastern end near Schenectady (Figure 3). Lake Amsterdam may have extended west to Little Falls and probably consisted of disjointed water bodies separated by isolated ice blocks and topographic highs. Although an ice surge of about one mile at South Amsterdam deformed and smoothed clay onto the stoss end of a Mohawk till drumlin, it does not appear that the lake was created by a readvance. The exit for overflowing Lake Amsterdam water is suggested at 500 feet at West Hill, west of Schenectady where a broad-floored, terraced and beheaded channel, cut in till and bedrock, carried water marginal to ice from the north and west onto bare ground and then over Hudson lobe ice to the south. This drainage contributed to the Voorheesville and Guilderland kame terraces marginal to Lake Albany. Active ice also occupied the West Hill outlet, and the same minor readvance cited at South Amsterdam may be responsible for a single thin till ridge 15 feet high and 1000 feet long on the West Hill channel floor. These features may be easily seen from the Thruway at milepost 161 just east of the Rotterdam Junction exit.

The extinction of Lake Amsterdam may have been caused by earliest Great Lakes drainage from the west [unless the Mohawk glaciation proves to be as young as Lavery or Hiram (LaFleur, 1979)]. According to Mörner and Dreimanis (1973), this discharge could have occurred during the Erie Interstade when Lake Leverett drained eastward. Whether this discharge occupied the West Hill outlet is not certain, but the outlet is large enough to accommodate major flow. Alternatively, a small ice plug in the eastern Mohawk could have suffered final deterioration under Great Lakes discharge, quickly lowering Lake Amsterdam by 90 feet to the next stable elevation provided by a till and bedrock sill at Cranesville. Two small deltas near Hoffmans at 410 feet record the final presence of ice in the eastern Mohawk.

Fonda Wash Plain

The Fonda wash plain at about 420 feet, recognized by Brigham (1929), consists of 5 to 10 feet of sand and pebble gravel overlying Lake Amsterdam clay (Figure 4). Sand terrace remnants can be traced westward from Cranesville to the mouth of East Canada Creek near St. Johnsville. The eastern Mohawk Valley was deglaciated by this time, but there was not accompanying high discharge from the west. The fine grain size of the sand plain and the abundance of locally derived lithologies suggest derivation from eroding uplands nearby, particularly from Schoharie Creek draining Lake Schoharie and from the Cayadutta draining the lower Sacandaga Basin. Kame delta deposits along the Lake Albany ice margin at Waterford and Niskayuna appear equivalent in age.

Schenectady Delta

Northward recession of the Hudson lobe past Schenectady permitted the Mohawk to discharge directly into Lake Albany for the first time (Figure 5). Dissection of the Fonda wash plain and Lake Amsterdam clay provided fine grained sediment for delta construction. Still this was not a time of abnormally high discharge through the Mohawk but rather a continuation of modest flow typical of the Fonda wash plain. North of Schenectady small deltas were built into Lake Albany at East Glenville by the Alplaus Kill, at this time an ice-margin stream. The Hoosick River constructed gravel terraces at 360 feet east of Schaghticoke, while at Halfmoon along the ice margin a kame delta complex formed in Lake Albany. The first of several detached ice blocks, all having importance in lake drainage history, was abandoned at Niskayuna.

Hoosick Delta and Willow Glen Kame Delta

Further recession of the Hudson lobe margin north of Mechanicville provided the location for the Willow Glen kame delta complex (Figure 6). As the Mohawk delta continued to build at Schenectady, the ice margin receded northward far enough to permit the Hoosick River to build a small sand delta in Lake Albany. Considering the size of the Hoosick drainage basin, it is surprising that the Hoosick River did not build a larger delta into Lake Albany. Other tributaries draining the Taconic Mountains behaved similarly in Lake Albany time. The western New England uplands may have remained ice-covered, denying a sediment supply.

Continued northward recession of the Hudson lobe margin toward Glens Falls was accompanied by lowering of Lake Albany (Hanson, per comm.). The reason for the drop in lake level is not apparent. Discharge from the Mohawk continued to be modest through the duration of Lake Albany, and the Hudson lobe at this time shows little evidence of activity.

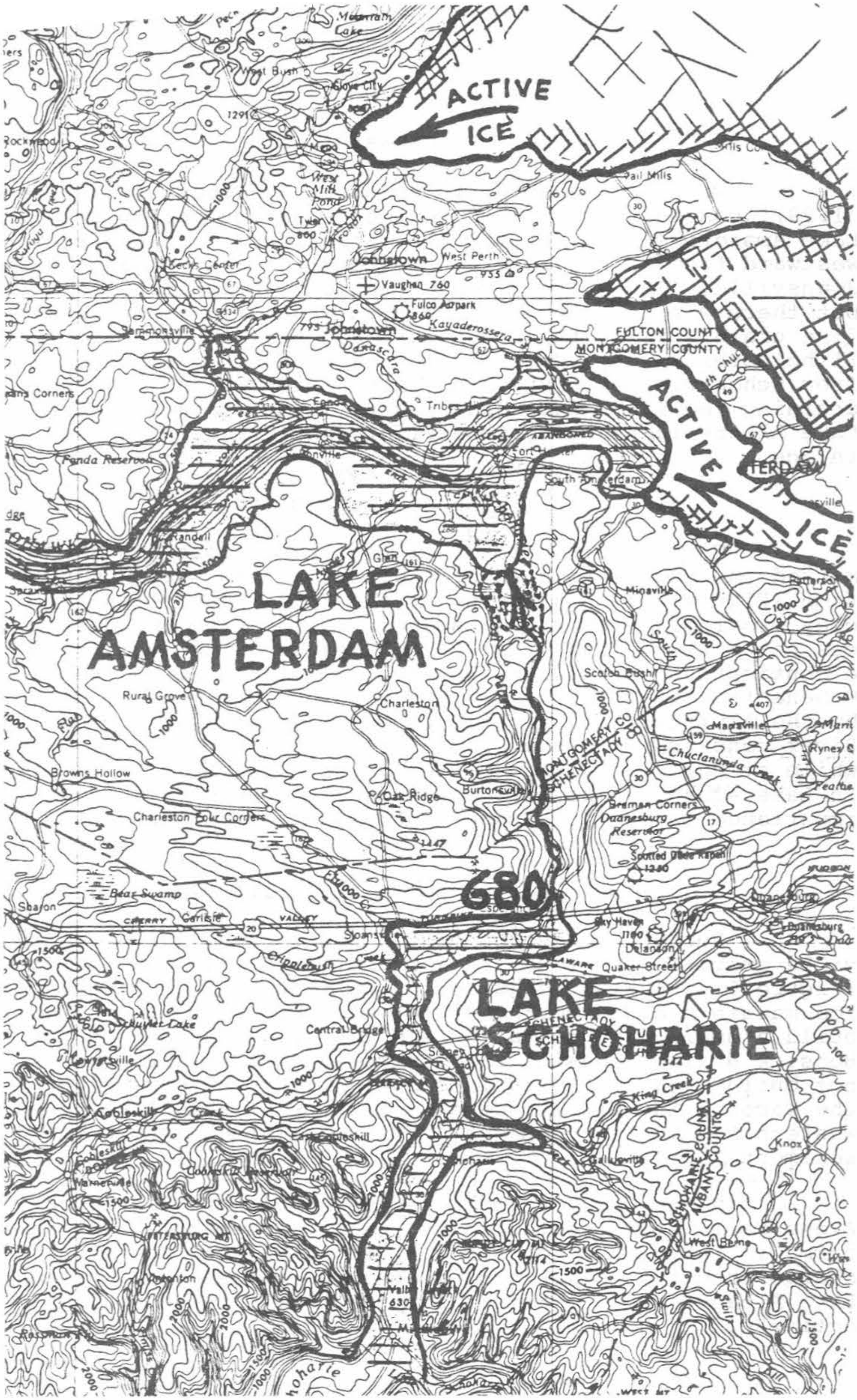
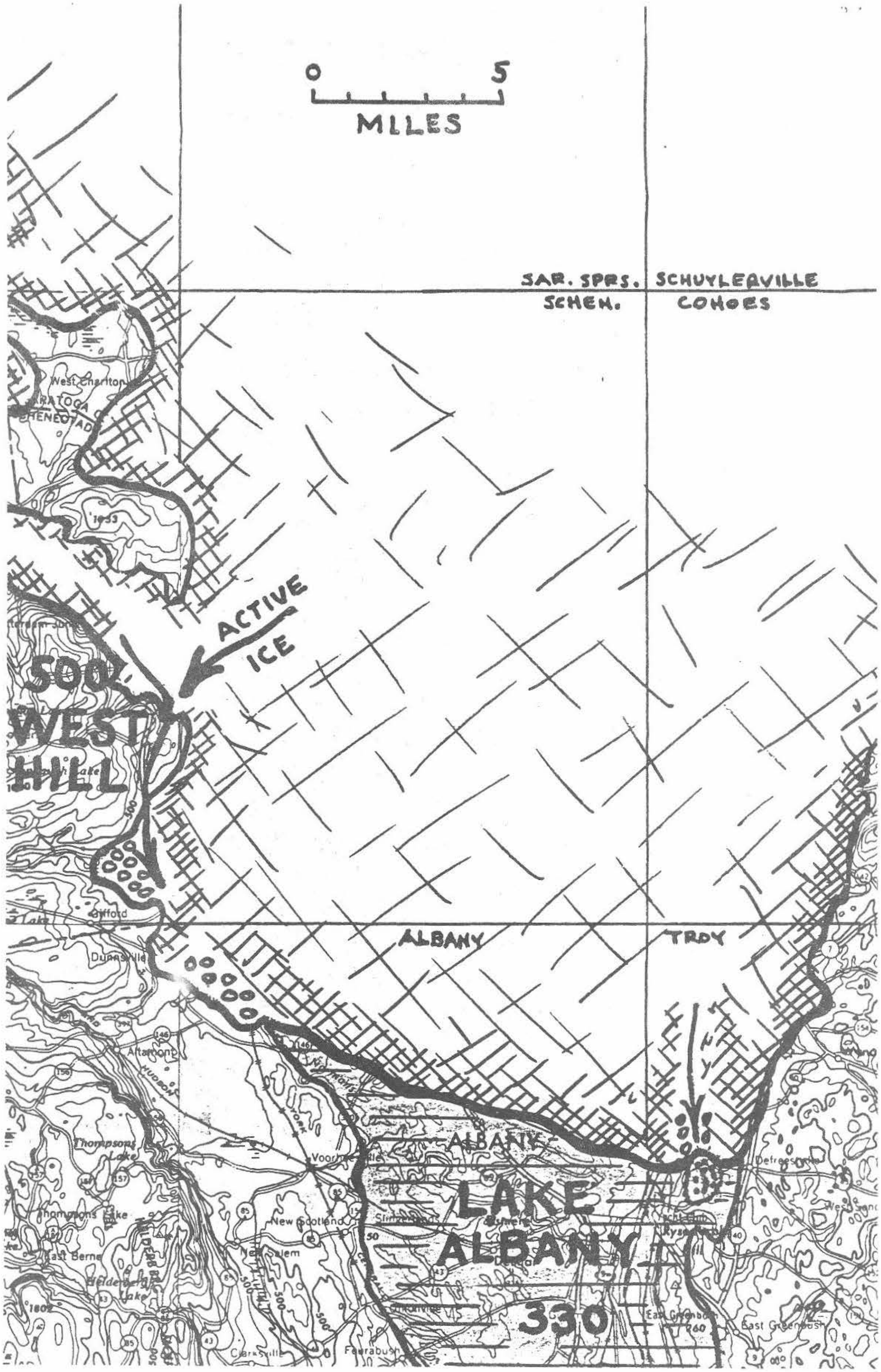


Figure 3. Active ice margin in Lake Amsterdam. Numbers are feet above sea.


0 5
MILES
SAR. SPRS.
SCHUYLERVILLE
SCHEN.
COHOES
ACTIVE ICE
500
WEST HILL
ALBANY
TROY
LAKE ALBANY
330
West Charlton
Gifford
Duanesville
Altamont
Thompsons Lake
Voorheesville
New Scotland
New Salem
East Berne
Helderberg Lake
Clarksville
Feura Bush
Defreestville
East Greenbush

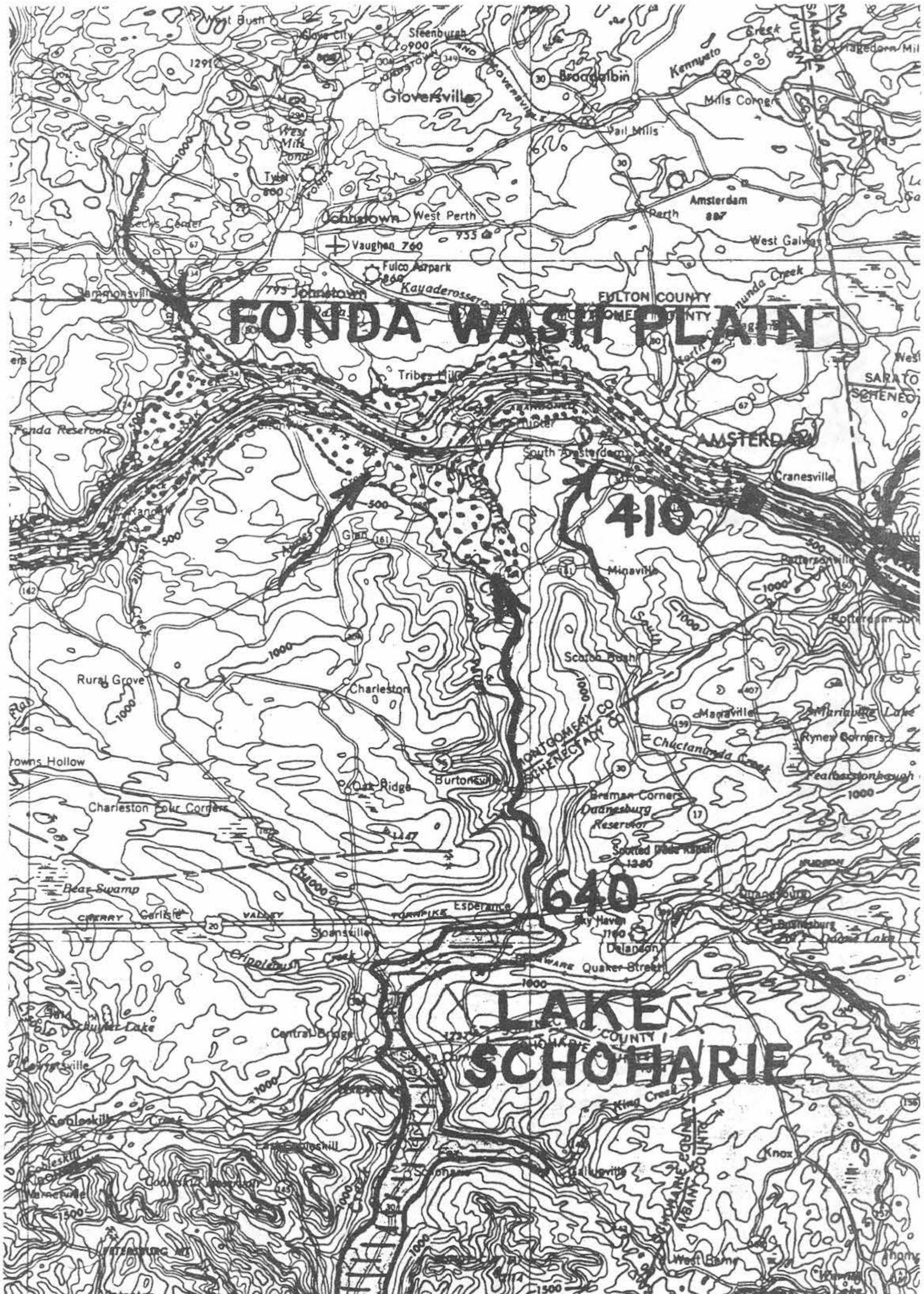
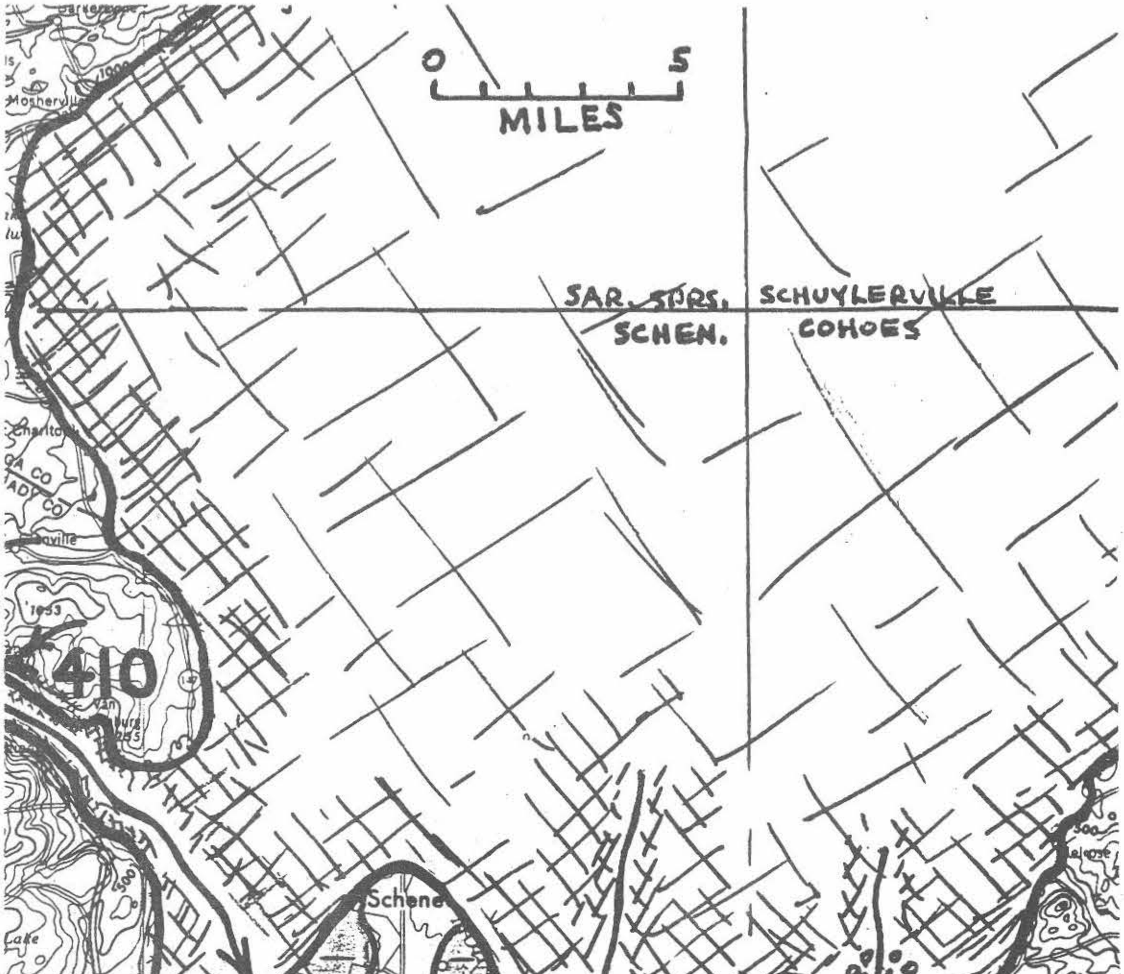


Figure 4. Fonda wash plain and final
ice plug in eastern Mohawk Valley.


0
5
MILES
SAR. SPRS.
SCHUYLERVILLE
SCHEN.
COHOES
410
SCHENECTADY COUNTY
ALBANY COUNTY
Cohoes
Troy
LAKE
ALBANY
330
ALBANY
New Scotland
Altamont

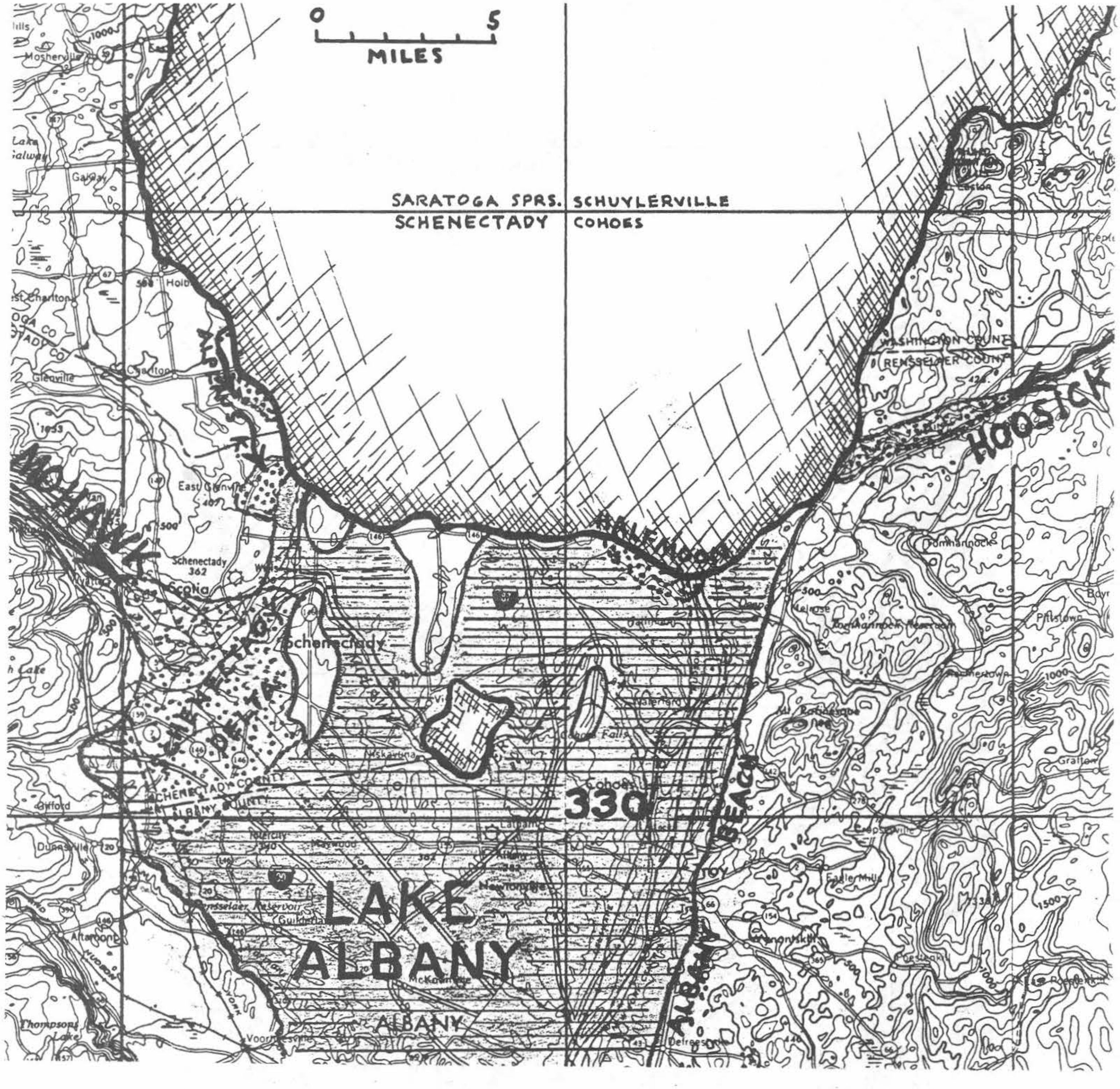


Figure 5. Ice front position during early deposition of Schenectady delta.

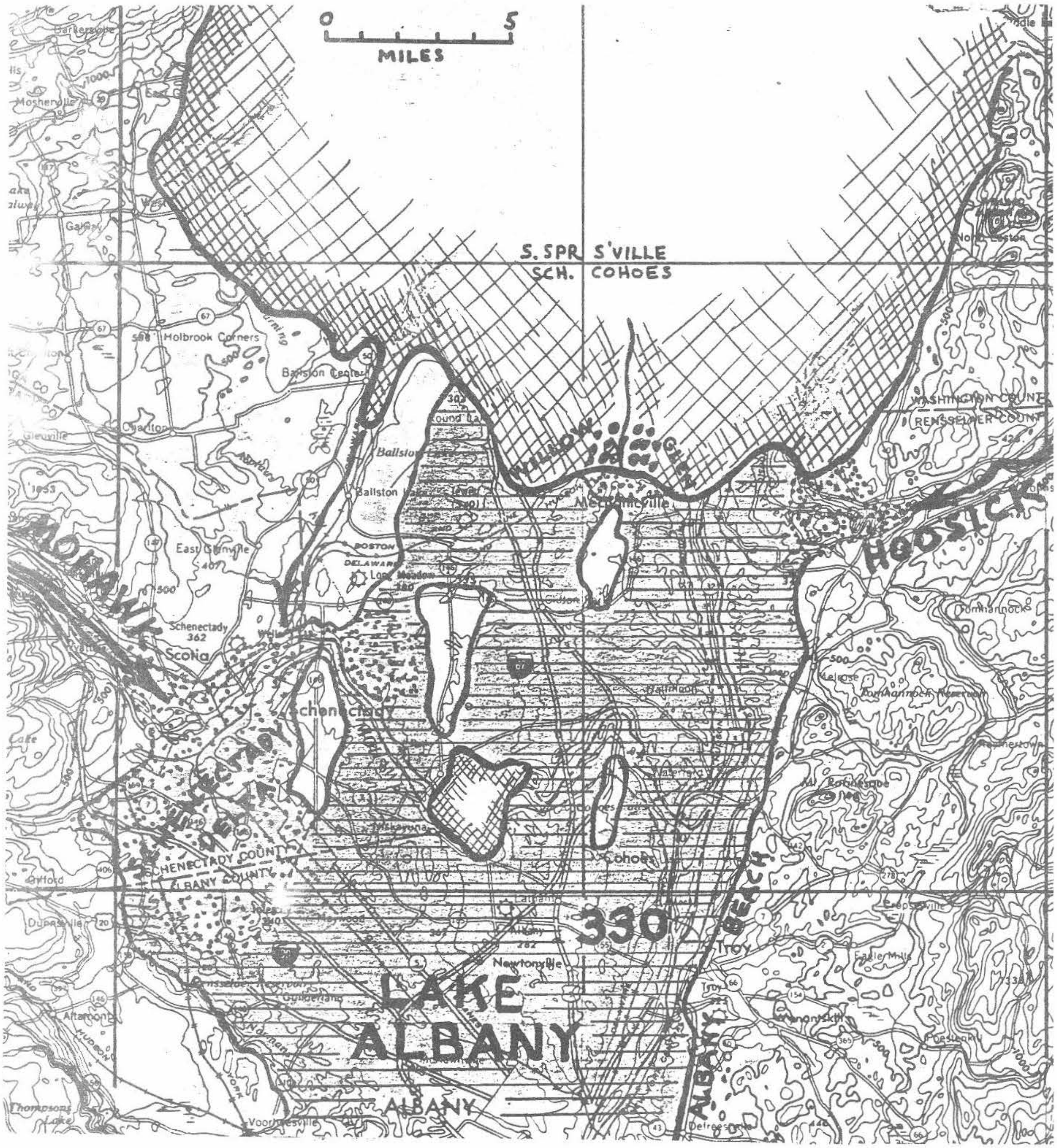


Figure 6. Ice front position at time of Willow Glen kame delta and Hoosick delta.

SACANDAGA
RESERVOIR
Sacandaga Park
Cranberry Creek
Northampton
North Broadalbin
Caroga Lake
Peck Lake
Riceville
Gloversville
Broadalbin
Kennyetto Creek
Hagedorn Mills
Vail Mills
Perth
Amsterdam
West Perth
Vaughn 760
Fulco Airpark
Johnstown
Kayaderosseras
FULTON COUNTY
MONTGOMERY COUNTY
North Chuctanunda Creek
Hagaman
Tribes Hill
Fort Hunter
South Amsterdam
AMSTERDAM
Cranesville
Glen
Minaville
Scotch Bush
Rural Grove
Charleston
Oak Ridge
Burtonville
Charleston Four Corners
Braman Corners
Bear Swamp
Esperance
Sloansville

Figure 7. Base map (right half) of Figures 8, 9, 10, and of Mohawk Valley west to Randall.

Lake Quaker Springs

Partial extent of the successor to Lake Albany, Lake Quaker Springs, some 50 feet lower, is indicated on Figure 8 (see Figure 7 for base map details of Figures 8, 9, 10). This lake stage was defended on the north by ice receding through the upper Hudson and Champlain Lowlands. In addition to the ice block detached in Lake Albany near Niskayuna, others at Ballston Lake, Round Lake and in the Saratoga Lake Basin prevented immediate northward diversion of the Mohawk River from Schenectady, and required its flow to pass over a rock sill at Rexford where a channel was cut in Lake Albany sand at 320 feet. Discharge past the lingering Niskayuna ice block joined Lake Quaker Springs at the site of the present Albany Airport. Erosion of the exposed Schenectady delta by the Mohawk continued as did dissection to 300 feet by the Alplaus Kill of the East Glenville deltas. Discharge of the Mohawk during this time appears to be no greater and perhaps even less than the flow that deposited the Schenectady delta in Lake Albany. Extensive deltas of the Hoosick and Battenkill, built to a Quaker Springs Lake level of 300 feet, suggest more active deglaciation of the Taconics than previously.

Mohawk Valley Gravels

West of Schenectady, massive, well-rounded cobblestone gravels up to 40 feet thick are found in separated masses at Randall, Fort Hunter, Rotterdam Junction, and Scotia. Rich in western Mohawk basin "bright" lithologies, these gravel units have a grain size and thickness much greater than one might expect to find near the end of a river of low gradient and nominal discharge. The source of these gravels appears to be a 50-foot-thick gravel unit which lies beneath tills, and is now exposed along Route NY 5, one to three miles east of the Little Falls plunge basin. The transport history of these gravel masses requires at least three events involving high discharge from unconfined glacial lakes west of Rome. The first discharge eroded the gravel valley fill at Little Falls and reworked it to a new location at Randall. The second discharge reworked part of the Randall gravel, and deposited it as a valley fill between Rotterdam Junction and Scotia. A third discharge dissected the Scotia gravel and lowered the western half of the deposit to an elevation of 250 feet at Rotterdam Junction.

Summit elevation of the gravel mass at Randall lies at 350 feet, too low for correlation with Lake Albany. Lake Quaker Springs did not receive a Mohawk River delta of any consequence, so it would seem the first of these outbursts occurred late in Quaker Springs time, and may actually have caused the lake to lower.

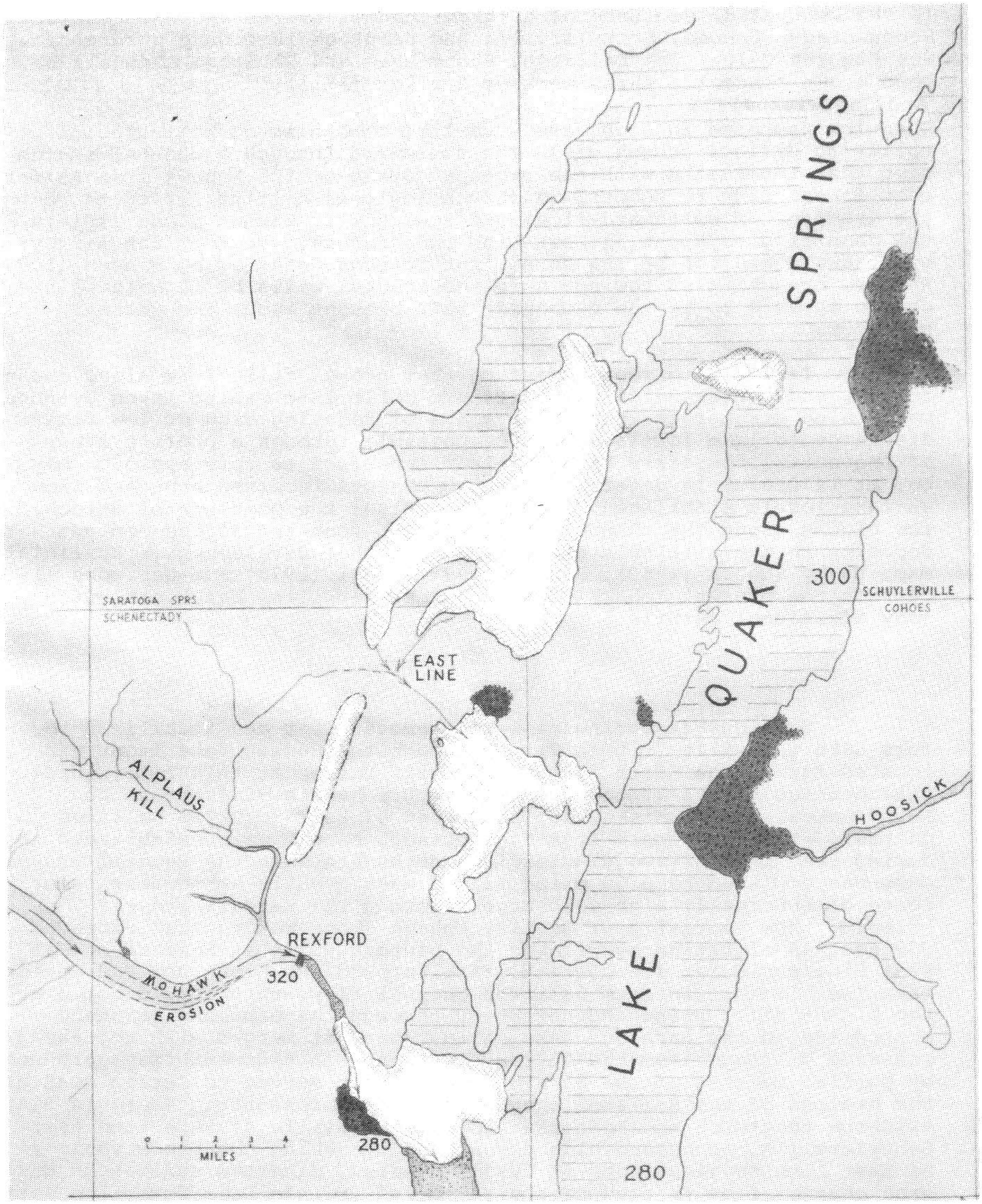


Figure 8. Drainage configuration during Lake Quaker Springs.

Channel Systems

Important to the development of Lakes Coveville and Fort Ann is the occupation sequence of a three-channel system shown on the Schenectady, Cohoes, Schuylerville and Saratoga 15-minute quadrangles. See Figures 7-10. The Ballston, Round Lake and Saratoga channels have been known since the early work of Stoller (1911), Fairchild (1912) and Chadwick (1928).
Chadwick proposed an elaborate wave-like mechanism of post-glacial uplift to deflect Mohawk discharge southward through a channel succession that terminated with the present course of the Mohawk from Rexford near Schenectady to Cohoes. Although regional tilting served to reduce the gradient of northward-flowing discharge, it cannot alone explain the channel diversions at East Line and Rexford. Neither can piracy by headward erosion be the cause, for reasons detailed by Hanson (1977). Rather, breaching of low spots in the channel walls by high-level discharge appears to be the mechanism that brought about the channel sequence.

If it is correct to assume that gravel fills form along channel routes, and coarse deltaic deposits are built into waning lakes by abnormally high discharges, then some means of relating high or low river discharge to lake levels should be possible through a profile study of sequential temporary base levels. Imperfect as this approach may be, it is useful in determining which channel received abundant flow as lake levels stabilized, then fell. Also, the presence of detached ice blocks along the channel routes adds a sequence of ice-contact deposits to the available evidence for channel development. Surficial mapping by Schock (1963), Hanson (1977), Dahl (1978) and DeSimone (1978), between the present Mohawk River and Schuylerville, has contributed many additional details.

Lake Coveville

Lake Quaker Springs lowered some 50 feet and stabilized to form Lake Coveville (Figure 9). Although the Hudson lobe front was located far to the north in the Champlain Valley at this time, three detached ice blocks lingered in the future basins of Saratoga and Round Lakes, and at Niskayuna, southeast of Rexford. The Ballston Channel, extending north from Schenectady, became well established during the first of two glacial lake outbursts when the Randall gravel mass was emplaced some 30 miles to the west. While subsequent recurrence of abnormally high discharge reworked the Randall gravels bringing them to rest near Scotia, Mohawk flood waters that exceeded 300 feet in elevation overflowed the bedrock sills at Rexford and at East Line emplacing ice-contact gravel around the Niskayuna and Round Lake ice blocks. Interim Ballston channel flow, which could not overtop either sill, proceeded northward through the Drummond channel, around ice in the Saratoga Lake basin, where it merged with the Kayaderosseras drainage from the Adirondack front. A sediment trap, produced by partial melting of the Saratoga ice block, served to retain most of the bedload of the Ballston channel and Kayaderosseras. There is little evidence that much sediment reached Lake Coveville at this time near Schuylerville. A second high discharge, breaching the black shale sill at East Line to elevations of 290' and below, diverted sufficient Ballston channel flow to produce a sizable influx into Lake Coveville south of Mechanicville. Dissection of the Lake Quaker Springs Hoosick River delta supplied additional sand there from the east. Some southward current flow in Lake Coveville is suggested by the sand distribution. At Rexford, however, the Schenectady sandstone cap was persistent. Little evidence for discharge into Lake Coveville at Cohoes is found.

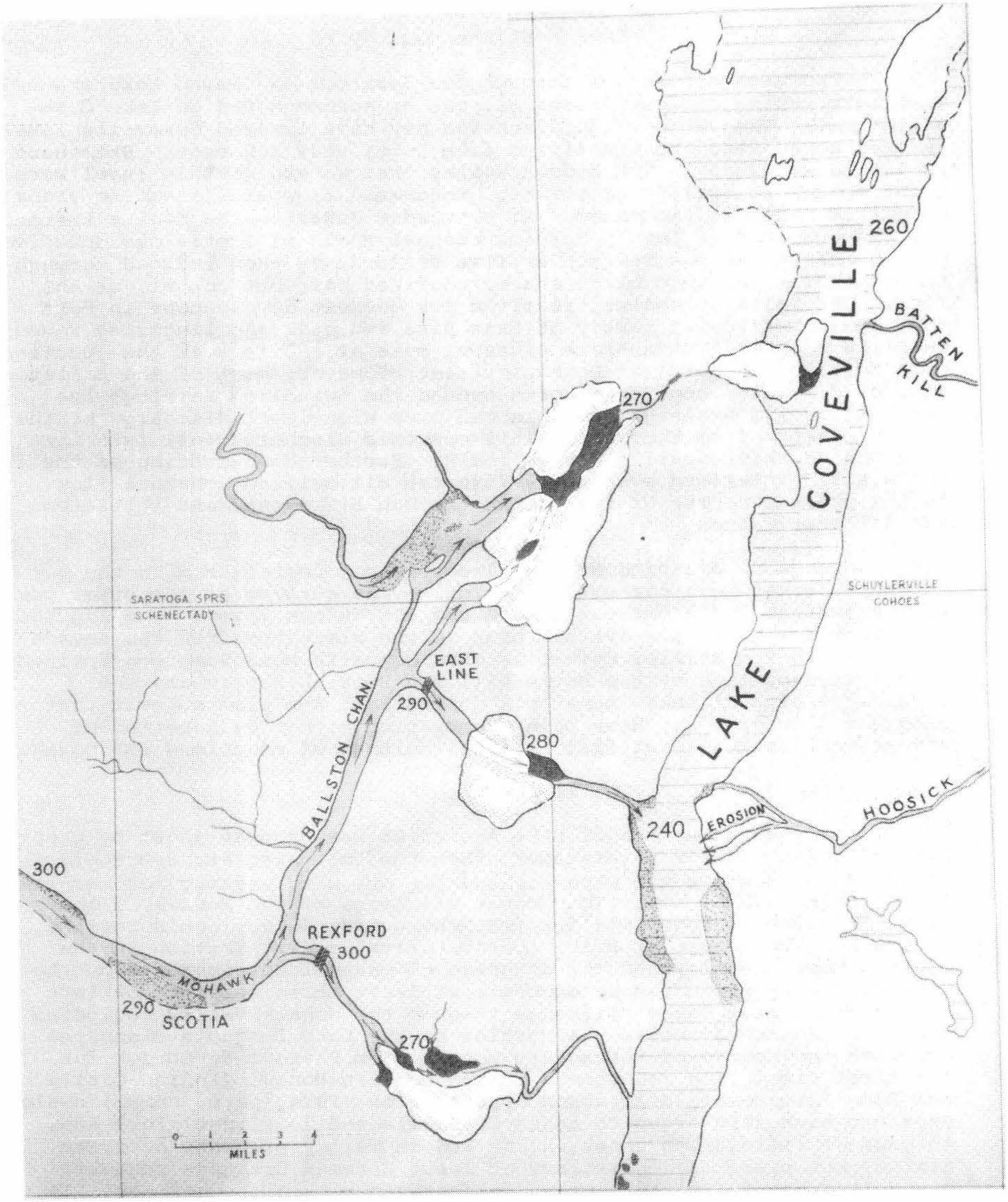


Figure 9. Drainage configuration during Lake Coveville.

Lake Fort Ann

Two high discharges through the Saratoga and Round Lake channels, with intervening nominal discharge, can be accommodated in Lake Coveville time. The second high discharge may have lowered Coveville level as much as 80 feet and stabilized lake level near 160 feet. But there is little evidence in the Hudson Valley that waters at this level were quiet enough to qualify as a lake. Southward flow sufficient to erode Coveville sands is indicated. At Rotterdam Junction the Scotia terrace was reduced some 40 feet. Harding channel north of Scotia was occupied by the Mohawk and the bedrock sill at Rexford, by then reduced through the sandstone cap into black shale, confined most but not all of the flow. The Ballston channel received its deepest development in Fort Ann time, overflowing partly at East Line and over the lingering Round Lake ice block to concentrate a gravel mass at 160 feet at the junction with Fort Ann "River," at Mechanicville. However, most of the Ballston channel discharge continued north around the dwindling Saratoga ice block where its drainage was enhanced by a high-level discharge of the Kayaderosseras from the west. This combined discharge fell into Lake Fort Ann at the Coveville plunge basin. Further down-cutting of the shale sill at Rexford eventually diverted all Ballston channel flow to the present course of the Mohawk through Niskayuna, and initiated the falls at Cohoes.

Eastward draining of Lake Iroquois may correlate with the latest, southernmost channel formation -- the cutting of the upper part of the bedrock gorge between Cohoes and the Hudson River. See Figure 11. Note again (Figure 10) the high-volume discharge from the Kayaderosseras eroding earlier Coveville sand deposits near Saratoga Springs. Severe down-cutting by the Battenkill and Hoosick Rivers and the sudden draining of Lake Tomhannock during Fort Ann time suggest that Iroquois discharge may have been accompanied either by a period of exceptional regional rainfall or final meltout of an upland ice cover.

Timing

If the extinction of Lake Amsterdam was brought about by Great Lakes discharge (Erie Interstade), then the following Pt. Bruce glacial stade is correlative not with ice advance but with wasting ice margins in northern Lake Albany. The modest discharge of the Mohawk following Lake Amsterdam, responsible for the Schenectady delta, could reflect Oneida lobe readvance at Rome. Coarse gravel redistribution in the eastern Mohawk Valley and the sequence of channel developments on the exposed Albany plain can accommodate at least three episodes of late Woodfordian Great Lakes discharge through the Mohawk Valley including draining of Lake Iroquois. A portion of the Lake Iroquois discharge occupied the course of the modern Mohawk from Rexford to Cohoes for the first time. Ice readvances in the western Mohawk (Indian Castle and Rome (Iroquois), diagrammed by Fullerton (1974, pers. comm.) could separate high discharges to Lakes Coveville and (earliest) Fort Ann. Absence of radiocarbon dates in the Hudson Valley prevents accurate timing, but there is consistency at least between drainage requirements, and channel formation and lake stages.

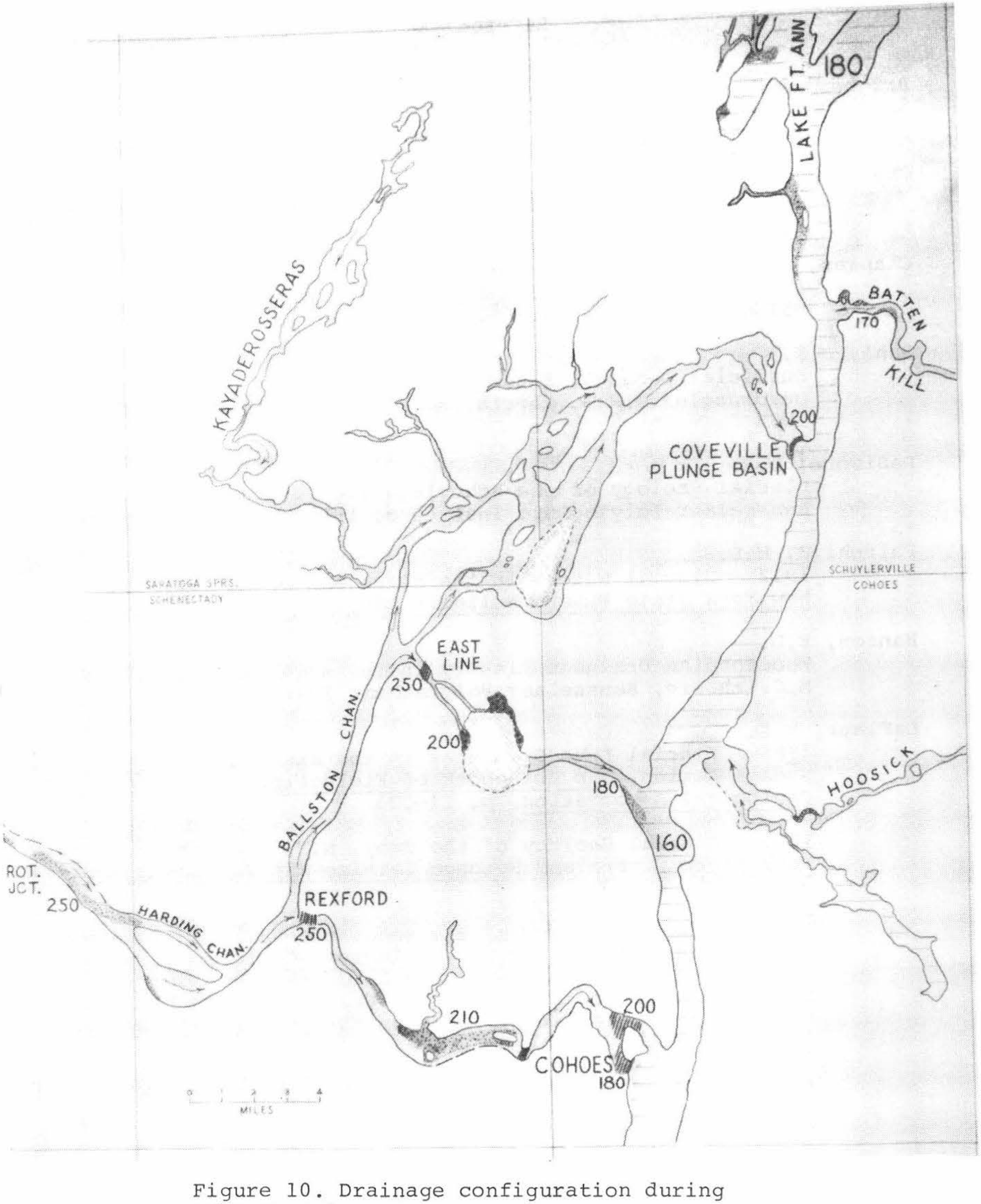


Figure 10. Drainage configuration during
Lake Fort Ann.

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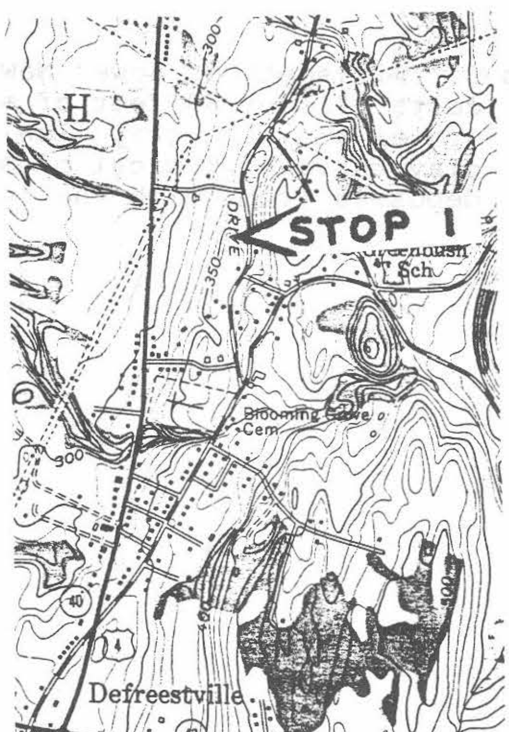
Selected Localities

Stop 1. Lake Albany 330-foot beach. West of Bloominggrove Rd., one mile north of Defreestville, Troy South quad. Reworked kame terrace gravels, berm, beach pond rhythmites.



(The remaining stops are all on the west half of the Cohoes 15 min. quad, and are located on Figure 12.)

Stop 2. Cohoes Falls. Gorge of the Mohawk River is cut in folded Ordovician shale. Nick-point marks post-Iroquois falls recession, about 2000 feet, from former point of upper gorge intersection with Fort Ann waters in the Hudson Valley. (Figure 11.)

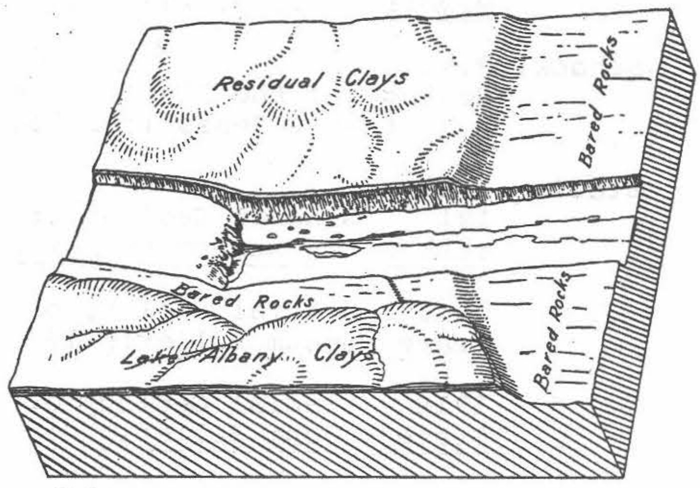


Figure 11. Block diagram by Stoller (1918) showing upper and lower gorge of Mohawk at Cohoes.

Stop 3. Pit south of Lower New Town Rd. in Lake Albany Halfmoon kame delta. About 60 feet of section shows interbedded clinoform gravel and blue-gray flow till, fining upward to sand and silt-clay varves. Typical of south-facing ice-edge lacustrine deposits from which the ice recedes northward. See Figure 5.

Stop 4. Coveville 240-foot sand terrace, inset in Albany clay, and fed by discharge through Round Lake channel into Lake Coveville at Mechanicville. See Figure 9.

Stop 5. Willow Glen kame delta; D.A.Collins pit. About 100 feet of section shows black shale overlain by cemented gravel and sand and blue-gray boulder till, in turn covered by clinoform, locally-deformed pebble gravel, sand, and Albany clay. Is the cemented gravel pre-Mohawk, or does the entire section show only a readvance into Lake Albany, followed by ice recession?

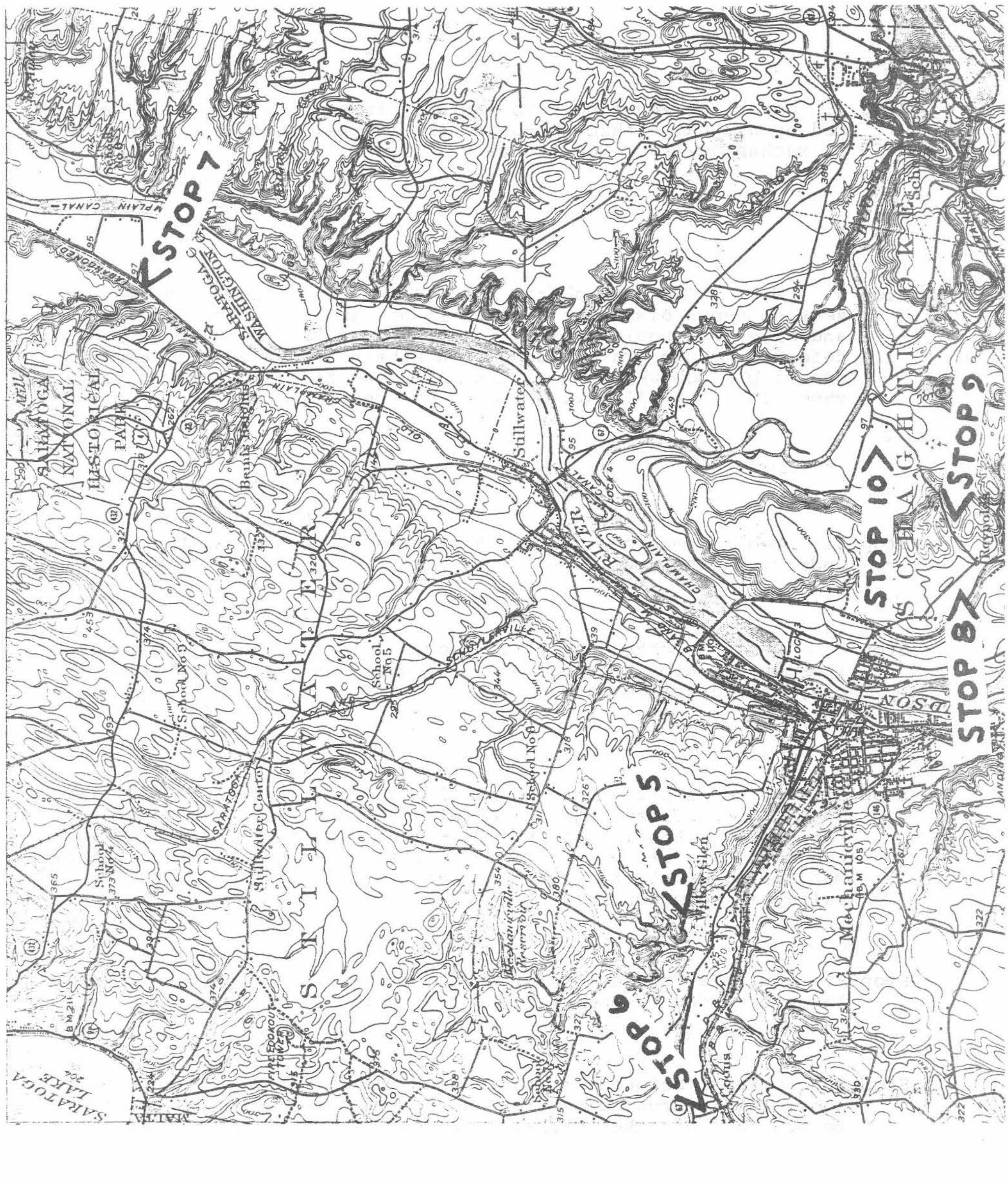
Stop 6. Coons Crossing. Round Lake terraced channel with modern underfit Anthony Kill.

Stop 7. Bemis Heights clay pit. About 55 feet of section exposes ice-contact Albany gravel and clay overlain by Quaker Springs clay and Coveville sand.

Stop 8. Reynolds pit. Late Coveville 200-foot terrace is underlain by 5-15 feet of fluvial gravel with abundant Taconic lithologies derived from Hoosick basin. Flow sense is to the south. Beneath the Coveville gravel, 15 feet of Albany clay overlies 15 feet or more of ice-contact gravel and sand containing mainly Hudson valley lithologies.

Stop 9. Gullies eroded in distal end of Quaker Springs Hoosick delta, later beheaded by Hoosic River dissection of delta.

Stop 10. Several Holocene terraces near modern stream inside eroded Hoosic delta; road climbs eastward over older terraces related to drainage of Lakes Quaker Springs, Coveville and Fort Ann.


STOP 5
STOP 6
STOP 7
STOP 8
STOP 9
STOP 10
Stillwater
Mechanicville
SARATOGA LAKE
SARATOGA NATIONAL HISTORICAL PARK
HUDSON
RIVER
CHAMPLAIN CANAL

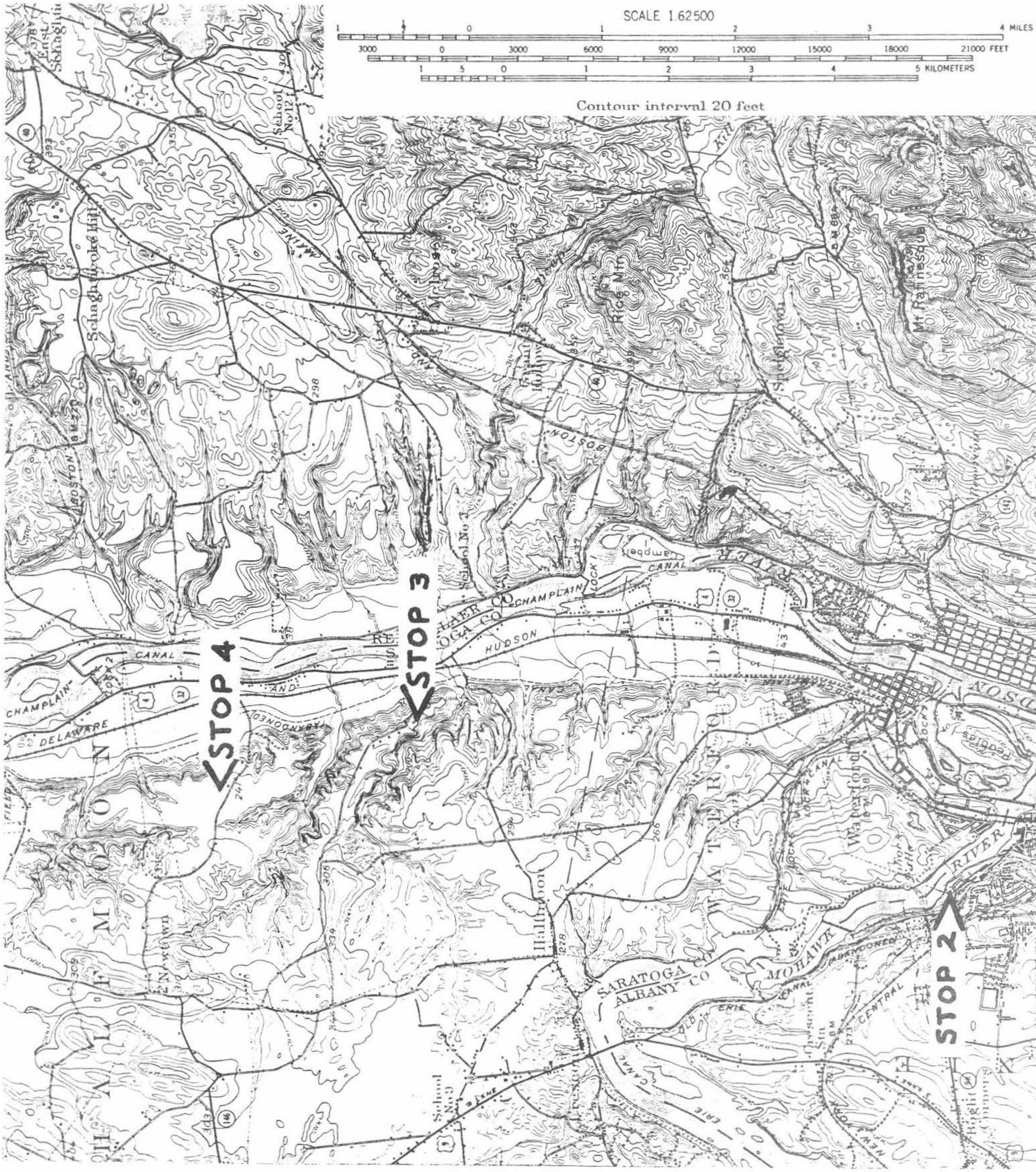


Figure 12. West half of Cohoes 15-minute quadrangle showing trip stops.