Trip E

LATE GLACIAL AND POSTGLACIAL GEOLOGY OF THE GENESEE VALLEY IN LIVINGSTON COUNTY, NEW YORK:

A Preliminary Report

by

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INTRODUCTION

Geologic and archaeologic investigations in the Genesee Valley have produced evidence of glacial drift blockage (moraine?) within the valley, followed by floodplain aggradation up to 95 feet above the modern river bed. The terraces may have been formed between 2500 and 4400 years ago between Avon and Mt. Morris, New York. The exact manner of emplacement of the abnormally thick till section in the valley is unclear, but the resulting postglacial fluvial aggradation and subsequent terracing appear to correlate in a general way with the periods of neoglacial climatic fluctuation discussed by Denton and Porter (1970).

PREVIOUS WORK

The Genesee Valley, as discussed by Fairchild (1909, 1928), has been described as a glacially enlarged valley, up to 2 miles wide near Geneseo with evidence of an interglacial or preglacial

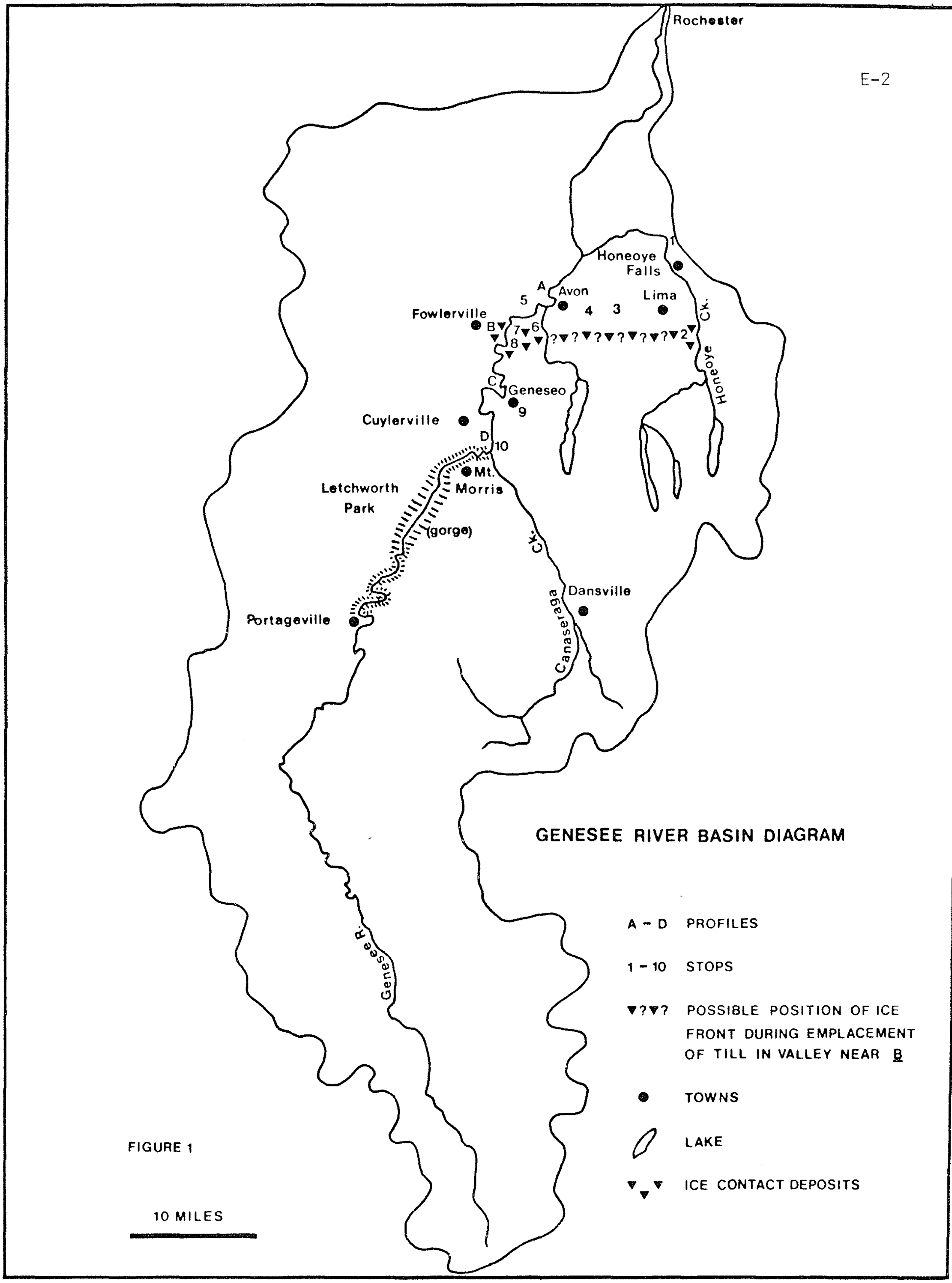

Rochester
Honeoye Falls
Avon
Lima
Fowlerville
Geneseo
Cuylerville
Mt. Morris
Letchworth Park
(gorge)
Dansville
Portageville
Canaseraga Ck.
Honeoye Ck.
Genesee R.
A
B
C
D
1
2
3
4
5
6
7
8
9
10
GENESEE RIVER BASIN DIAGRAM
A – D PROFILES
1 – 10 STOPS
▼?▼? POSSIBLE POSITION OF ICE FRONT DURING EMPLACEMENT OF TILL IN VALLEY NEAR B
TOWNS
LAKE
ICE CONTACT DEPOSITS
10 MILES

FIGURE 1

buried channel north of Avon. A younger, postglacial gorge section through Letchworth Park (Figure 1) formed as a result of filling of an older valley near Portageville by morainal deposits. The Letchworth gorge may be more complex than Fairchild's description (1928, p. 179) because of the fact that some portions of the gorge are excavated in bedrock, whereas other sections are eroded in an interglacial(?), drift-filled valley which may also have drained to the north (R.A. Young, work in progress). Within the main Genesee Valley north of Mt. Morris there is ample documentation (Fairchild, 1909) of glacial modification by moraines, hanging deltas (stop 5, 6) ice marginal channels (stop 1), and lake sediments deposited in a complex series of oscillating lake stages (stop 3) following the retreat of the ice from the Valley Heads moraine near Dansville. The river course north of Avon on the north portion of the Rush quadrangle and across the Genesee Junction quadrangle is controlled by ice-depositional landforms and ice-sculptured terrain. Through this section the river is sinuous, with a floodplain as narrow as 1000 feet in several places.

Young and Rhodes (1971) presented evidence of a more complex postglacial history for the Genesee Valley between Mt. Morris and Geneseo as determined during the course of archaeologic excavations in terrace deposits south of Geneseo (work currently in progress under the direction of Dr. Wendell D. Rhodes).

In retrospect, this recent work, combined with the fresh exposure of till at the large slump (Figures 2, 3) along the

GENESEE VALLEY PROFILES A–D

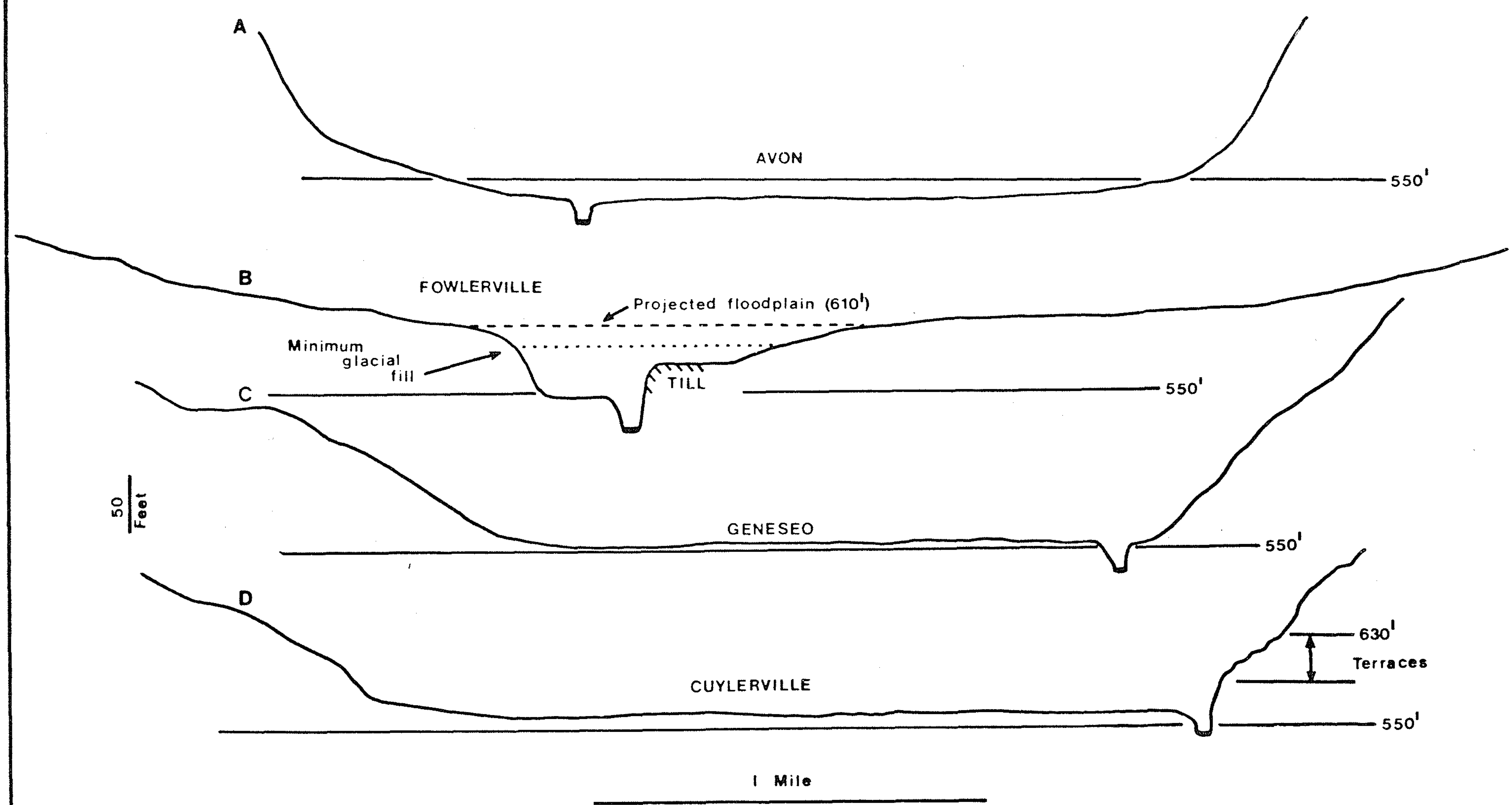


FIGURE 2

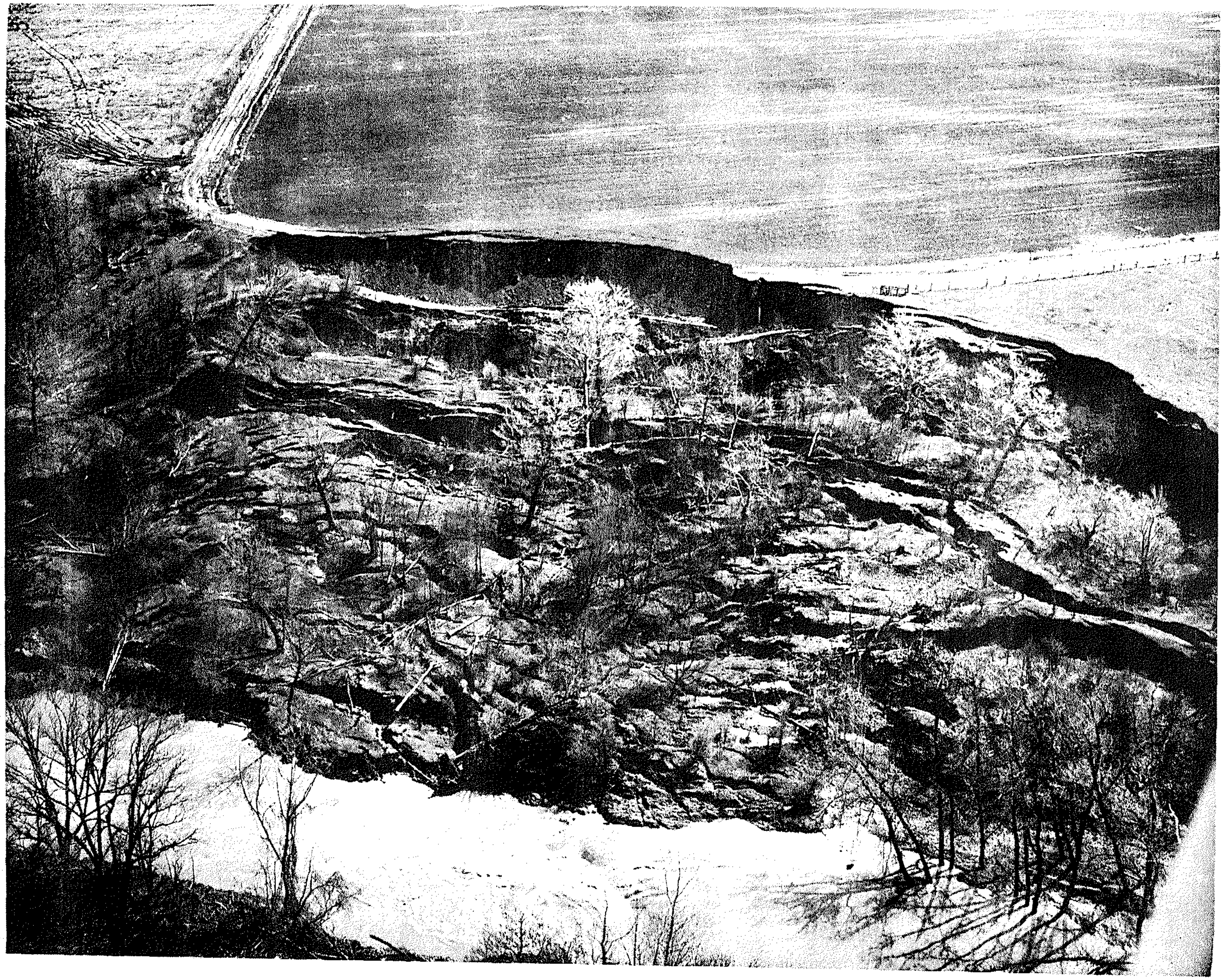


FIGURE 3. Large slump of April, 1973 on east bank of Genesee River at the end of Oxbow Lane, Town of Avon. Photo courtesy of Rochester Democrat and Chronicle, Burr Lewis photographer.

river between Avon and Geneseo, sheds light on some observations made by Fairchild concerning the final ice-marginal lake stages in the lower valley.

Beginning with Fairchild's description of the Lake Warren stage (880 feet), the late glacial history included lowering of the Warren waters down to 700 feet (Lake Dana) and the accompanying formation of the Rochester (Pinnacle Hills) moraine. This lake stage partially submerged the slightly older Mendon Kames complex. The last local lake stage filling the Genesee Valley was Lake Scottsville, confined to the Genesee Valley between the Pinnacle Hills moraine and Avon at an elevation of 540 feet. It has not previously been clear why Lake Scottsville did not extend further south up the Genesee Valley. The river channel is near 540 feet in elevation at Geneseo, and river sediments are known to overlie glacial lake sediments in many places, such as north of Avon (Fairchild, 1928, p. 147). Thus, one might expect the modern valley floodplain near Geneseo to be somewhat higher than the older glacial deposits which floored the valley during Lake Scottsville time. These observations can be reconciled by considering the significance of the till filling the valley between Geneseo and Avon.

GLACIAL VALLEY FILL AND POSTGLACIAL SEDIMENTATION

Figure 2 illustrates the anomalous nature of the valley cross-section near Avon as compared with the valley to the north and south. Section B, near the large slump that occurred in April, 1973 (Figure 3), is near the end of Oxbow Lane in the town of Avon. A 20-foot section of till is exposed at the back of the slump scarp. Till is also exposed near the Fowlerville bridge (stop 7) at 570 feet. The significance of this anomalously thick fill becomes clear if a comparison is made of the cross-sections on Figure 2. The most obvious conclusion is that the fill acted as a barrier, preventing further extension of Lake Scottsville to the south.

If the maximum floodplain level is projected from the highest terrace near Geneseo (Figure 2, D) northward to the area of section B (Figure 2), assuming a gradient similar to the present (20 feet per 9 miles), we obtain the level of the former alluvial fill (dashed line) at this location. The <u>dotted</u> line indicates the <u>minimum</u> probable elevation of the former till section eroded by the river (indicated by terracing). The 20-foot interval between the dashed and dotted line is, therefore, the probable maximum extent of alluvial fill that would have been required near section D to correlate with the thicker alluvial fill (terraces) south of Geneseo. In other words, assuming that till did not originally entirely fill the valley near profile B up to 610 feet and thereby directly cause all of the fluvial aggradation upstream, only about 20 feet of alluvium above the till would require a corresponding aggradation of the floodplain near Geneseo to 95 feet above the modern river bed (Figure 4). Such a thickness of alluvium is equivalent to the distance from the modern floodplain to the river bed.

The thick till deposit which fills the valley for a distance of 5 miles between Geneseo and Avon may represent a morainal fill in the valley in that section. Alternatively, constriction of ice flow due to narrowing of the bedrock valley profile in this area might have produced the anomalous fill by some obscure ice-depositional process.

The authors currently favor the morainal hypothesis. However, the only other evidence for a moraine at this latitude is an esker-kame-kettle complex 10 miles due east near Honeoye Creek (stop 2). Admittedly, it is possible that isolated eskers, kettles, or kames such as these could probably have developed at random locations along a slowly melting ice front without signifying the formation of a major recessional moraine.

A delta-like deposit north of the till filling at the outlet of Conesus Creek near Ashantee (stop 6) indicates either (1) a remnant of a former floodplain surface near 580 feet in the valley north of the till-filled section, or (2) a glacial lake delta built into the sequence of falling lake levels. If the feature is a delta, it would probably have to represent deposition in Lake Avon (pre-Warren low stage) near 580 feet. If the feature is merely an eroded floodplain remnant, consistent with the fill to the south, a higher proportion of gravel in the sediments discharged from Conesus Creek might account for the resistance to erosion of this portion of the valley fill.

TERRACES NEAR GENESEO

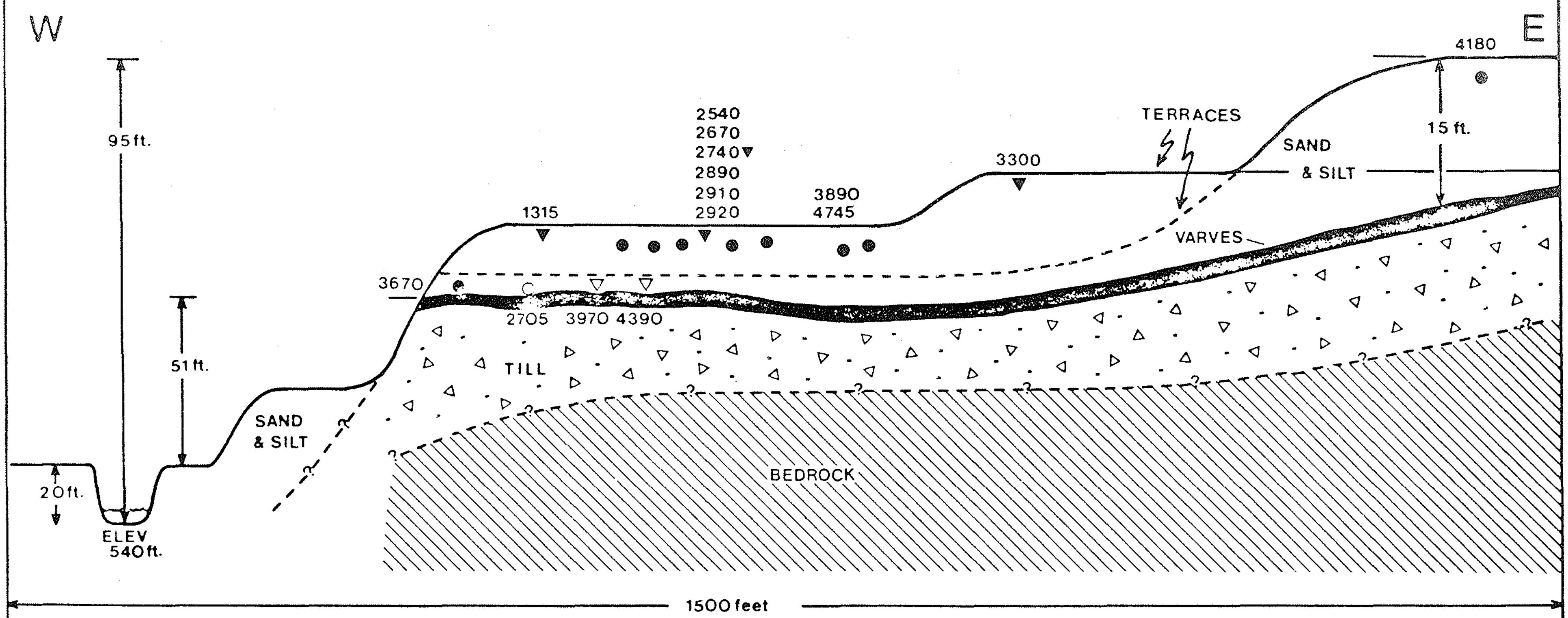
The terraces in the Genesee Valley (Figures 2 and 4) are portions of an alluvial fill built up to the approximate level of the till deposits (moraine?) between Geneseo and Avon. This fluvial aggradation might also have been influenced by the climatic changes and vegetation succession which followed deglaciation, and by the postglacial influx of sediments contributed by the drift and bedrock eroded from the Letchworth gorge immediately upstream.

It is also possible that a shallow lake existed in the Geneseo-Dansville portion of the valley before the river had cut through the till plug. The existence of such a lake would depend on the elevation of the former valley fill. Glacial varves beneath the terrace sands (Figure 4) indicate that the valley may have been nearly filled with glacial deposits, but precise reconstruction of the original postglacial cross profile is not possible. It does not appear that these varves (Figure 4) were deposited in a small shallow lake because the fine-grained nature of the varves beneath the terraces imply deeper, quieter water than would have been the case near the margin of a shallow lake.

Radiocarbon dates from archaeologic hearths within the sandy terraces (Figure 4) shed some light on the approximate time of floodplain aggradation and terrace formation, if certain assumptions are made. Charcoal from hearths taken from depths down to 3 feet imply that occupation of the sites was concurrent with floodplain deposition near river level. Floods are commonly within about 20 feet of the river bed, since deeper flooding over the <u>entire</u> floodplain would require unusual volumes of water, given the valley cross-sectional profile (as demonstrated by the flood of June, 1972).

GENESEE VALLEY NEAR MOUTH OF CANASERAGA CREEK

DIAGRAMMATIC AND COMPOSITE



(NOT TO SCALE)

●○ RADIOCARBON DATE >12 in.

▼▽ " " <12 in.

ALL DATES IN YEARS (B.P)
FROM ARCHAEOLOGICAL MATERIALS

OPEN SYMBOLS NOT IN PLANE OF DIAGRAM

FIGURE 4

Sedimentary structures, such as cross bedding, are uncommon in the terrace deposits. Thin persistent oxidized zones from 3 to 12 inches apart (Figure 5) are present throughout most of the excavations, except close to the underlying varves. One possible explanation of the oxide zones is that they are incipient soil horizons composed of leached colloidal oxides deposited by downward percolation of soil water between flood deposition intervals. However, it is difficult to imagine how such thin, uniform, oxide zones would have been preserved in well-drained sands and silts and still exhibit such regularity if normal, soil-forming processes have been continuously operating up to the present (downward migration of colloidal and dissolved material). In any event it appears that some type of repetitive sedimentation, weathering, and terracing were occurring on floodplains 30 to 75 feet above the modern floodplain when the sites were being occupied, probably under forest conditions. This means that the river bed was correspondingly higher at that time, and that the flooding was occurring near river level as overbank deposits.

The grain size characteristics of the terrace sediments, their physical location, the topography of the site, and the location of the excavations make slope-wash deposition an unlikely mechanism to explain the depth of burial of the artifacts and hearths. In addition, the material immediately upslope is till. The arrangement and positioning of many of the hearths and associated artifacts excavated from the terraces indicate that reworking of the river sediments by lateral river migration

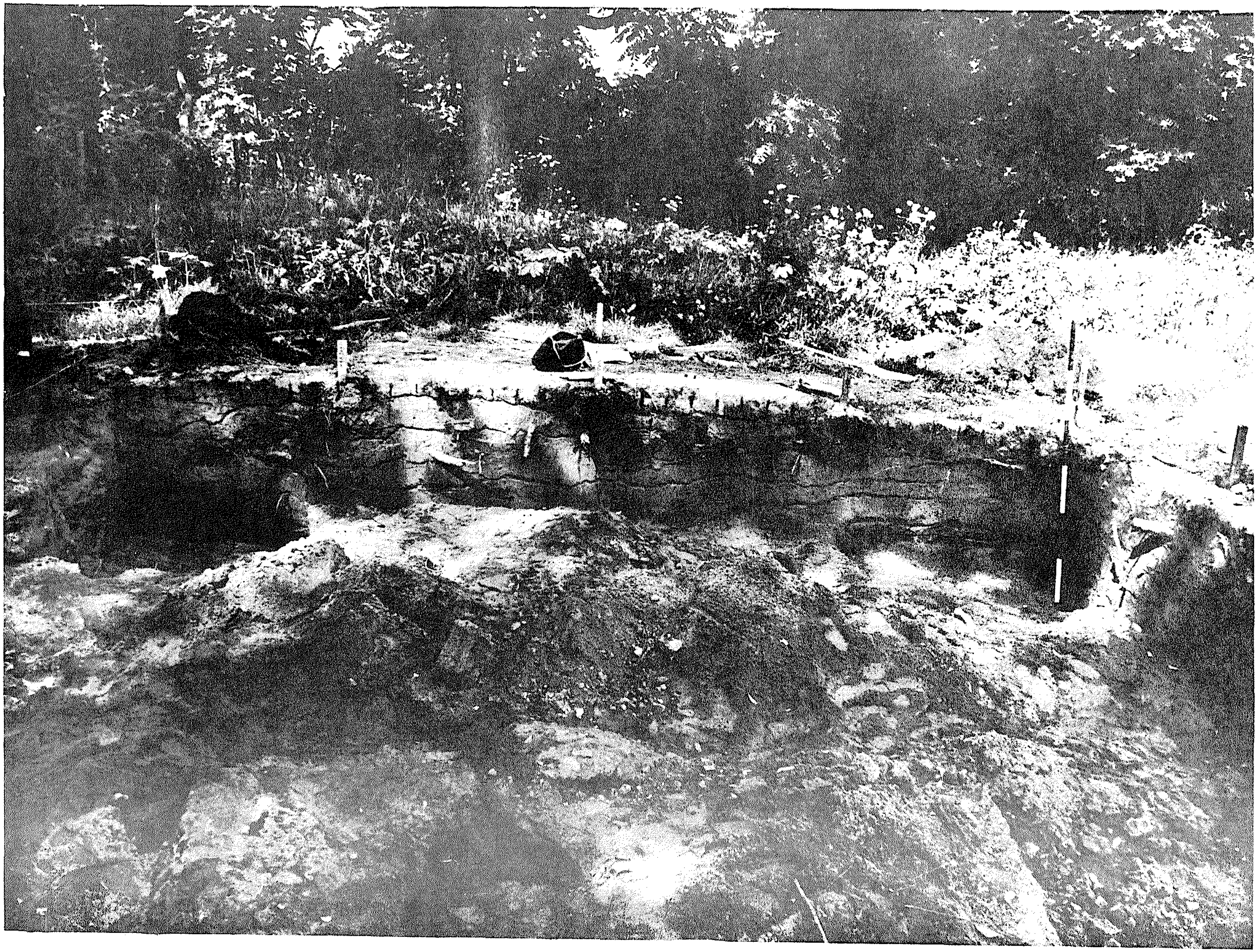


FIGURE 5. Excavation at the Macauley Complex near Geneseo, New York. Oxide horizons in the terrace sediments have been accentuated with the point of a trowel. Photo: Herbert Edelsteine.

did not occur subsequent to burial. However, lateral river migration and terracing could have completely removed some sediment and artifacts. This could then have been followed by renewed aggradation so that a complete record of archaeologic occupation is not preserved.

The distribution of dates on Figure 4 also illustrates that the oldest dates occur both in high and low terraces, whereas the intermediate dates are found in intermediate terraces. If the sites were repeatedly flooded at the time of occupancy, the distribution of dates suggests a period of maximum aggradation sometime between 4400 and 3900 years Before Present (BP), with oscillatory cut and fill cycles occurring over the interval from 3800 to 2500 BP.

All of the floodplain formation, terracing, and associated valley sedimentation would have to postdate Lake Warren (circa 11,000 BP), which covered the archaeologic sites (all below 640 feet). Post-terrace, random occupation of all the terrace levels is possible, but believed to be unlikely in view of the depth of burial by what are interpreted as a series of overbank flood deposits, and by the apparent nonrandom pattern of occupation with regard to elevation (terrace levels). In some cases the more deeply buried artifacts may be related to older terrace surfaces (floodplains) now completely buried rather than being closely related to the existing terrace profiles.

For the sake of argument, it is assumed that net aggradation occurred generally over the interval from 11,000 BP (post Lake Warren) to 4000 BP and that general (net) downcutting followed with some conspicuous aggradation from 2900 to 2500 BP. This would explain the topographically highest terrace dates near 4000 and the influx of intermediate dates on intermediate level terraces above the deeply buried 3670 BP date (Figure 4). More precise correlation of individual terraces based on radiocarbon dates is impossible due to probable overlap of dating errors and possible occupation of individual terrace levels for spans of tens or hundreds of years, as well as destruction of the exact terrace profiles by recent gully erosion.

SUMMARY AND CONCLUSIONS

If this tenuous sequence of events has any validity, it appears to fit the general climatic curve for neoglaciation maxima of Denton and Porter (1970). This is based on the assumption that cooler, wetter periods cause aggradation, whereas warmer, dryer periods cause erosion and terracing. The neoglacial maxima (cooler intervals) of Denton and Porter (1970) peak near 4700 and 2700 BP.

This hypothesis is given additional support by detailed studies over the same time interval in the Southwest by Karlstrom et al. (1973) as presented in an informal progress report. Such a comparison with the arid Southwest is made only because of a lack of similar, detailed studies in the eastern United States. The Mississippi Valley archaeologic and geologic chronology shows a similar generalized history involving 50 feet of alluviation in the last 7000 years, followed by terracing and downcutting (Griffin, 1968).

ADDENDUM

The following information was obtained during continuing studies of the Canaseraga Creek floodplain in June 1973.

Correlation of logs of wells near Dansville and near the mouth of Canaseraga Creek with seismic refraction surveys (Young, 1973) and shallow test borings (U.S. Army Engineers) in the center of the valley north of Sonyea indicate that the Genesee Valley floodplain between Mt. Morris and Dansville is underlain by uniformly thin (averaging 30 to 40 feet) fluvial sands, silts and gravels interbedded with lacustrine(?) clays and peat horizons which overlie thick "tough blue clay". The surficial sands and gravels thicken locally near Dansville where a delta was built northward into the valley. Wells near Dansville penetrate 180 feet of the "tough blue clay" which is interpreted as varved(?) lacustrine clay similar to that which is exposed at numerous locations along the Genesee River north and south of the Letchworth gorge.

A comparison of the Genesee Valley with cross-sections of the Cayuga Lake basin suggests that the Genesee Valley bedrock profile should be similar in cross section and depth, assuming that conditions controlling glacial erosion were comparable. This comparison is partially substantiated by well logs at Dansville and at Cayuga Lake (O.D. von Engeln, 1961, The Finger Lakes Region, p. 53) which indicate that both valleys are eroded in bedrock to depths probably in excess of 450 feet below the river floodplain and lake surface, respectively.

Considering their probable similar erosional development and glacial history, it is unclear why the Genesee Valley should be so completely filled with fine-grained lacustrine sediments. However, when viewed in light of the thick till filling the valley near Avon and the related fluvial aggradation (terraces) south of Geneseo, the thick section of fine-grained lake deposits could be explained as a result of the lengthy exist nce of glacial and postglacial lakes contained by the till plug (moraine?) near Avon. If these hypothetical lakes (gradually lowering levels) were maintained for several thousand years as suggested by the radiocarbon dates related to the overlying Genesee River terraces (Figure 4), sediment brought by Canaseraga Creek and the Genesee River into this restricted basin could account for the thick clay deposits.

The exposure in the accompanying photograph (Figure 6) is at the mouth of an unnamed creek on the east side of the valley two miles south of the archaeological site on Figure 4 (opposite Mt. Morris). Cross bedding and imbrication in these delta deposits above and below the varved clays (V) indicate an environment of laterally shifting channels alternating with lacustrine deposition. The varved clays could only have developed when the small stream discharged somewhat north or south of the exposed section. The elevation of the exposure is near 600 feet which puts it within 10 feet (vertically) of the six-foot section of varves beneath the terraces on Figure 4. In the delta deposits the varves are now approximately 30 to 40 feet above the modern floodplain.

Building out of the delta into a lake is indicated by the varves. Any streamflow to a lower floodplain level without such a lake present (above 600 feet) would have caused erosion rather than deposition as demonstrated by the small stream now incised into the delta.

All of the above information further substantiates a complex lacustrine and fluvial history for this portion of the Genesee Valley. Presumably, there was a gradual filling in of the lake(?) floor while the Genesee River was cutting through the till plug south of Avon. As the lake lowered and became a marsh or swamp, floodplain (fluvial) sedimentation processes reworked the uppermost lacustrine deposits and climatic influences may then have dominated the aggradation and downcutting (terracing) of the floodplain surface. Continued erosion of the main channel has resulted in a gradual lowering of the modern floodplain.

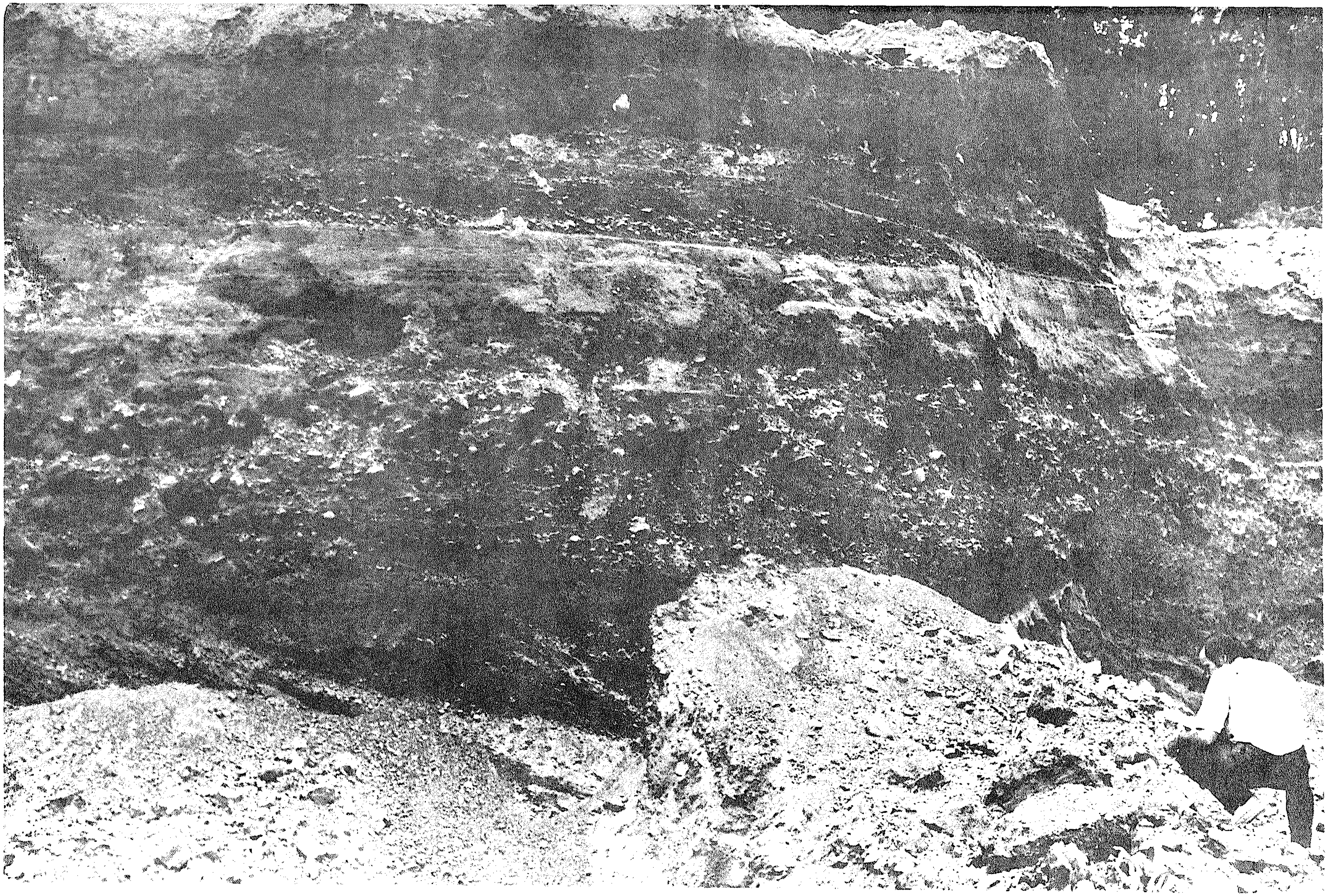


FIGURE 6. Exposure of delta gravels and sands interbedded with varved clays (V) on the east side of the Genesee Valley along Route 63, two miles south of Hampton Corners (opposite Mt. Morris). Elevation near 600 feet. Photographic reproduction by Roger Smith.

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FIELD TRIP ROAD LOG FOR GENESEE VALLEY

Glacial and Postglacial Geology

Mile	
0	Turn south on Mt. Hope Avenue. Proceed south along East Henrietta Road to Westfall Road
1.0	Turn east on Westfall Road and proceed to junction with Clover Road
4.5	Turn south on Clover Road, continue past Mendon Ponds Park (9.4 miles)
13.9	Turn east on Route 251 toward Mondon Center
14.1	STOP 1. After 2/10 mile turn south and cross ice marginal drainage channel
15.6	Proceed 1 1/2 miles south to Cheese Factory Road at border of second channel. Turn west on Cheese Factory Road following ice marginal channels to Sibleyville (make sharp right then left across Route 65). Cross Honeoye Creek on approach to Sibleyville, Honeoye Creek occupies ice marginal drainage at this point. Turn south from Sibleyville on Route 15A and proceed to Lima
20.0	Lima Turn east at Lima on Routes 5 & 20 to Doran Road (1.1 miles)
21.1	Doran Road - proceed south 0.6 miles to turnoff for Round Pond (dead end road to east)
21.6	STOP 2. View esker, kettles, and kames at Round Pond
23.2	Return to Lima and proceed west on Routes 5 & 20 to Oak Opening Road
24.9	STOP 3. Oak Opening Road follows Warren Shoreline north-south across Routes 5 & 20
25.4	STOP 4. Continue 1.5 miles to beach along wave eroded drumlin(?) on south side of highway

Mile

30.3 STOP 5. Proceed (4.9 miles) west on Routes 5 & 20 across Genesee Valley (past junction of Route 20) to gravel pit on west bank near large glacial drainage which discharged SE into Genesee Valley. View drainage features and gravels mapped as deltas by Fairchild (1909)

35.2 Return to Avon and proceed south on Route 39 to Ashantee (1.7 miles)

36.9 STOP 6. Pass through Ashantee and turn west (right) on Fowlerville Road. For 1/2 mile cross remnant of delta-like deposits at 580 feet at Conesus Outlet stream which might have been deposited into lake waters prior to the formation of Lake Scottsville at 540 feet. Alternatively it could represent the remnant of a higher floodplain in the Genesee Valley 40 feet above the modern floodplain (See discussion regarding Genesee Valley terraces)

39.6 STOP 7. Continue to bridge over river near Fowlerville to view valley profile and till outcrop

42.3 Return to Route 39, continue south to South Avon Road (1.8 miles)

44.1 Turn west on South Avon Road and proceed straight to river (3 miles) at landslide of April, 1973

47.1 STOP 8. Avon landslide of 1973
Return to Route 39, continue to Geneseo

55.4 STOP 9. Lunch at Department of Geological Sciences, Geneseo. View maps, aerial photographs, etc.

55.4 Continue south through Geneseo on Route 39 to Farm Road 1 mile south of Jones Bridge Road. (8.7 miles)

58.8 STOP 10. Turn west toward river through field to Archaeology site in Genesee River terraces near confluence with Canaseraga Creek