TRIP F - GLACIAL GEOLOGY AND BURIED TOPOGRAPHY IN THE VICINITY OF FREDONIA, GOWANDA, AND ZOAR VALLEY, NY

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Notes: The trip will be made in cars as there are several bridges that will not handle the weight of a bus.

Total roundtrip mileage is about 80 miles

The route of the fieldtrip is outlined on Plate 1, page D-13

Total Miles	Miles from last point	Route description
		Leave the Fredonia State campus by the Temple Street exit turning left (south) onto Temple Street. The road log begins at the intersection of Temple Street and Main Street (U.S. 20) at the town square. Turn left (east) onto Main Street and begin road log.
2.2	2.2	Cross Rt. 60 and continue along the Lake Warren Beach. Later Warren ridges are to the north (1) and the Lake Whittlesey (2) Ridge to the south. Note Warren strand along U.S. Route 20 in Sheridan (see plate 2f and Plate 1). The surface of this gravel terrace is at 755 feet above sea level. This beach trends east-northeast, rising about 50 ft. in elevation in 45 miles.
6.5	4.3	Turn Right (East) onto N.Y. Rt. 39. Gravel pits are in Lake Whittlesey beaches. The escarpment ahead and to right (south) which separates the lake plain from the plateau has been called the Portage Escarpment, but it is developed on the Canadaway Formation in this area. The escarpment bears no relationship to the Portage Group, which does not crop out in Chautauqua County. The Canadaway Formation totals about 950 ft. and is dominantly composed of shale. The Laona and Shumla Members, each about 30 ft. thick are dominantly siltstone and somewhat thicker-bedded than the other members. These two siltstone members may account for details of the character of the scarp as developed eastward toward Forestville.

Total Miles	Miles from last point	Route description
		Question: In view of the dominantly shale lithology exposed in this portion of the escarpment, is structural control an adequate explanation of the origin of this scarp? Regional dip is very gentle toward the south. If the topography be truly cuestaform, where are the resistant capping strata responsible for the scarp which is 700 to 1100 ft. high in eastern Chautauqua County?
12.8	6.3	Turn Left (north) on Center Rd. The road drops into a channel (3) formed either along the ice margin (Gowanda) or the beach ridge (Plate 2e and f).
13.5	0.7	Note Whittlesey strand at approach to King Road (Cook Rd. of Forestville 7½ minute Quadrangle). A shallow borrow pit 0.3 mile southwest off King Rd. in 1957 exposed the following: 3. Shingle gravel, stratified dipping southeast; dominantly of clastic pebbles; matrix coarse-textured; structure, open. 10 ft. 2. Laminated lake silt with thin sand and pebble layers. 4 ft. 1. Gravel, coarse, poorly-sorted with numerous erratics and rounded boulders suggesting derivation by wave washing of proglacial sediments. 4 ft.
13.5	0.0	Turn right (East) onto Cook (King) Rd. For most of the way this road follows the beach ridge. To the south between the beach and the escarpment lie Gowanda moraine remnants (Plate 2e), kame terrace deposits and ice marginal channels. Plate 2f shows the geography of Lake Whittlesey time.
15.4	1.9	Cross Erie RR. This is the original right of way. The railroad completed in the early 1850s ran from Piermont on the Hudson to Dunkirk, avoiding such dens of iniquity as New York and Buffalo.

Total Miles	Miles from last point	Route description
17+	1.6	Look for the spit (4) built by the longshore drift into the Walnut Creek embayment coming up.
18.3	1.3	Cross Rt. 428.
19.0	0.7	Dennison Corners Left (N) on Dennison Rd.
20.1	1.1	STOP F1. Buried valley of Walnut Creek. Hanover Center Landslide. Figures F1 and F2 outline the general setting of this stop. A well at the house across the road from the "landslide" bottomed in "quick-sand" at 290 ft. and had to be abandoned because too much sand was pumped with the water. The landslide has appeared to result from groundwater sapping and liquifaction of the units exposed in the base of the amphitheater. Such active processes make for uneasy householders and highway departments.
20.4	0.3	Bridge over the Silver Creek Gorge. To the east is the open valley cut in the Walnut Creek valley fill and to the west is the bedrock gorge of Silver Creek which extends most of the way to Lake Erie.
20.7	0.3	Turn right (NE) onto Angell Rd.
20.9	0.2	Turn right again (SE) onto Hanover Rd. crossing the filled valley of Walnut Creek. Note the moraine remnants to the south of the road.
22.0	1.1	Turn left (E) on Versailles Rd. Again we are along the Whittlesey beach (6).
22.8	0.8	Intersection. Continue on Versailles Rd.
25.1	2.3	Enter Cattaraugus County.
28.9	3.8	Cross Bridge (5 ton capacity) over Cattaraugus Creek which is flowing over on bedrock part of which is the south wall of the old Allegany Channel (Figure 1-6).
		Bear Left.

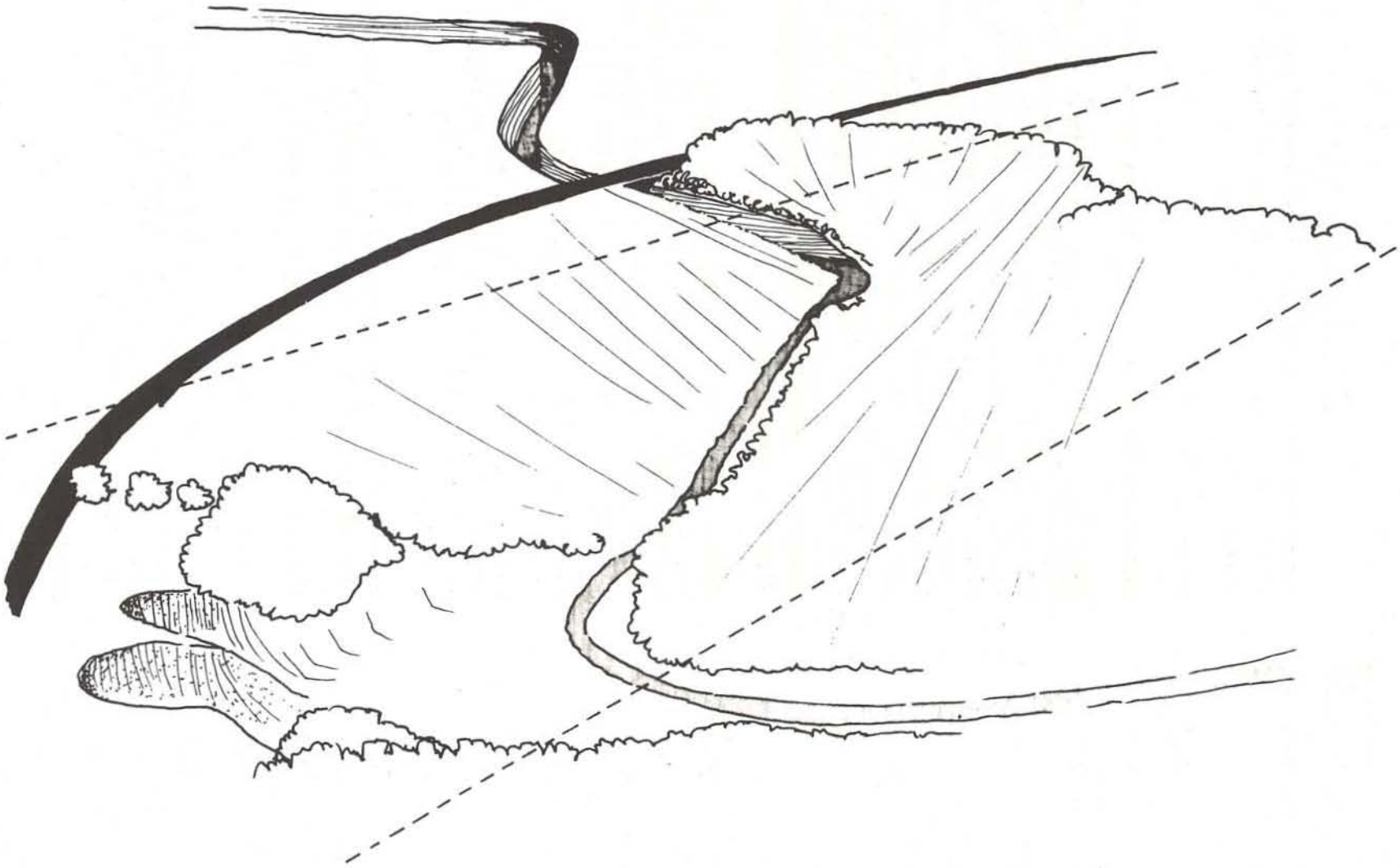


Figure F1. STOP F1, Post glacial Erosion. Broad valley is excavated in fill of buried valley of ancestral Walnut Creek (Wklson, 1974). Silver Creek enters in the foreground and leaves in the background in a postglacial bedrock gorge.

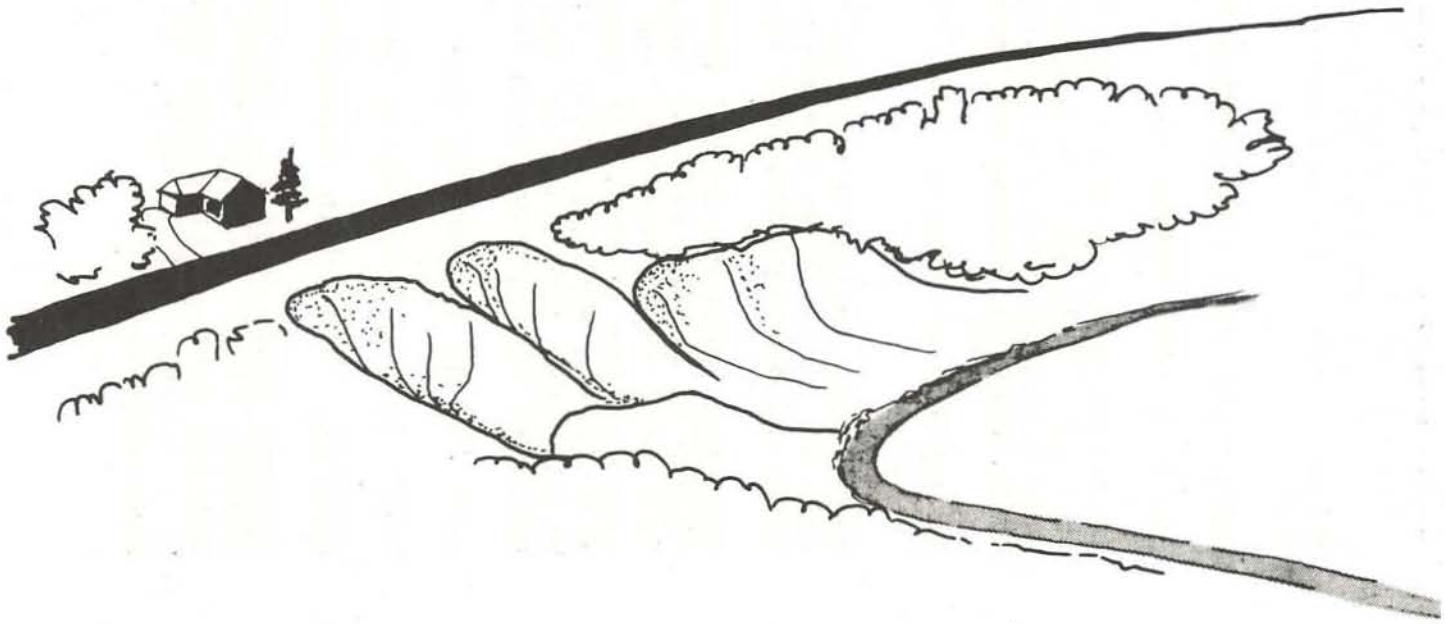


Figure F2. STOP F1. Landslides in the fill of the buried valley of Walnut Creek. These were active for about two years and have progressed only slowly over the past year.

Total Miles	Miles from last point	Route description
29.6	0.7	Cross Four Mile Level Rd. (Rt. 438) and continue north. In this area you are crossing the ancient Allegany valley (7) which has at least 500 ft. of fill near here.
30.2	0.6	Turn Right (NE) onto Seneca Rd.
31.6	1.4	Possible side excursion: Southeast on Long House Rd. 0.6 miles to end of road. This is a spit which extends southeastward from the island in Lake Whittlesey (8). Elevation 840+ ft.
32.9	1.3	At village of Lawtown turn Right (S) onto Rt. 62.
33.5	0.6	Right onto Raylor Hollow Rd. The road crosses Clear Creek and rises onto Four Mile Level (Elevation 800-840+ ft.).
35.5	2.0	STOP F2. Gernatt Gravel Products Pit. Figure F3 summarized the relation between Four Mile Level and the land form being quarried for gravel. If Four Mile is Whittlesey, what is this? If this Whittlesey, then what is Four Mile? What agencies can produce such level surfaces?
35.9	0.4	Left (E) on Richardson Rd.
36.7	0.8	Right (S) to Clear Creek Bridge.
37.0	0.3	STOP F3. Wisconsin Stratigraphy Gowanda State Hospital Section. Stream bluffs, Clear Creek at Route 63, 39, 18. Collins town, Cattaraugus quadrangle, Erie County. (78°55'50"W, 42°29'20"N). Composite section.

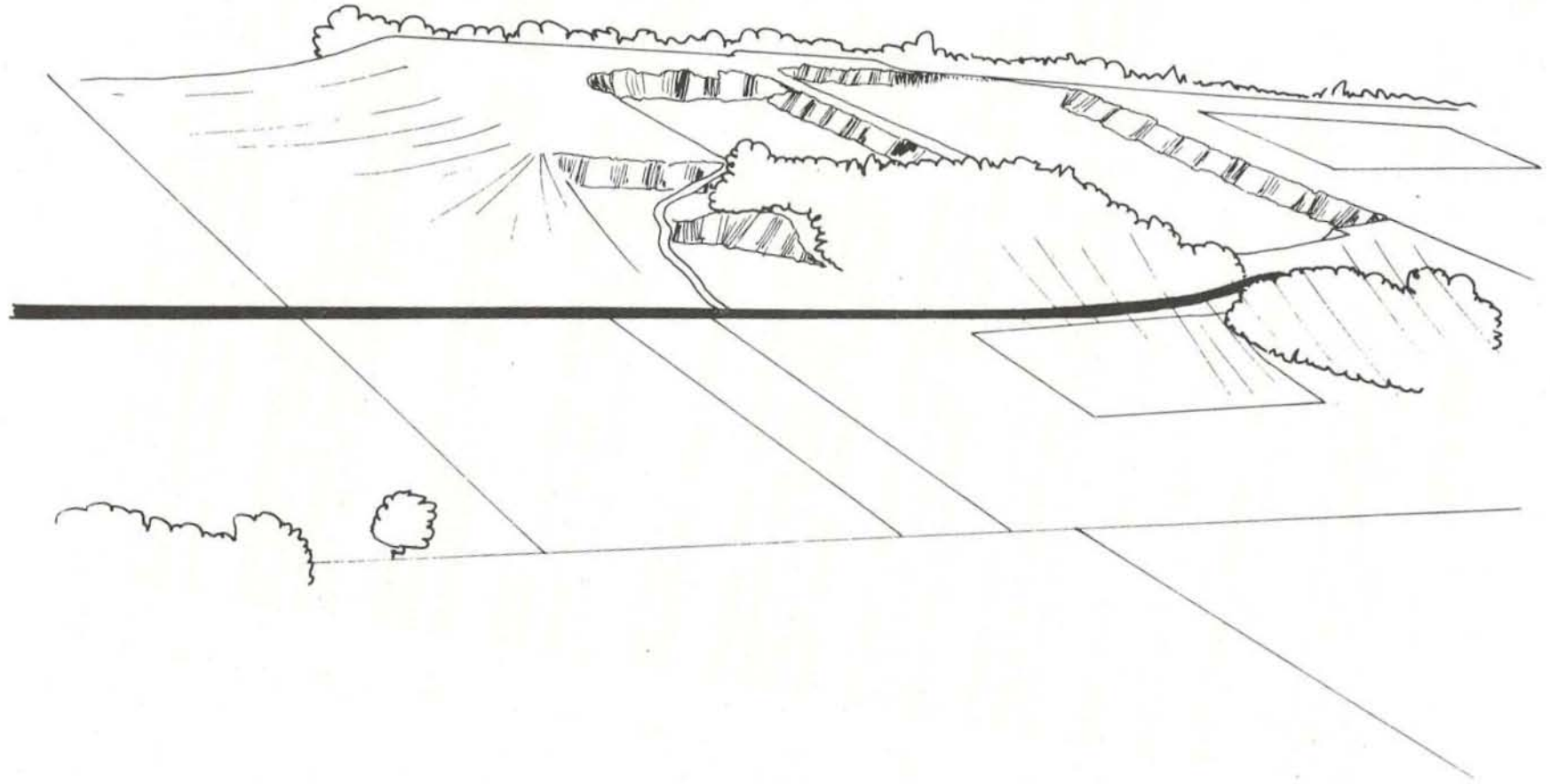


Figure F3. Gernatt Gravel Products Pit in
surface 20+ feet abo
level

Unit	Lithology	Thickness
11	Alluvial gravel; oxidized, many pebbles and cobbles deeply weathered; rounded to sub-rounded; exotic pebbles numerous	3.3 ft.
10e	Silt, dark olive-gray; stratified, includes fine sand laminae; oxidized and leached	1.0 ft.
10d	Silt, tan to olive, oxidized but unleached	1.3 ft.
10c	Fine sand, finely laminated, yellow-brown	1.2 ft.
10b	Clay and silty clay interlaminated with sand and silt; pairs are ½ to ¼ inch thick, finer toward top. Clay-rich layers are unoxidized.	6.5 ft.
10a	Silt and fine sand, light- to medium-gray; un-oxidized, unleached; laminated to medium-bedded; sparsely pebbly towards base	10.0 ft.
9	Till, silty matrix, blue-gray, sparsely pebbly with shale and siltstone dominant. Includes sand and silt lenses but is more compact than overlying laminated units.	4.0 ft.
8	Stratified sand, silt and sandy gravel; unoxidized	1.0 ft.
7	Till, silty matrix, dark blue-gray, compact, sparsely pebbly. Upper contact marked by seep. Includes minor light gray silt part-ings.	8.0 ft.
6	Stratified silt, sand and gravel; unoxidized; upper contact transitional, lower contact sharp	2.0 ft.
5	Till, silty matrix, dark blue-gray, compact; moderately pebbly with relatively high pro-portion of exotic pebbles. Faint seep shows better-sorted lens.	6.0 ft.
4	Gravel, pebbles and cobbles in coarse sand. Crude imbrication suggests flow to northwest. Pebbles dominantly rounded with diverse lith-ology. Unit thickens southwest to about 20 ft. at the stream bend.	3.0 ft.

Unit	Lithology	Thickness
3	Till, calcareous throughout; color ranging from olive-brown to orange-brown, suggesting incomplete assimilation of diverse materials. Compact. Sparsely to moderately pebbly. Toward base appears to incorporate and deform underlying stratified sediments.	20.0 ft.
2	Silty and carbonaceous clay; stratification disturbed enough to suggest crushing and sliding. One layer contains sparse invertebrate tests and several contain twigs and other plant remains. Wood is more than 38,000 years old (W-866). This unit abuts northward against Unit 3.	15.0 ft.
1b	Till, pink, silty matrix, (Color 5Y 4/1), fairly pebbly. Surface rises east cutting out part of overlying stratified section. Relationship to Unit 3 not clear as contact is nowhere exposed. Base obscured west of bridge but transitional relationship to underlying is suggested 200 ft. upstream.	18.0+ ft.
1a	Till, medium blue-gray (5B 5/1), with abundant shanners and flaggy bits of local blue-gray siltstone. Basal contact concealed, but upstream a few hundred yards this unit rests on bedrock. This may be a color phase of the overlying pink till, different only in assimilation of abundant local rock.	6.0+ ft.

(Note: Sequence of deposition of lower, contorted and disturbed portion of bluff is not certainly established because of discontinuity of exposure and obscured relationships.)

About .8 mile west of highway bridge a well is reported to have penetrated 620 feet of unconsolidated material to about 240 feet above sea level. If correct, this information gives a measure of depth and sharpness of the bedrock valley.

Total Miles	Miles from last point	Route description
		From Clear Creek Bridge return toward Buffalo (N).
37.2	0.2	Turn right (E) following N.Y. Route 39 through Collins.

Total Miles	Miles from last point	Route description
38.6	1.4	Cross Gowanda moraine, (9) marking recessional position north of the Lake Escarpment moraines.
39.8	1.2	Turn right (S) onto Jennings Road.
41.0	1.2	Diagonal SE onto Foster Rd.
42.6	1.4	Begin rise onto proximal slope of massive Lake Escarpment moraine complex (10).
43.1	0.5	Commence descent into Zoar Valley following Zoar Valley Rd. CAUTION: This is a long, steep grade. USE LOWER GEAR Cattaraugus Creek flows across the grain of bedrock topography, crossing bedrock uplands through confined, steep-wall gorges and crossing drift-filled lowlands in broad, mature reaches. One such open reach is Zoar Valley ahead to the southeast, whereas due south at this point, Cattaraugus enters a 3-mile long gorge deeply incised in bedrock. (Figure F4). Silt and silty-clay till and lacustrine sediments in slumped moraine topography at left. Soil is mapped as Mahoning silty clay loam, steep phase.
44.7	1.6	Turn right (S) past Burt's Zoar Valley Park and across Cattaraugus Creek. Leave interval between cars in crossing wooden bridge (Three ton capacity). (11) Cross mature floodplain. Leave Erie County. Enter Cattaraugus County. Figure F4 is an aerial view of Zoar Valley looking west downstream.
46.0	1.3	Pass Girl Scout Camp. Waterfalls ahead mark the west edge of a drift-filled bedrock valley. Commence climb out of Zoar Valley on steep, winding road.
47.3	1.3	Turn Right (W) onto Wickham Rd.

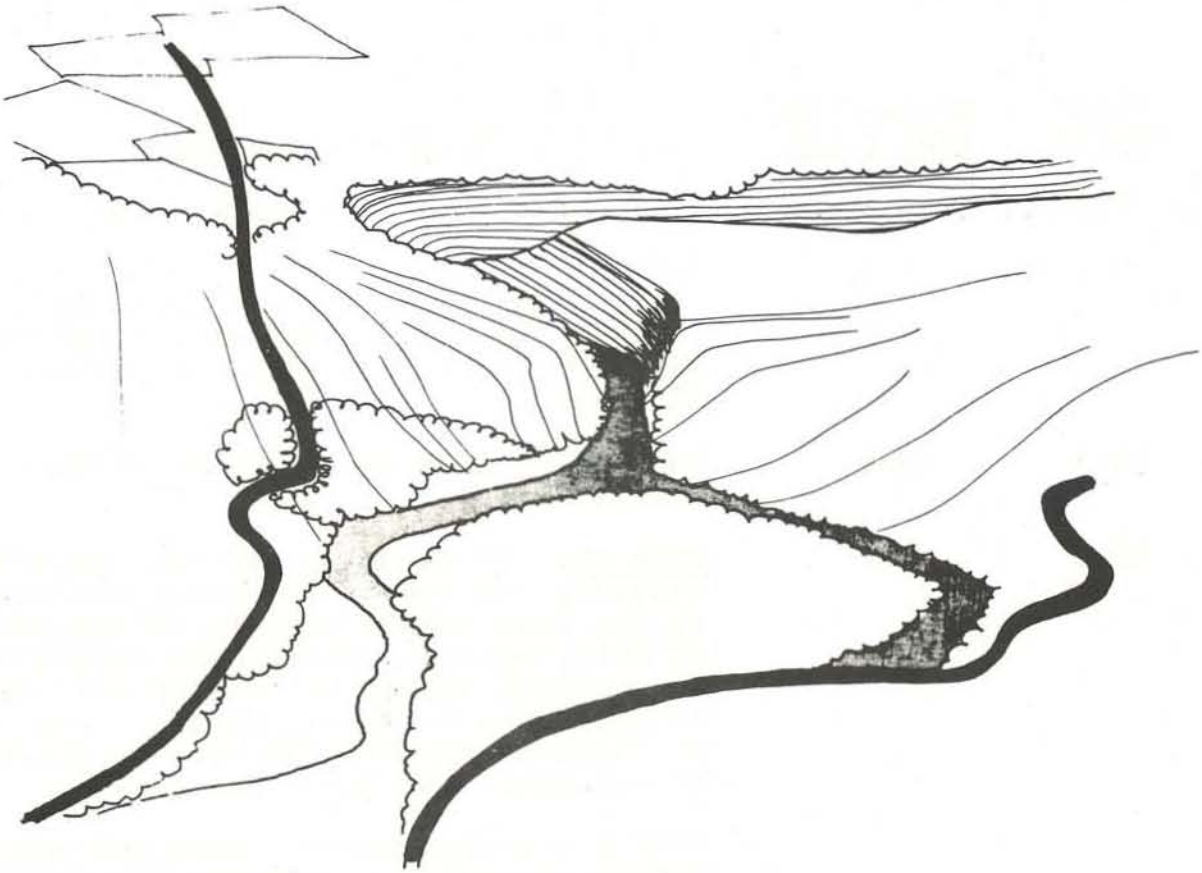


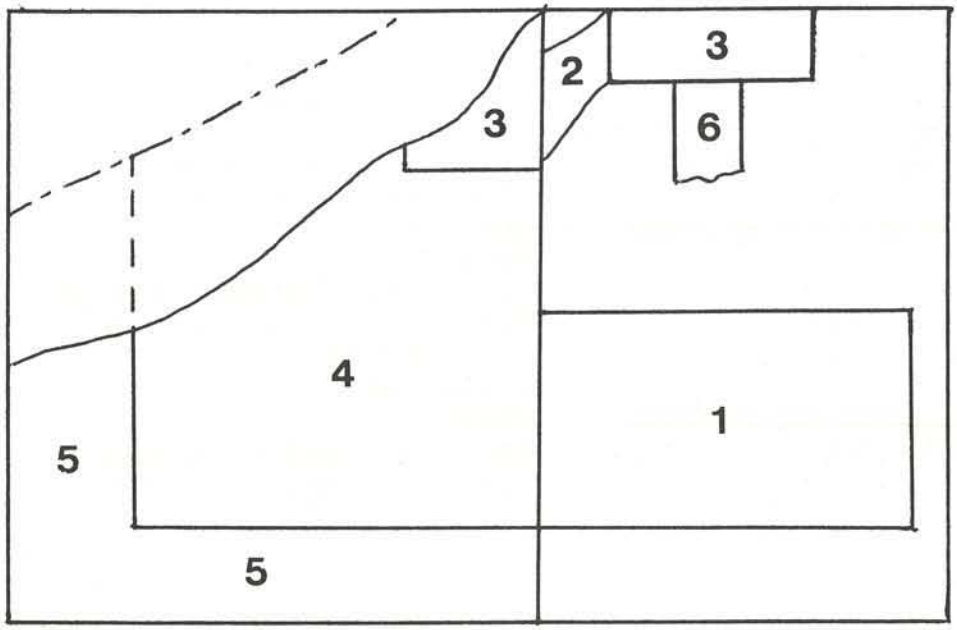
Figure F4. Aerial view of Zoar Valley and Gorge looking downstream on Cattaraugus Creek.

Figure F5. Aerial view of buried Allegany valley exposed in cliff making up the east wall of the Cattaraugus Creek Valley. Notice how the bedrock outcrop makes a diagonal across the cliff face. Above the line is unconsolidated valley fill.

Total Miles	Miles from last point	Route description
47.6	0.3	Crest of a Lake Escarpment moraine.
49.7	2.1	Turn Right on Forty Rd. to the 2-ton bridge over the South Branch of Cattaraugus Creek. The road climbs out of the valley. More spectacular views are available at STOP F5.
51.4	1.7	Turn Right (NW) on Point Peter Rd. to STOP F4.
51.5	0.1	STOP F4. If slumping has not obscured the bedding, the source direction and extent of the beds should clearly reveal the nature of this deposit. Should the relationships be somewhat vague, an attempt will be made to make them perfectly clear. There will be complete cooperation with no attempts to stonewall the investigators. Time permitting we will make two more stops before returning to Gowanda and going our separate ways.
52.4	0.9	Turn Right (NE) off Point Peter Rd. to the Zoar Gorge Lookout. STOP F5. The view point about 200 meters from the parking space is on a knife edge meander core well above the valley floor. There are friendly trees for those who prefer something to hold on to.
54.2	4.8	Return to Point Peter Rd. and turn right.
54.7	0.3	STOP F6 is on the east valley wall of the ancient Allegany valley. The small tributary which has filled the Gowanda water supply reservoir to spillway level leaves the broad valley at the cam on the west to enter a deep, entrenched, meandering channel in bedrock on the east side of the road. From this bedrock channel it emerges into Cattaraugus Creek. Brave souls may visit the meander core via a knife edge (without trees this time) or may peer into the broadening valley of Cattaraugus Creek and observe immediately below in the face of the cliff the diagonal line of the contact of fill and bedrock which is shown in Figure F5. Continue on Point Peter Rd.

Total Miles	Miles from last point	Route description
55.2	0.5	Turn Right on Broadway into Gowanda, astride Cattaraugus Creek in Erie and Cattaraugus Counties. Gowanda in the Seneca langauge means "a beautiful valley between hills". The Seneca Nation of Indians maintains its business office in downtown Gowanda, but the reservation is north of town, extending along Cattaraugus Creek to Lake Erie. Cattaraugus in the Seneca language means "odorous waters", an epithet given new meaning by the white man's tannery and glue factory on the southern outskirts of Gowanda. Cattaraugus Creek is the largest creek in New York west of the Genesee River to flow north across the Lake Escarpment - Valley Heads moraines. In so doing, it has inherited the valley of the Ancestral Allegheny River where it descended from the plateau in a constricted gorge. Bedrock exposures on opposite sides of the valley at Gowanda are only 0.7 mile apart, yet a municipal well is reported to have penetrated 320 feet of drift. (Note: Well probably not on axis of valley as 7-800 ft. is reported elsewhere.) END OF TRIP Those returning to Thruway East may get on Thruway by following Rt. 62 North through Hamburg to the entrance. Those returning to Fredonia and the Thruway west will hopefully make a Left turn at the base of the hill before entering downtown Gowanda and head west on Route 39 crossing hill and vale (buried) through Perrysburg and Forestville to Route 20 and Fredonia, approximately 25 miles.

PLATE 1. Glacial Map of western New York



Index Map of Published Data Sources Used in this Compilation. (Numbers refer to list below).

Map Data Sources

1. Bryant, Jay C., 1955, A refinement of the upland glacial drift border in southern Cattaraugus Co., N.Y. Cornell Univ. M.S. thesis, 127 p.
2. Calkin, Parker, 1970, Strandlines and chronology of the Glacial Great Lakes in northwestern New York; Ohio Jour. Sci. 70: 78-96.
3. Leverett, Frank, 1902, Glacial formations and drainage features of the Erie and Ohio Basins, U.S.G.S. Monograph 41, 802p.
4. Muller, E. H., 1964, Geology of Chautauqua Co., N. Y. Part II, Pleistocene Geology, N. Y. State Mus. and Sci. Svc. Bull. 392, 60p.
5. Shepps, V.C., G. W. White, J. B. Droste and R. F. Sitler, 1959, Glacial geology of northwestern Pennsylvania. Penna. Geol. Survey Bull G-32, 4th series.
6. Sweeney, J. F., 1969, Glacial geology of the Springville, N.Y. and northern part of the Ashford Hollow, N.Y. quadrangles. S.U.N.Y. Buffalo, M.S. thesis, 51 p.

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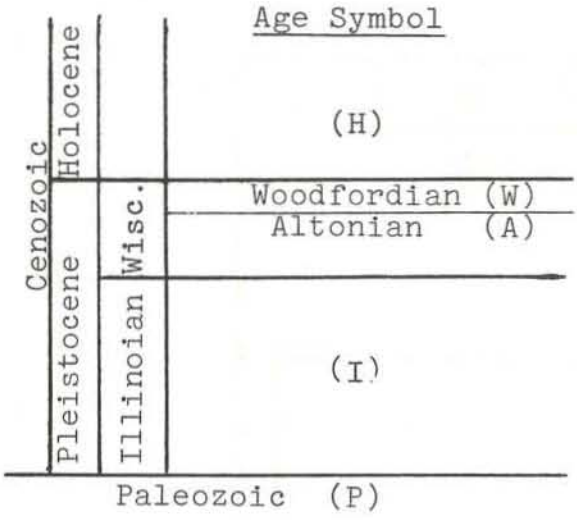


Deposit	
Alluvial sand and silt	as
Alluvial gravel	ag
Beach sand and gravel	ls
Lake silt and clay	lc
Peat, marl and muck	pm
Wind deposited sand	ws
End moraine	em
Ground moraine	gm
Ice contact stratified drift	kg
Outwash, terrace and delta gravel	og
Colluvium	cl
Shale	sh
Sandstone and siltstone	ss
Limestone and dolomite	ld

Symbols

Contact — Probable — Inferred

Glacier marginal positions (hachured toward glacier) — Probable — Inferred

Moraine ridges

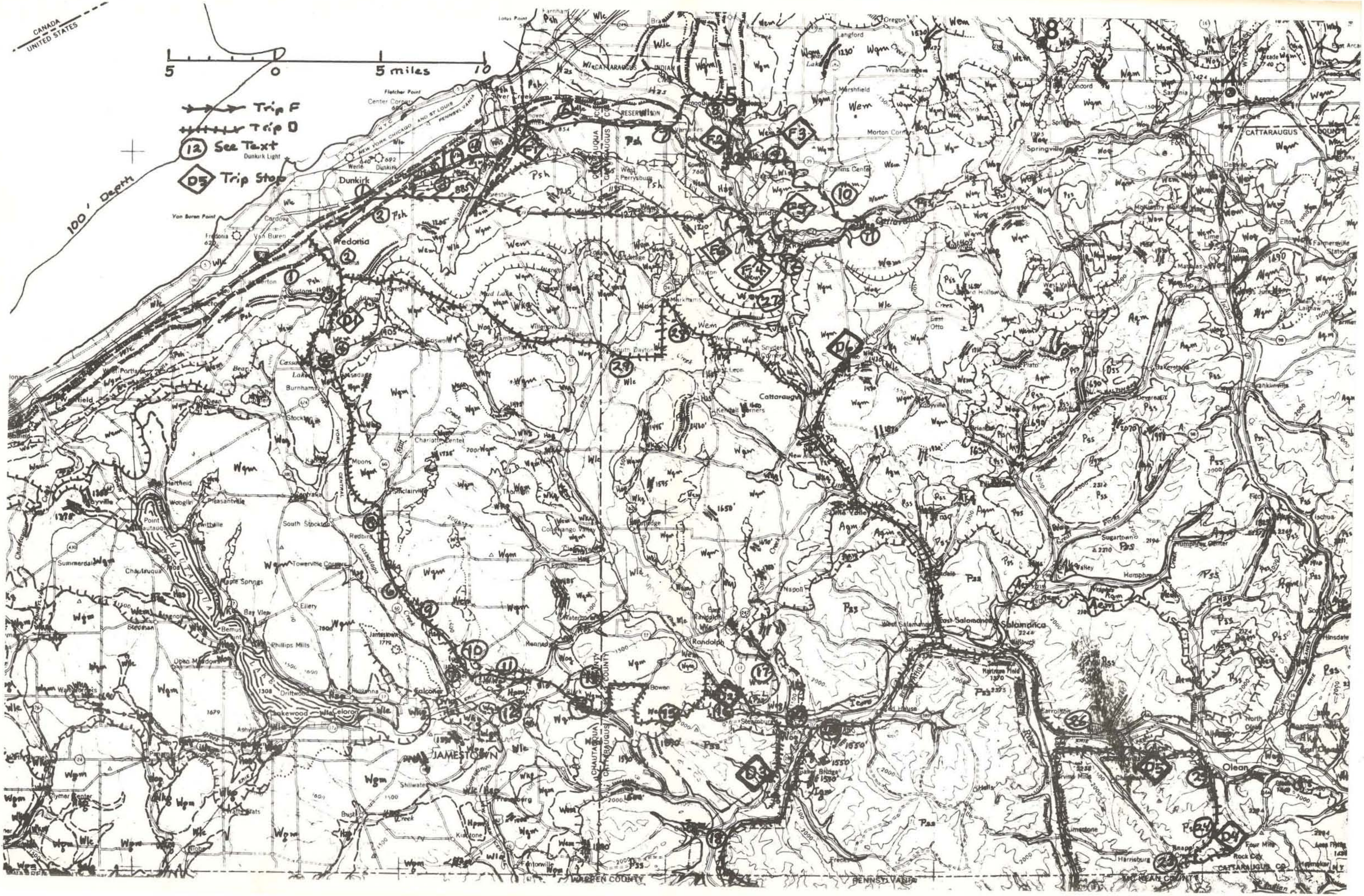
Wave-cut cliff (hachured toward lake)

Beach, bar or strandline

Drumlins and fluted till plain (symbol represents either individual drumlin or groups of drumlins)

Striae (arrow head indicates sense of flow) — Sense of flow unknown

Glacial meltwater channels (ool elevation in feet)


CANADA
UNITED STATES
5 0 5 miles 10
Trip F
Trip D
12 See Text
D5 Trip Stop
100' Depth
Dunkirk
Fredonia
Jamestown
Salamanca
Olean
Cattaraugus
Springville
Chautauqua
Lakewood
Celoron
Randolph
Gowanda
Dayton
South Dayton
Westfield
Sardinia
Yorkshire
WARREN COUNTY
PENNSYLVANIA
MC KEAN COUNTY
CATTARAUGUS CO.