Holocene Meander Incision Imposed Across a Buried Valley Wall

Michael P. Wilson
Geosciences Department
SUNY College at Fredonia
Fredonia, NY 14063
(716/673-3843)

and

William T. Boria
Division of Environmental Health Services
Chautauqua County Department of Health
Clothier Building
Mayville, NY 14757
(716/ 753-4481)

TOPICS

This field trip provides an opportunity to visit two contrasting kinds of glacially buried valley fills. While looking at buried valley fills in northern Chautauqua County we have noticed that the fills are not internally deformed when not involved in modern landslides. The exception to this scenario occurs where the fills include near-surface outwash and lacustrine sediments among the Lake Escarpment and Lavery Moraines. These settings show ample evidence of deformation from the melt of underlying ice. Surface land morphology shows well-defined kettle holes and gently undulating surfaces with a few tens of feet of relief. Gravel pits show dips that range to between 50 and 90 degrees. Outcrops show folded and faulted sediments.

This trip will provide an opportunity to discuss recent meander incision across a buried valley wall. Our sketches and photography, in addition to published information, allow for a nearly complete reconstruction of meander movement during recent decades.

Although not part of our immediate objective, we will bring with us copies of the 1990 NYSGA Guidebook article by Gilman and Berkley. Their article included one of the stops that we will visit (our Stop 2). Their trek down Chautauqua Creek (and other parts of their article) paid particular attention to brittle structures in the bedrock. We will point these out while we hike to our Stop 2. We have been especially interested in the timing of the development of the pop-up folds. In scanning cliff walls of western and central New York streams, we note the absence of these folds. On the other hand, pop-ups occur routinely at quarter or half mile intervals in stream beds or Lake Erie cliffs. Also noteworthy is that one-meter amplitude folds are very commonly associated with basal tills. The non-glacial pop-ups are apparently related to erosional unloading.

FIGURES

Before flipping through the illustrations of this article, try beginning with Figure 1 and try drawing the buried valley outline that you might infer from Chautauqua Creek floodplain width. Then go to Figure 2. Yes, you are probably a little bit right as well as a little bit wrong. Figure 2 is based primarily on mapping of the elevations of exposed bedrock in tributaries (courtesy of the late Ken Fahnestock).

Figure 3 shows the historic positions of the meander loops at Stop 2 (the undeformed sediments at Stop 1 are exposed by a combination of natural gully growth and reservoir outlet erosion). From the dates it can be seen that the stream alternates periods of erosion between the two faces of the meander loop.

Figures 4 and 6 present sketches compiled from our approximately twice-yearly visits during the past 13 years. Figure 5 gives some food for thought. To what extent did Lake Escarpment glacial oscillations create this outcrop as opposed to a more complicated history that could include earlier glacial episodes? Lack of radiometric or other dates makes the answer difficult. Another idea for discussion ... are the gravels at the base of the outcrop from subglacial processes?

REFERENCE

Muller, Ernest H., 1963, Geology of Chautauqua County, NY, Part II, Pleistocene Geology: New York State Museum and Science Service Bulletin No. 392.

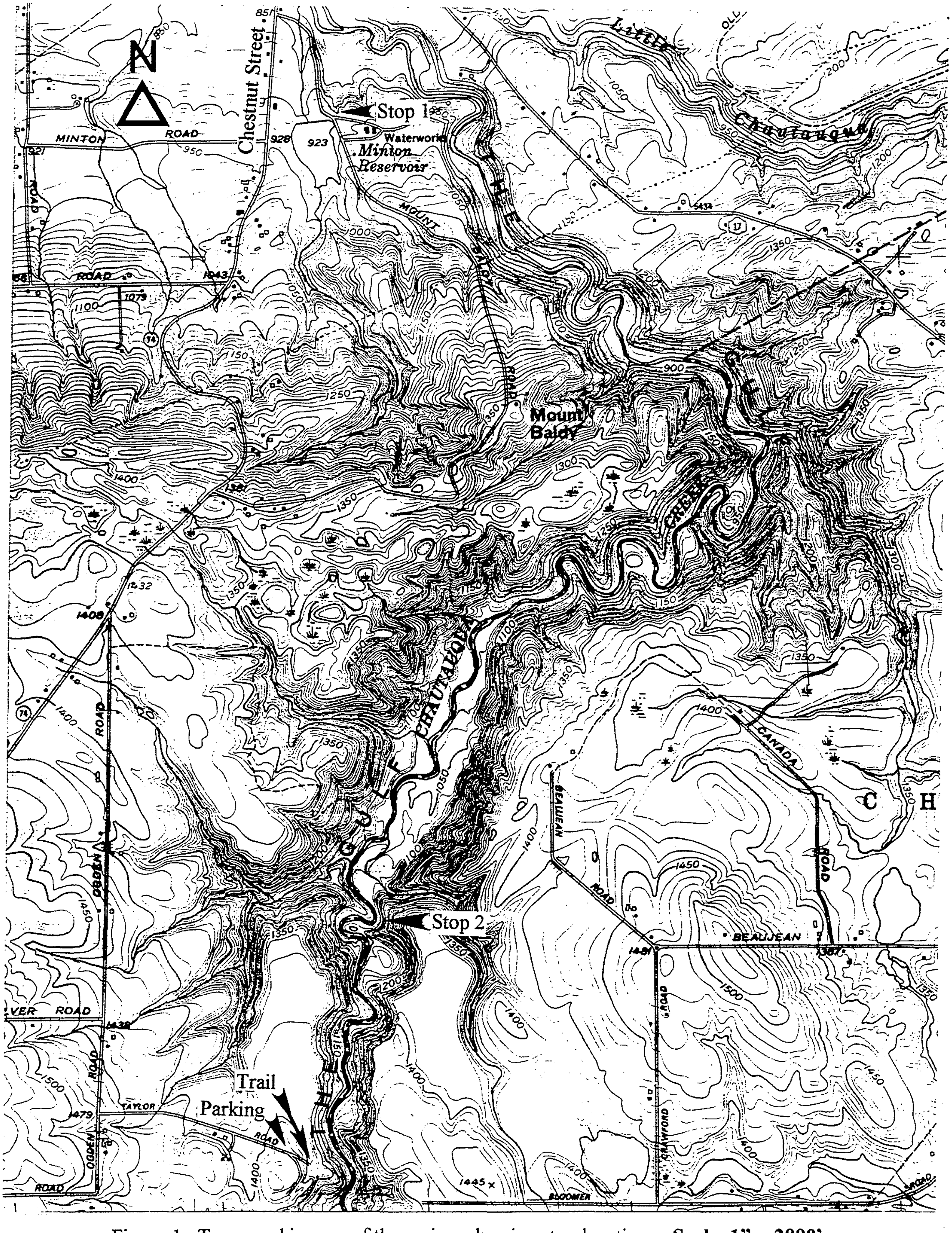

Figure 1. Topographic map of the region, showing stop locations. **Scale 1" = 2000'**

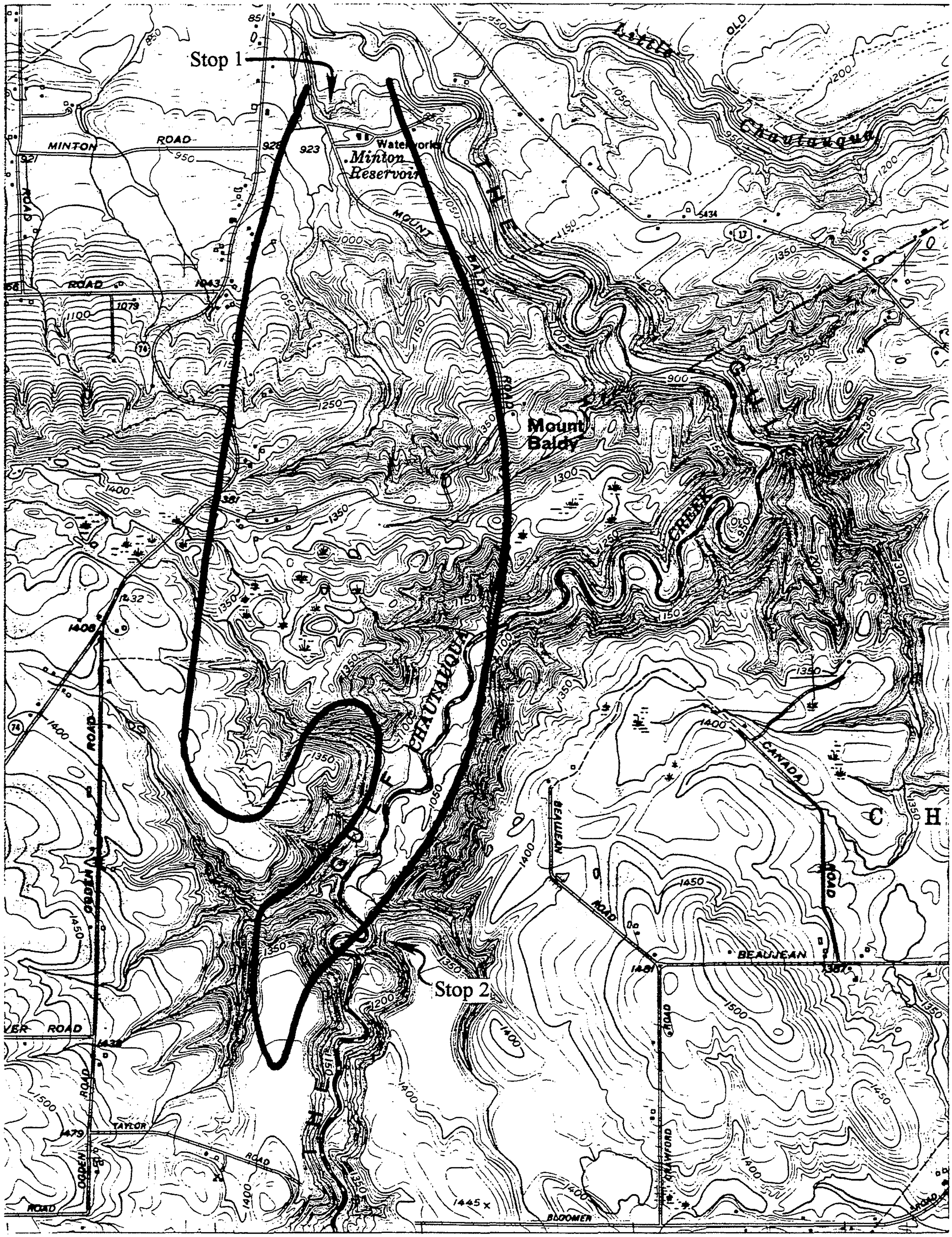

Figure 2. Approximate boundary of deeply buried bedrock, showing stop locations.

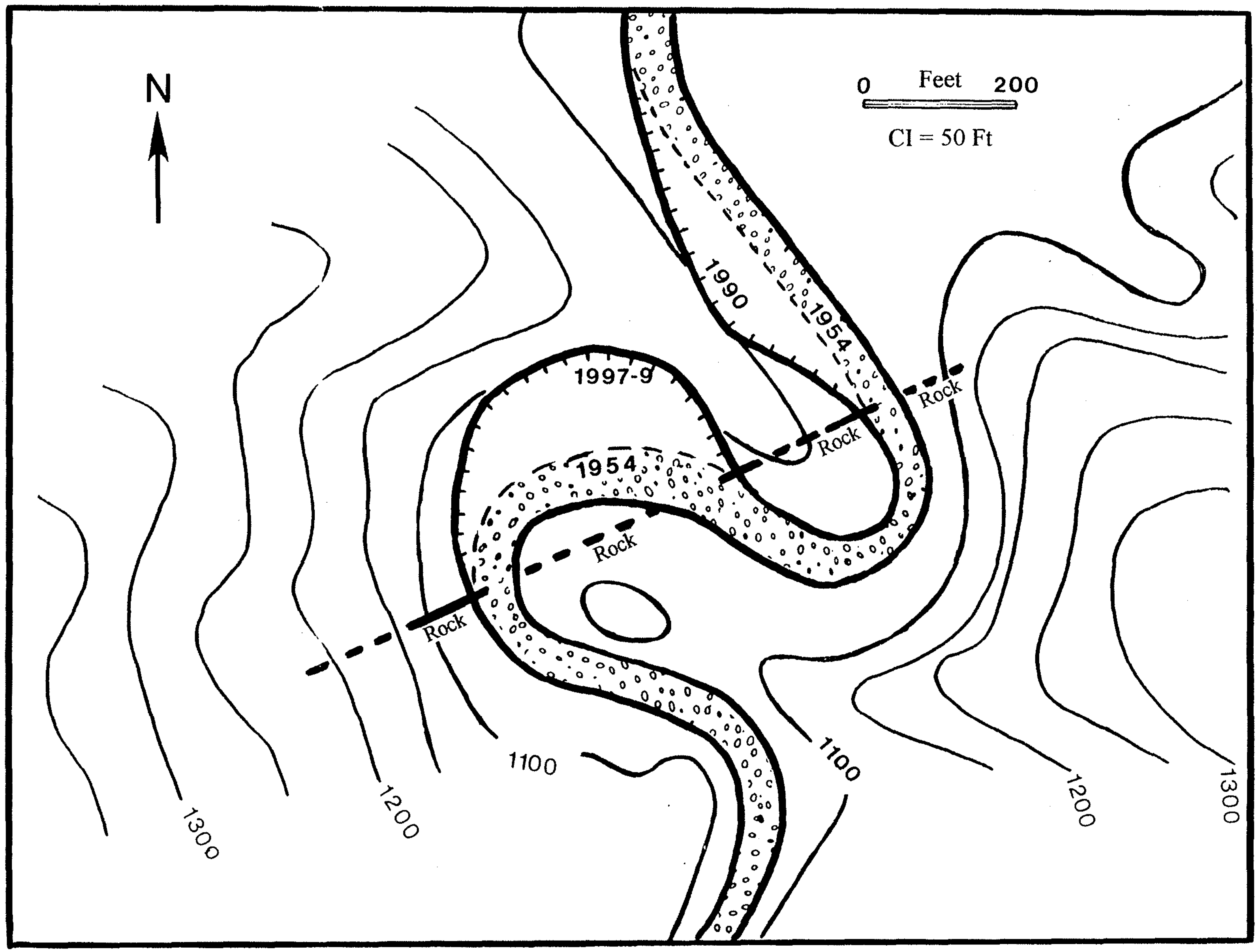

Figure 3. Map showing 1954 location of Chautauqua Creek with locations and dates of farthest lateral erosion since then.

Sun. D6

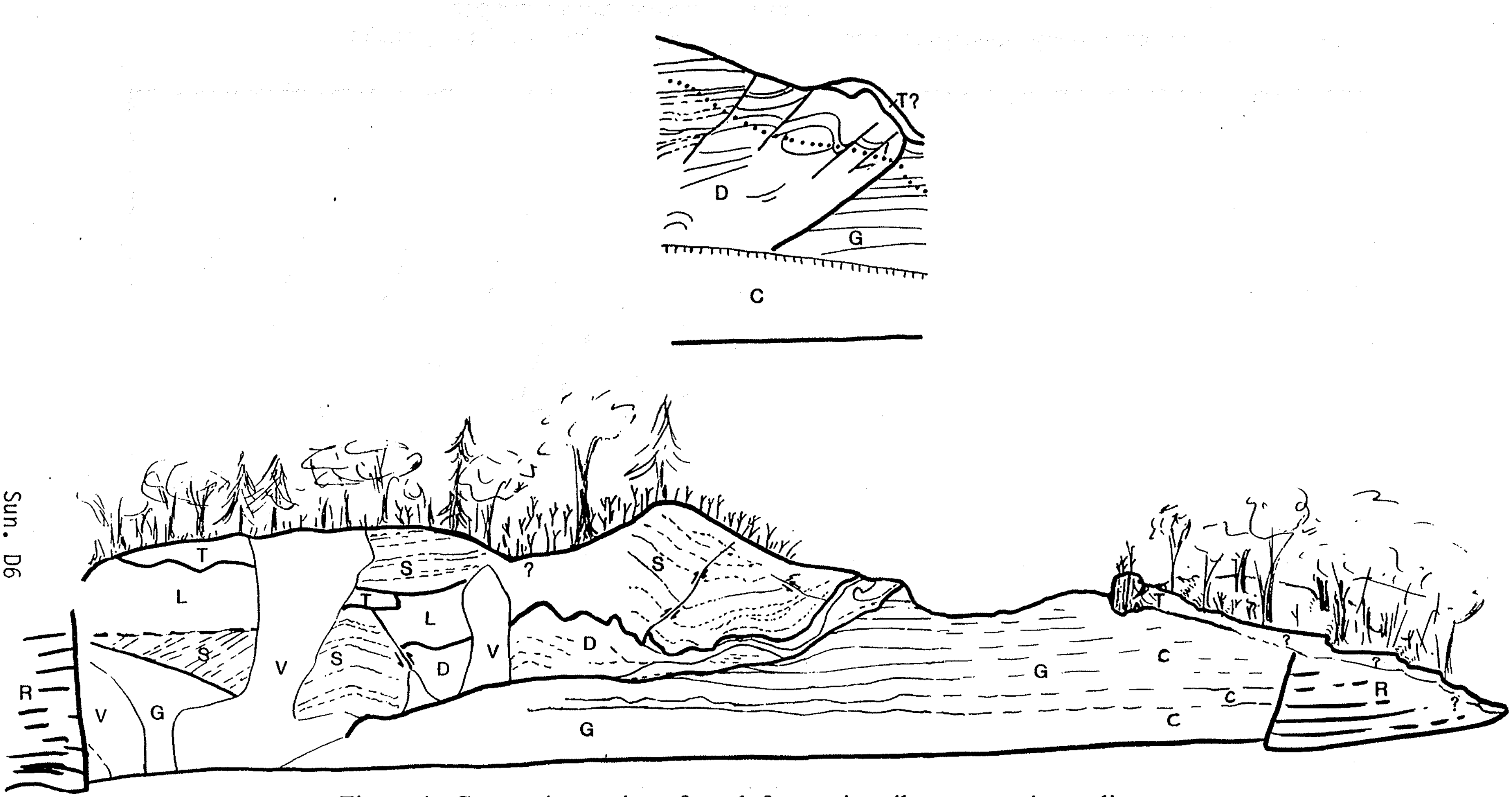

Figure 4. Composite section of south face, primarily representing sediments as exposed in 1997. Upper drawing is central section as exposed in 1988 (dotted line matches 1997 skyline). Symbols are: G = gravel; D = disturbed gravel; S = sand; L = lake sediments; T = till; R = rock; V = vegetation; C = covered.

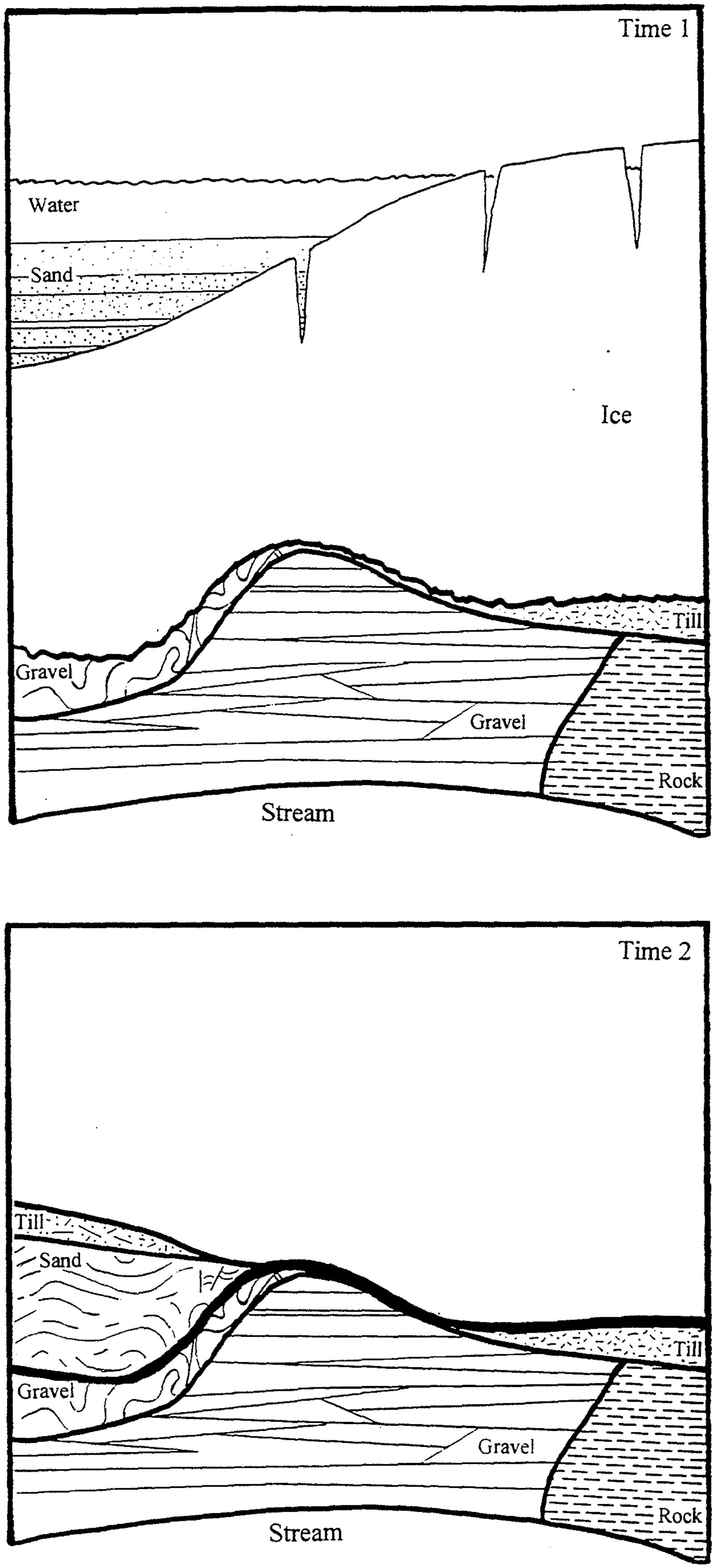

Figure 5. Schematic diagram of the central and eastern portions of the south face. Time 1 shows the glacier stagnant after deformation of the underlying gravel (left) and deposition of till (right). Time 2 shows subsequent let-down of sand layers as they are seen today. Till at the upper left post dates these events (and till at upper right may also).

Figure 6. Composite section of north face. Symbols are: G = gravel; S = sand; gS = gray sand; D = disturbed gravel; T = till; tf = tunnel fill (?); C = covered.

Road Log

Imminent Breaching of Chautauqua Creek's Great Meander

Total Miles	Miles from Last Point	Route Description
0.0	0.0	Leave the SUNY Fredonia campus at the Temple Street exit. Turn Left (south) onto Temple Street
0.7	0.7	Turn Right (west) onto State Route 20. The Village of Fredonia lies mostly on Glacial Lake Warren shoreline and Canadaway Creek delta and terrace sand and gravel. We will drive for approximately 15 miles, mainly on top of the Warren shoreline. Often, about ½ to 1 mile to the south (left), the Glacial Lake Whittlesey shoreline (approx. 13,000 BP; Muller and Calkin, 1993) can be observed as a 20 to 40 ft. high terrace. Whittlesey shoreline deposits are typically narrower and more gravelly than Warren (Woodbury, 1992; Woodbury and Jenson, 1990). The Lake Escarpment Moraines (approx. 14,000 BP; Muller and Calkin, 1993) cap the top of the Portage Escarpment to the south. The ridge line is about 1000 ft above Lake Erie (1550 ft vs. 573 ft). Continue for about 15 miles, through the Village of Brocton, Town of Portland, and Village of Westfield.
16.0	15.3	Go over the long bridge over Chautauqua Creek on the immediate west side of the center of the Village of Westfield.
16.3	0.3	Turn Left (south) onto Chestnut Street.
17.5	1.2	Turn left (southeast) onto Mt. Baldy Road.
17.9	0.4	**STOP 1.** Outlet ravine of Minton Reservoir. Park on the roadside (don't drive all the way to the edge of the bull-dozed area). This will be a brief stop to peer into the ravine and observe the nature of the buried valley fill and contrast these materials to those at Stop 2. Backtrack (northwest) down Mt. Baldy Road.
18.3	0.4	Turn Left (south) onto Chestnut Street.

20.5	2.2	Turn Left (south) onto Ogden Road.
22.0	1.5	Turn Left (east) onto Taylor Road.
22.6	0.6	**STOP 2.** Wet-foot trek into Chautauqua Gulf. Parking at end of Taylor Road (remains of gravel pits in kames).
44.5	21.9	Return: drive back down the hill to Westfield, then right (east) onto Rt. 20 to Fredonia; at the intersection of Temple Street and Rt. 20 (at Barker Common) in Fredonia, turn left ontoTemple Street, then right onto campus.

Total Trip Approximately 44.5 Miles.