

Field Musings on Glacial and Geo-Political Boundaries in Western New York

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INTRODUCTION

Glaciation was literally a heavy influence on the topography in Chautauqua County, New York's westerly and southerly boundary with Pennsylvania. We will visit relic shorelines of pro-glacial lakes that occupied the Erie basin as ice near the Buffalo area dammed easterly flow; we will see that the shorelines are now tilted from post-glacial isostatic rebound and how geodetic evidence suggests the rebound continues. We will visit ice marginal features such as eskers, sub-glacial meltwater channels and deltas, and an apparent sub-aqueous recessional moraine. We will visit one or more "pop-up" structural features in the otherwise flat-lying Devonian stratigraphy, possibly the result of glacier-weight unloading. We will visit the inter-state boundaries to explain how George Washington, Benjamin Franklin and other early American leaders strategically determined the geographic interface between New York and Pennsylvania, to see the field challenges facing government surveyors who marked the lines, and learn how glacial-related geologic features defined the westerly line of New York.

BACKGROUND

This trip is an extension of the NYSGA field trip, "Paddling Up a Meltwater Channel: A Late-Wisconsinan Ice-Marginal Cruise Near Fredonia, New York" (Woodbury and Jensen 1990) by including work within the MS thesis, "A Proposed Ice Margin for Late Lake Arkona or Early Lake

Whittlesey and Geodetic Evidence for Continuing Post-Glacial Uplift in Western New York” (Woodbury 1992). Additionally, stops are included to give a wider and more general view of the glacial history of Chautauqua County, and the rides between stops will be narrated between vehicles by radio so that even the traveling views will be mental stops for geologic and geo-political thought. For more detail on glacial items, see the references already cited and the excellent summaries with references in “New York Glacial Geology, U.S.A.” (Cadwell and Muller 2004) and “The Glaciation of Pennsylvania, U.S.A.” (Braun 2004 and 2011). For enlightening and extensive detail on western New York’s geo-political boundaries see “Report of the Regents’ Boundary Commission Upon the New York and Pennsylvania Boundary” (Clarke 1886) and “Andrew Ellicott, His Life and Letters” (Mathews 1908). Also, an illustrated color brochure will be supplied to the participants on this trip and will be pdf-available by email request to supplement this publication.

STOP ONE:

During either a period during a stage of late Lake Arkona or a period during an early stage of Lake Whittlesey, a long series of high-volume sub-glacial meltwater channels drained the southerly edge of ice that advanced southwesterly in the Erie basin to the area now Chautauqua County. The lowest of these meltwater channels carved out large amounts of local Devonian inter-bedded shales and siltstones as it emptied into, and formed a large delta in, either late Lake Arkona or early Lake Whittlesey. See Figure 1 for locations of the channel, the delta, and the delicate eskers likely formed near a wasting ice margin. We will observe evidence that waves washed the northerly ends of the eskers at the beach elevation of the pro-glacial lake that drained the Erie basin westerly during this glacial stage. At Stop Ten we will see apparent sub-aqueous recessional moraines that seem to correlate with glacial events forming the meltwater channel, the delta, the beach ridge, and the eskers.

At Stop One we will stand at the former water level – as surveyed by differential leveling for this project with the help of graduate student Bobbi Jo Gibbons – that snubbed the esker noses about 14,000 years ago, then walk the sinuous top of the esker and muse on what the feature contains within. We will get lucky as the grape-farmer owner has cut a cross-sectional path through the esker and we can take out our rock picks to better examine the core of mostly local and angular material with some sorting and stratification.

STOP TWO (with restrooms also available here):

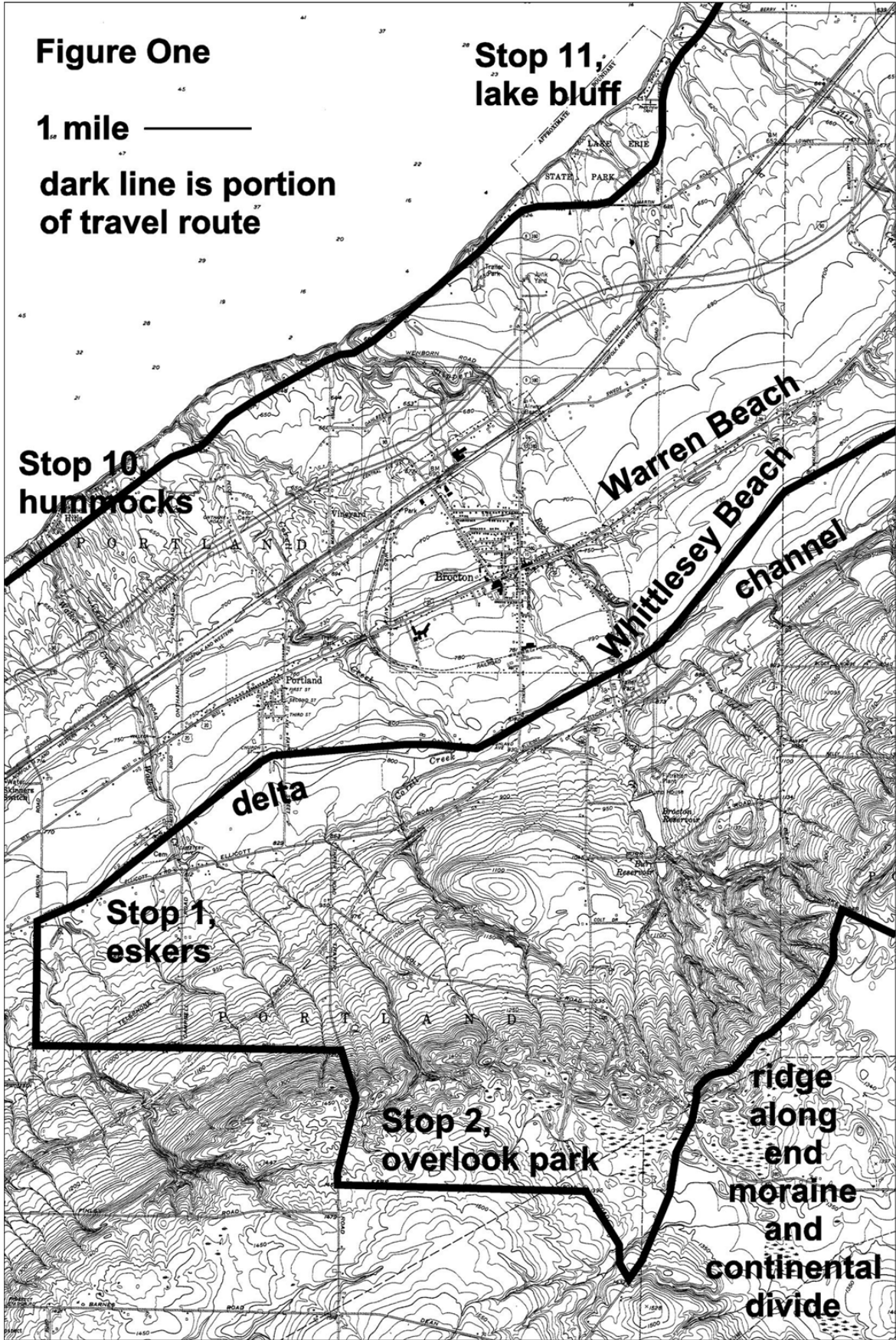
Luensman Overview Park sits atop the Lake Escarpment End Moraine. Views northerly give a glimpse of current Lake Erie and the higher and older relic shorelines of Lake Warren which United States Route 20 generally follows here, and of the even higher and older Lake Whittlesey which Webster Road follows here. Author Gilman assisted in the development of this gem in the county parks system by authoring a brochure on its geologic history, and he will give another of his hilltop lectures from the site. A nature trail, with its own guidebook at the trail head, is a nice addition to the original park and is highly recommended for those who can re-visit this stop at a more leisurely pace.

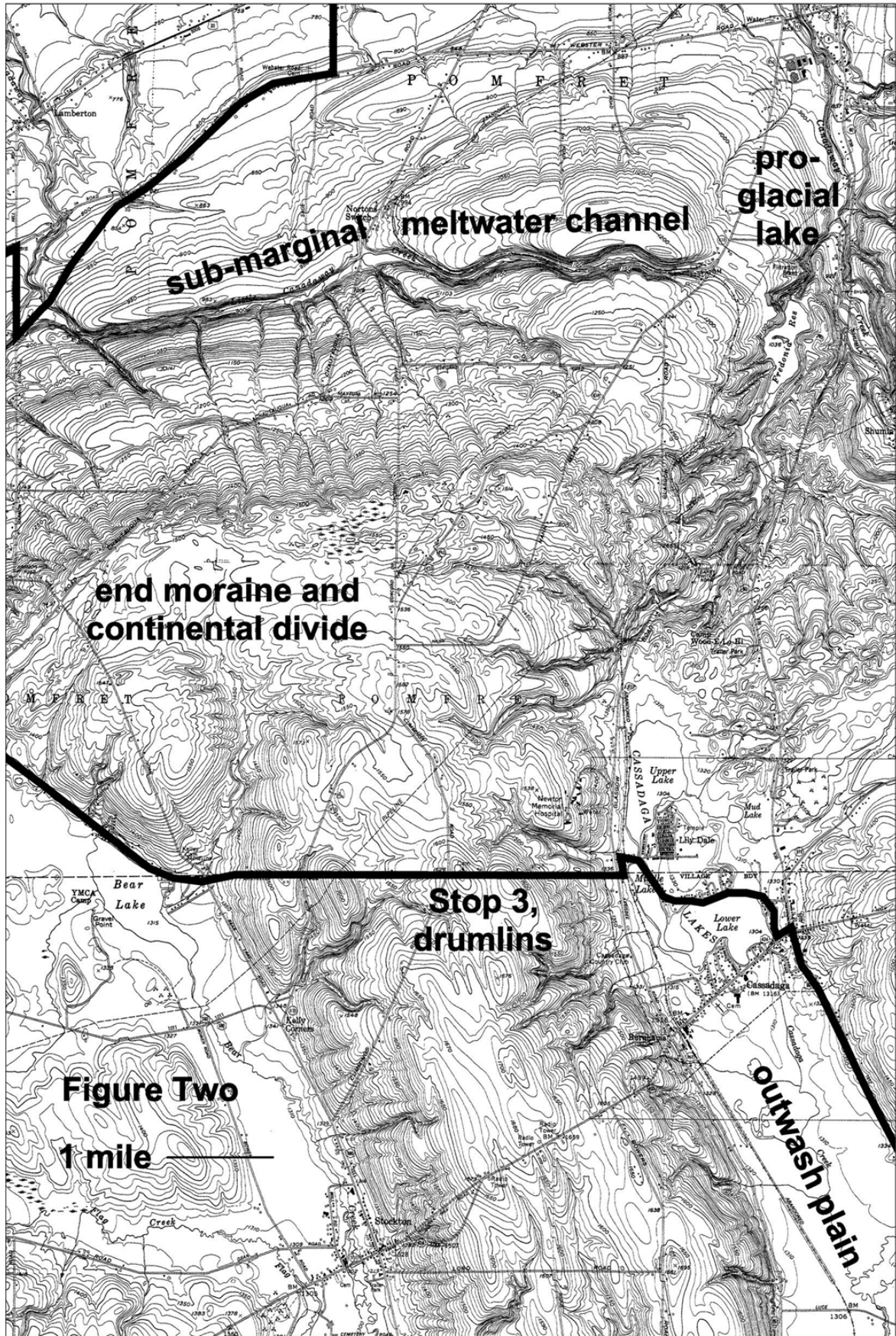
STOP THREE:

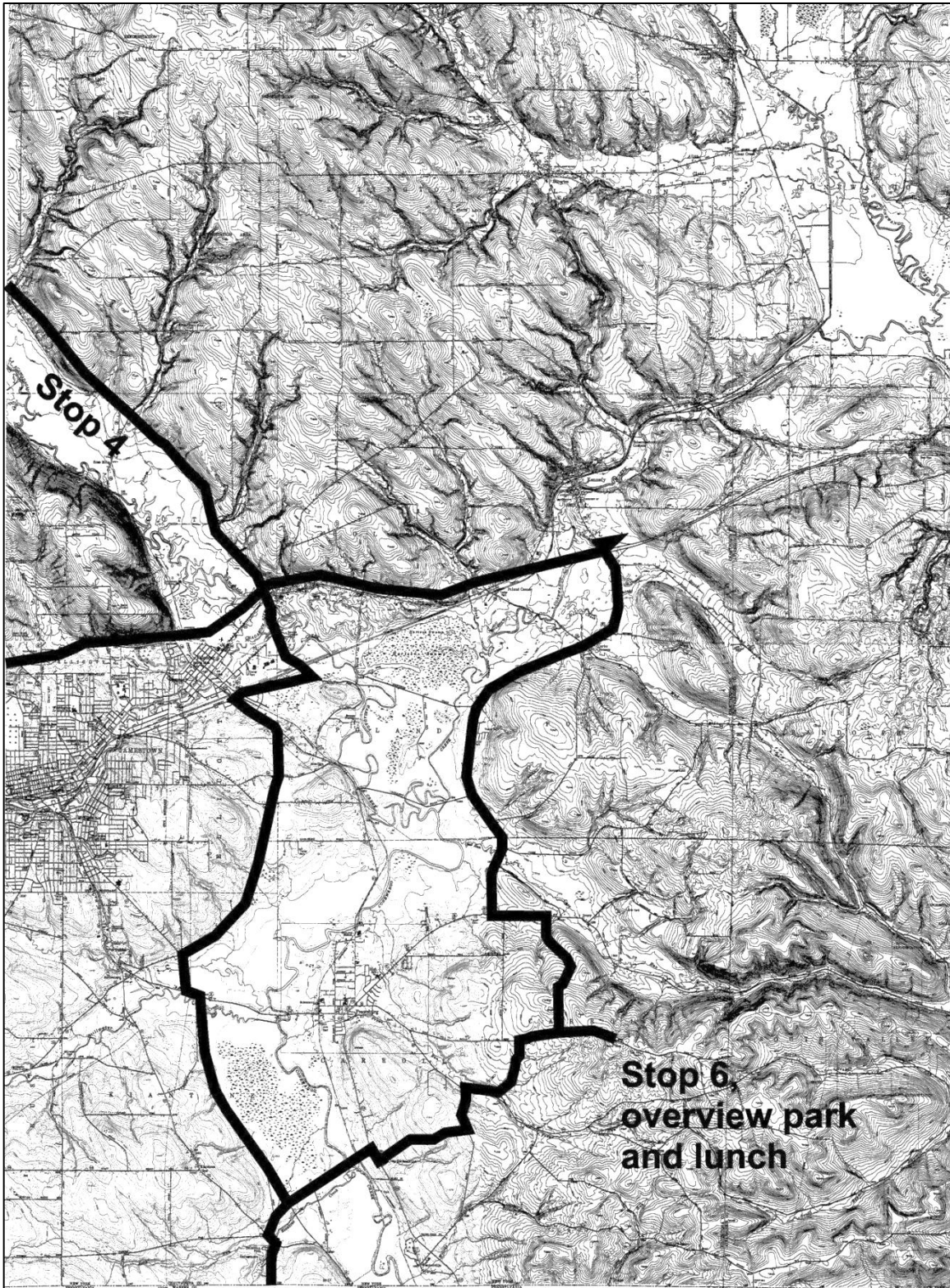
We will cross and ride the ridge of the continental divide between the Great Lakes Drainage Basin and the Mississippi Drainage Basin as we move to this stop. We will pass Bear Lake, a kettle lake at the northerly end of a broad outwash plain. We will then cross perpendicularly across a drumlin field along a town line road surveyed and cut through wilderness more than 200 years ago. Our stop is at the summit of one drumlin at a spot offering great views toward Buffalo, the area thought to be the source of the most recent glacial lobe advance southwesterly in the Erie basin and also views to the northwest, the orientation of the drumlin field and the likely source of an older pulse of glaciation that traveled across the continental divide and beyond the southerly end of what is now Chautauqua County. After this stop, we will drive through the quaint village of Cassadaga and see its three inter-connected kettle lakes as we move southerly down the easterly side of a wide valley of outwash – a filled-in finger lake perhaps?

STOP FOUR:

An excellent perch for pensive musings on geology, this is a stop above the pioneer settlement of Ross Mills with a breathtaking panorama of the wide outwash-filled valley below and the hills in Pennsylvania unreached by glaciers many miles to the south.







Firgure Three
one mile

Stop 5, 1787 latitude stone

**Stop 6,
overview park
and lunch**

STOP 5:

In 1786 and 1787, brothers Andrew, Joseph, and Benjamin Ellicott represented “Pennsylvania President” Benjamin Franklin – others represented New York – to blaze a survey line to Lake Erie along 42 degrees North Latitude, the boundary between the two states. About every 20 miles, astronomic readings were made by Andrew Ellicott and stones were there marked and set. We will visit a rare remaining stone. In 1781, New York had ceded lands west of the meridian through the west end of Lake Ontario to the United States, although that boundary was not established until US President George Washington ordered it surveyed in 1789 and 1790 when the Ellicott brothers represented the United States for that task. Pennsylvania hoped Chautauqua Lake would be in Pennsylvania. Figure Four is a map sent to Washington from the 1787 work of the Ellicotts for which Washington returned a letter of hope that Chautauqua Lake might indeed go to Pennsylvania, but Figures Five and Six are maps drawn by Andrew Ellicott filed, respectively, with the Holland Land Company in Amsterdam and with the Commonwealth of Pennsylvania, showing Chautauqua Lake and its surrounds were found by his survey completed and marked in 1790 to be in New York.

STOP 6 (with restrooms also available here):

Lunch at the Erlandson Overlook Park, where we have views of glacial-carved and outwash-filled valleys, including the former valley of a northerly flowing Allegheny River, and views toward the un-glaciated Salamanca Re-entrant where the river now flows south.

STOP 7 (not mapped, but location is on road log, and restrooms also available here):

The northwesterly corner of New York is marked by granite stones set in 1884 to replace the 1790 marks placed by Andrew Ellicott. Another large stone monument is near here and we will read its ornate and elaborate markings. For this fieldtrip, modern geodetic surveying was used to establish the latitude and longitude of the stones tied to the current reference ellipsoid to field-discuss the accuracies of the original surveys done centuries ago.

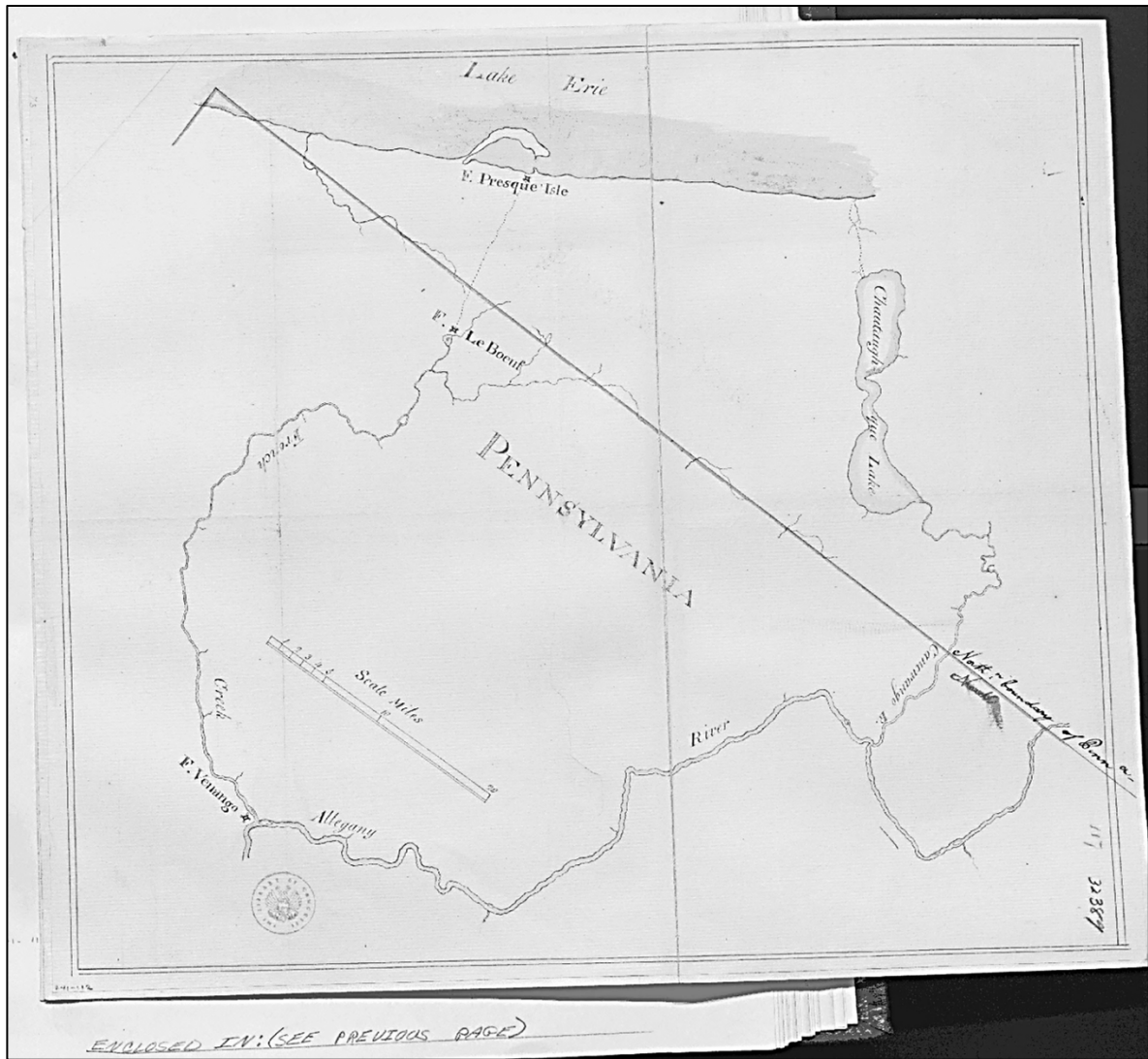
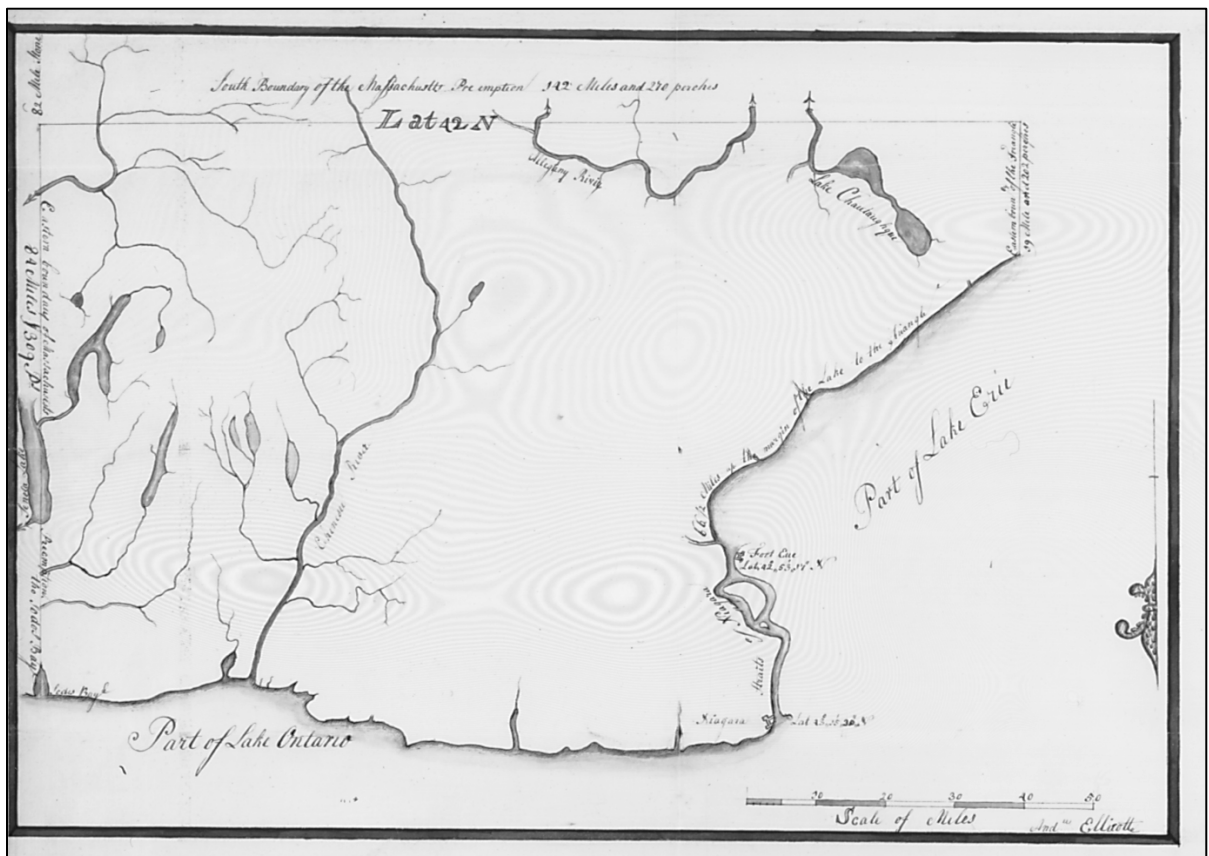
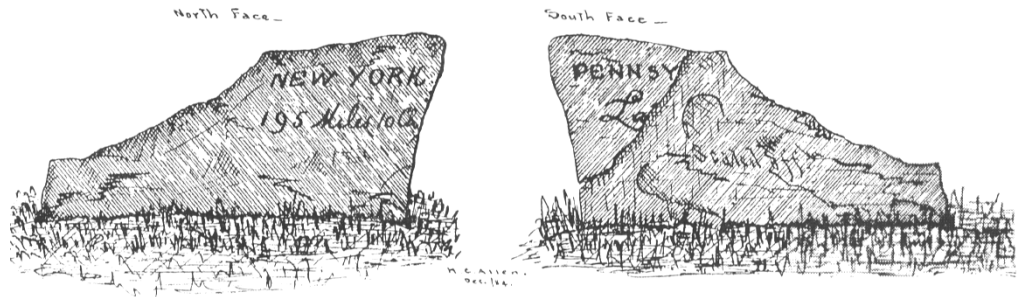
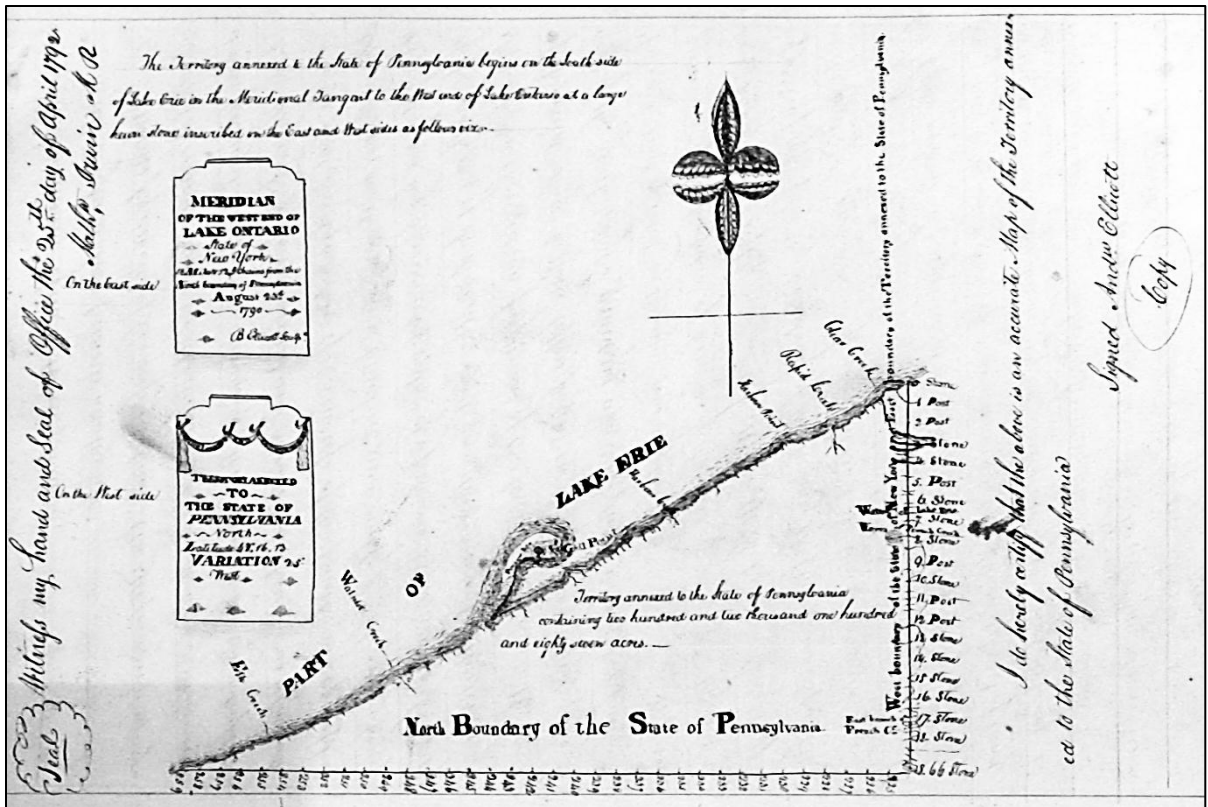


Figure Four above is a gracious scan for this research by the Library of Congress, from the original letter books of George Washington. Figure Five below is an 1884 drawing of the 1787 latitude stone set south of Chautauqua Lake. Map and stone to be discussed in the field along with Figures Six and Seven at the right that are Andrew Ellicott survey maps of the western boundary of New York.

EIGHTH LATITUDE STONE. 195 1/2 M.
N.Y. and Penn Boundary.





STOPS 8 AND 9 (not mapped, but locations are on road log):

These stops show fascinating structural features as the usually flat-lying Devonian strata in Chautauqua County near Lake Erie has “popped up” – and perhaps due to glacier-weight unloading. Geodetic leveling research (Figure 10, Woodbury 1992) shows continuing local post-glacial rebound, so is present isostatic adjustment a key to these past effects?



Figure 8, left, “pop up” along Lake Erie bluff near Ripley wastewater plant, Stop 8.



Figure 9, left, “pop up” along Lake Erie bluff at Ripley Beach, Stop 9.

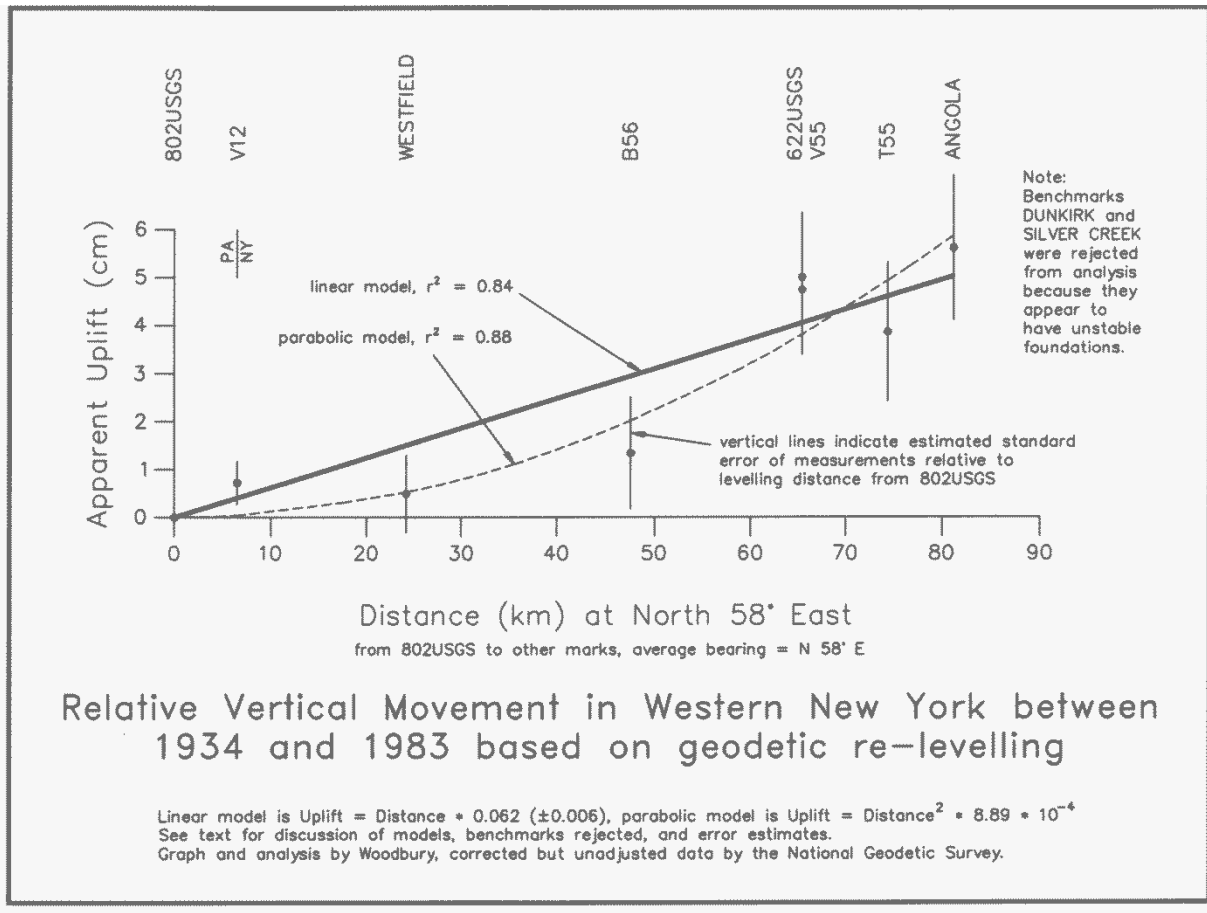


Figure 10, Geodetic Evidence for Continuing Post-Glacial Uplift in Western New York. The National Geodetic Survey (division of NOAA and successor to the US Coast and Geodetic Survey) provided this investigation with unpublished and unadjusted (not tilted to conform to a datum) survey data. The two epochs of data were identically computer-processed by NGS and corrected for systematic errors from level collimation, rod scale imperfections, atmospheric refraction, curvature of the Earth, tidal accelerations, and gravity effects (from Woodbury 1992).

STOPS 10 AND 11 (and with restrooms also available at Stop 11):

Heading back to campus we will stop to see hummocky terrain that seems to correlate with the eskers we first visited, and the research theory in progress is that these mounds are sub-aqueous recessional moraines formed as ice calved away in a westward flowing Lake Whittlesey. Lake Erie State Park takes us to a dramatic glacial stratigraphic section, a yearly adventure for geomorphology students and a pleasant Pleistocene place for our closing muse.



Figure 11: Hummocky Terrain, possible sub-aqueous recessional moraine at time of eskers

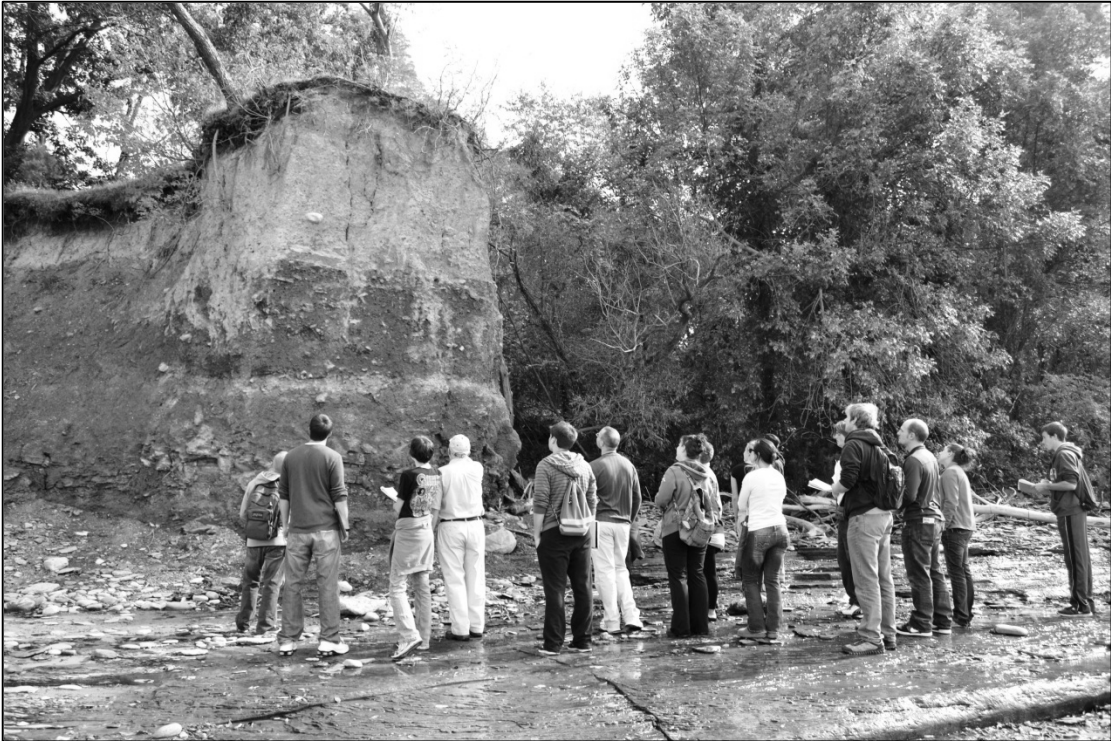


Figure 12: Lake Erie State Park, a classic classroom to study glacial-related stratigraphy

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SPECIAL THANKS FOR FIGURES AND MORE

Julie Miller, Historian of Early America at the Manuscript Division of the United States Library of Congress, was exceptionally gracious to provide the scan of Figure Four which she emailed with this insight to the rare and special service: “Your question was forwarded to me in the Manuscript Division since we have the George Washington papers here. The Washington papers are mounted in volumes and, as you guessed, the map was folded in half at the time it was microfilmed. We normally do not make scans from the George Washington papers since digital and microfilm images are already available, because they’re fragile and irreplaceable, and because we get so many requests. However, since this image is not digitally available, I made an exception. The scan, in pdf form, is attached. Thanks for telling us about this oversight - I will try to get the full map included in the American Memory Washington papers.”

Barbara Kittle, Librarian at Reed Library of SUNY Fredonia, graciously provided the high-resolution scan of Figure Six from the remarkable archives of Holland Land Company Records at Reed.

Pennsylvania’s Archives provided a web link for their Erie Triangle map by Andrew Ellicott, Figure Seven.

Thanks also to Dr. Deakin and Dr. Lash in SUNY Fredonia Geosciences for encouraging this project and for editing the guidebook. Both professors bring Fredonia incredible distinction for science, both nationally and internationally. They inspire students in the ways of wise and careful science and they inspire their colleagues as well. Of course with this year not only being a NYSGA host year for SUNY Fredonia Geosciences but also the 50th anniversary reunion to celebrate the start of the department, the homecoming gathering will remind us all of the so many talented professors who created generation after generation of excellent Earth scientists starting with their careful and caring education at SUNY Fredonia Geosciences. So a special thanks too to everyone involved with and who help support the excellent programs – especially Dr. Baird and Dr. Wilson who organized all NYSGA events and alumni events this year.

ROAD LOG -- NYSGA 2013 Guidebook – Road Log for Trip A-5

This field trip will depart at 8:00 a.m. from the Services Complex at SUNY Fredonia. It is intended to only use two university vans with room for 15 visitors total in addition to four leaders and faculty. Please use restrooms before you arrive at the trip launch site. Please pick up your FSA lunch if you bought one, or go to a store before the start time and carry a bag or box lunch with you as our lunch area has nothing for sale or vending. Restrooms are at several stops on this trip, and those stops are noted in the main stop descriptions.

Miles from last point	Cumulative mileage	Route description
0	0.0	SUNY at Fredonia President’s Drive (set trip miles here)
0.1	0.1	Turn right onto Central Avenue
0.5	0.6	Veer left onto Temple Street at Light
0.2	0.8	Turn right onto U.S. Route 20
0.5	1.3	Crossing Chestnut Street Following old Early Lake Warren Beach
1.4	2.7	Turn Left onto Adams Road Possible offshore bars approaching Lake Whittlesey Ridge
0.7	3.4	Turn Right on Webster Road
0.1	3.5	Passing Webster Pioneer Cemetery. This is an undisturbed Lake Whittlesey high water mark.

0.5	4.0	Crossing Farel Road Profile in Guidebook To the south is a channel
0.7	4.7	Veer Left at split onto Ellicott Road Channel visible to the right between Ellicott and Webster Road to the North.
0.9	5.6	Crossing Little Canadaway creek
0.2	5.8	Turn Right on Harmon Hill Road Crossing channel that was parallel and under the ice front
0.5	6.3	Turn Left on Webster Road Following Lake Whittlesey Ridge
2.2	8.5	Jogging into State Route 380. Bare to the right at Webster Road
1.3	9.8	Passing a grape vineyard to the right that was relocated while many cubic yards of gravel was removed to build to prisons in Portland, New York
0.3	10.1	Farmhouse on wave washed delta deposits reached by Lake Whittlesey waters. Antenna to the South is next to Luensman Overlook.
1.3	11.4	Passing Cemetery Road between roads toward distal part of the delta which contains the Portland Pioneer Cemetery.
0.6	12.0	Ellicott and Webster Roads join at foreslope of delta. Local farmer confirmed that the soil was very sandy in these fields.

Stop 1 – Eskers, get your rock hammers out here

0.2	12.2	Turn Left onto Munson Road Profile in Guidebook where all levels of Lake Warren were crossed.
0.3	12.5	Rise onto Whittlesey beach. Possibly due to the exposure of the Shumla Siltstone at this location. Crossing recessional moraines as we head up the hill.

0.6	13.1	Turn Left onto Wolebon Road
1.7	14.8	Turn Right on Thayer Road.
0.3	15.1	Turn Left into Luensman Overlook Park

Stop 2 Luensman Park (Lake Escarpment End Moraine, overlook of the Lake Plain)

0.1	15.2	Turn Left onto Thayer Road
0.4	15.8	Turn Left on Farr Rd Notice the hummocks on both sides of the road.
1.5	17.4	Turn Right onto Parcell Rd.
0.5	17.9	Turn Left onto Chautauqua Route 37
1.0	18.9	Cross State Route 380 and proceed straight onto Chautauqua Road Old road commissioned by the Holland Land Company which passes right over the continental divide.
1.6	20.5	Turn Right on Bear Lake Road.
1.0	21.5	Kettle Hole Lake Clever Store run by one of the original Geology Graduates from S.U.C. at Fredonia
0.7	22.2	Cross Kelly Hill Road Crossing Drumlins
1.0	23.2	Cross Fredonia-Stockton Road Proceed to Stop 3

Stop 3 Pioneer Cemetery at top of Drumlin on Holland Land Company Town Line

0.9	24.1	Turn Left on Frisbee Road
0.1	24.2	Turn Right on Dale Drive

		3 Kettle Hole Lakes Lily Dale Spiritual Center
1.0	25.2	Turn Right on Park Avenue
0.3	25.5	Turn Left onto Maple Avenue
0.1	25.6	Turn Right onto State Route 60 Ridge on Right covered by Drumlins.
1.7	27.3	Turn Left
2.0	29.3	On Town Line Road You can see several miles ahead as this road was also commissioned by the Holland Land Company in 1798.
7.9	37.2	Continue Straight through light onto Gerry-Levant Road
1.3	38.5	Stop 4

Stop 4 Ross Mills Overlook

1.3	39.8	Cemetery in Valley Fill
2.9	42.7	Straight ahead the outlet of Cassadaga, Chautauqua, Conewango, and Chadakoin Rivers all came together
0.5	43.2	Proceed Straight ahead
0.9	44.1	Turn Right on New York Avenue (?) Storage facilities for the Jamestown aquifer
0.9	45.0	Turn Left onto State Route 380 (Work Street)
4.2	49.2	Turn Left onto Martin Road
0.6	49.8	Turn Left onto State Route 60
0.1	49.9	Turn Right onto U.S. Route 62
3.0	52.9	Turn Right onto Riverside Road
0.7	53.6	Turn Left on Kiantone Road

0.2	53.8	Turn Right onto Sturdevant Road
0.5	54.3	Turn Right onto Honey Lane

Stop 5 Shale Latitude Stone Established by Andrew Ellicott in 1787

0.6	54.9	Turn Left on Sturdevant Road
0.1	55.0	Turn Left on Kiantone Road
0.2	55.2	Turn Right on Riverside Road
0.5	55.7	Continue on Riverside Road and Cross U.S. Route 62
1.3	57.0	Turn Right on Chautauqua Route 53
0.2	57.2	Turn Left on Austin Mill Street.
1.3	58.5	Turn Left on Bain Road.
0.6	59.3	Turn Right on Frew Run Road.
0.4	59.7	Turn Left on Peterson Road Salamanca re-entrant to the right.
0.5	60.2	Turn Right onto Oak Hill Road.
1.5	61.7	Turn Right into Erlenson Park.

Stop 6 Erlandson Park Overlook (Lunch Stop)

0.0	61.7	Turn Left onto Oak Hill Road.
0.8	62.5	Turn Right onto Scott Road.
1.7	64.2	Turn Left onto Ivory Road.
0.8	65.0	Turn Right onto U.S. Route 62
6.1	71.1	Turn Right onto circular entrance ramp for I-86
27.1	98.2	Turn Right onto Sherman Exit 6

0.3	98.5	Turn Right onto Route 76N Kipp Street
0.3	98.8	Bear left at fork staying on Route 76N
0.1	98.9	Turn Right onto Route 76N
11.1	110.0	Passing Ripley Water Treatment Plant
0.6	110.6	Passing Lavurus Road (Crossing Lake Whittlesey Beach)
0.4	111.0	Stay on Route 76N
0.1	111.1	Turn Left onto State Route 5
2.3	113.1	Proceed along Route 5 to the trailer park near the Pennsylvania State Line which is Stop 7

Stop 7 Three boundary monuments with an excellent story.

0.1	113.4	Turn Around (Left) out of Trailer Park onto Route 5 East
2.3	115.7	Return to Ripley Wastewater Treatment Plant for Stop 8

Stop 8 Pop-Up at Lake Shore by Ripley's Wastewater Treatment Plant

2.9	118.6	Turn Left onto Ripley Beach Road
0.2	118.8	Proceed to the Lake Shore

Stop 9 Pop-Up at Ripley Beach

0.2	119.0	Turn around and proceed South on Ripley Beach Road to State Route 5
0.0	119.0	Turn Left onto State Route 5 East
10.2	129.1	Turn Right into Small Driveway to Stop 10

Stop 10 Hummocky Terrain where there should be lake bottom sediments.

1.0	130.1	Passing Walker Road
4.0	134.1	Turn Right into Entrance for Lake Erie State Park, bear right by the gate house and park near bathrooms at far left (westerly side) of the last parking lot.

Stop 11 Lake Bluff Exposure at Lake Erie State Park

1.0	135.1	Leaving Lake Erie State Park and Proceeding back onto State Route 5 East
0.9	136.0	Turn Right onto Van Buren Road
3.4	139.4	Proceed onto Matteson and turn soft Left onto Brigham Road at Temple Street
0.2	139.6	Proceed Right onto Athletic Fields Road
0.1	139.7	Proceed Left onto Ring Road
0.6	140.3	Turn Left onto University Parkway
0.1	140.4	Turn Right on Academic Avenue
0.1	140.5	Turn Left onto President's Drive