THE CATSKILLS REVISITED

by

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On this trip we hope to present an overview of sediments that accumulated to form the Catskill Clastic Wedge. Rather than develop a paper and field trip guide that deal entirely with new research, we plan to visit some outcrop locations that have already been reported in the literature, add one or two new locations, including a fossil collecting stop in the Mt. Marion formation, and travel to the Blenheim-Gilboa Hydroelectric Power Station north of Grand Gorge.

The study first begins in the post-Onondaga Bakoven shales at an outcrop in the Kingston area. These dark shales, deposited in a deep, euxinic marine environment, are successively overlain at other locations by mudstones, shales, and sandstones that comprise the first gray, and then red beds to be seen as we travel stratigraphically higher into the Catskill Front. The Stony Hollow formation, which we may see en route, was deposited on a distal prodelta slope. The first four stops are clustered a few miles within the trip's point of origin at locations where the Bakoven, then Mt. Marion mudstones, fossiliferous Mt. Marion iron-stained mudstones exposed in a somewhat remote quarry, and the Plattekill sandstones are exposed. the Ashokan formation, which underlies the Plattekill, was deposited on an intertidal shelf, while the Plattekill best represents a piedmont floodplain deposit.

From here, we will travel in a northwest direction through Shandaken, onto NY 23, then along NY 30 N past Grand Gorge to the Blenheim-Gilboa Power Station. On the trip towards Grand Gorge, we will be traveling on terrain mostly underlain by the Oneonta formation and have opportunities to view on our left, the valley of Schoharie Creek. The Schoharie is normally an underfit stream, although heavy rains during April, 1987 caused considerable flooding and erosion. The Blenheim-Gilboa Power Station, completed after World War II, employs waters of the Schoharie Creek, held in a main (channel-level) reservoir and an upper reservoir located on a plateau west of the Schoharie, to generate electricity for the Power Authority of the State of New York. A cluster of four stops in this area, which is essentially underlain by beds that are upper Hamilton and Tully equivalents, will include a visit to a sharply undercut slope in the Schoharie channel produced during the April floods, and a revisit to the Gilboa bridge, north of the Schoharie Reservoir. Near the bridge stand some of the stumps of the famous Gilboa Forest flora.

The return south through Grand Gorge and then eastward, will carry us to a unique exposure of the Oneonta formation, where we can be afforded the chance to examine a small, yet detail-packed outcrop, and discuss various ideas on the environment of deposition of these sediments. It is not a new outcrop, but apparently it is visited by geologists quite often, according to people living nearby, and this would seem to justify our return to it.

As we travel through Haines Falls to Tannersville, in a direction roughly perpendicular to the depositional strike (mean cross-bedding in this area near the Catskill Front has a vector of 297° according to Fletcher's 1967 paper), we will not be traveling "down-section" to any great degree. At Tannersville, we will turn towards North and South Lakes and stop at the edge of the Catskill Escarpment, nearly 2000 feet or about 700 meters above the Hudson Valley floor. Hopefully, we can reach this location before late afternoon. The view eastward, across the Hudson Valley to the Housatonic Mountains in the distance, is a grand vista. It should make any of us speculate on, and perhaps better understand the Acadian Mountains that were the high source terrain for the sediments that we revisited.

We hope that you will enjoy this trip, and rest secure in the comforting thought that there will be no examination at the end of the trip!

Field Trip Road Log and Stop Descriptions

Cumulative Mileage	Distance between Stops	Remarks
---	0.0	Ramada Inn. begin at entrance. Drive to traffic light on NY 28.
0.1	0.1	Turn right onto NY 28 (west).
0.7	0.6	Turn right onto Forest Hill Road then right onto City View Terrace and stop on right.
STOP 1		Bakoven Shale. The black shale and overlying siltstone section in the high road cut across the road area well described by Pedersen et al. (1976, Stop 7) and appear to represent the upper part of the Bakoven formation. This unit may represent initial deposition of a delta toe in a deep distal basin. Return to NY 28.
0.8	0.1	Turn right (west) onto NY 28 and get into left traffic lane.
1.2	0.4	Turn left onto Mountain Road (Ulster 5) and proceed along base of Mountain Marion escarpment (on right) with Esopus floodplain (bottom of glacial lake) on left.
5.4	4.2	Park on right.
STOP 2		Base of Mount Marion Escarpment. Observe the variation in lithology, sedimentary structures, and fossils or lack of them. Can you find any reason for postulating the adavance of a delta into the Bakoven basin such that these sediments represent deposition on a distal to proximal prodelta slope? Many blocks of Mount Marion, some quite large, have rotated with slow gravitational descent to give erroneous impressions of bedding plane attitudes along the escarpment. Continue south on Mountain Road.
6.1	0.7	Turn right (west) onto Johnson Road.
7.6	1.5	Keep straight onto Lapla Road.
7.9	0.3	We have been ascending up section and for the next 0.9 miles will note increasing sandstone bed frequency and thickness in the road cuts and nearby outcrops as we pass from Mount Marion to Ashokan beds.
8.8	0.9	Turn right onto Quarry Hill Road.
9.4	0.6	'Slow Children' and Feral Dogs. Close your windows and drive very slowly.
9.7	0.3	Drive to far end of quarry and park to right on glaciated pavement.

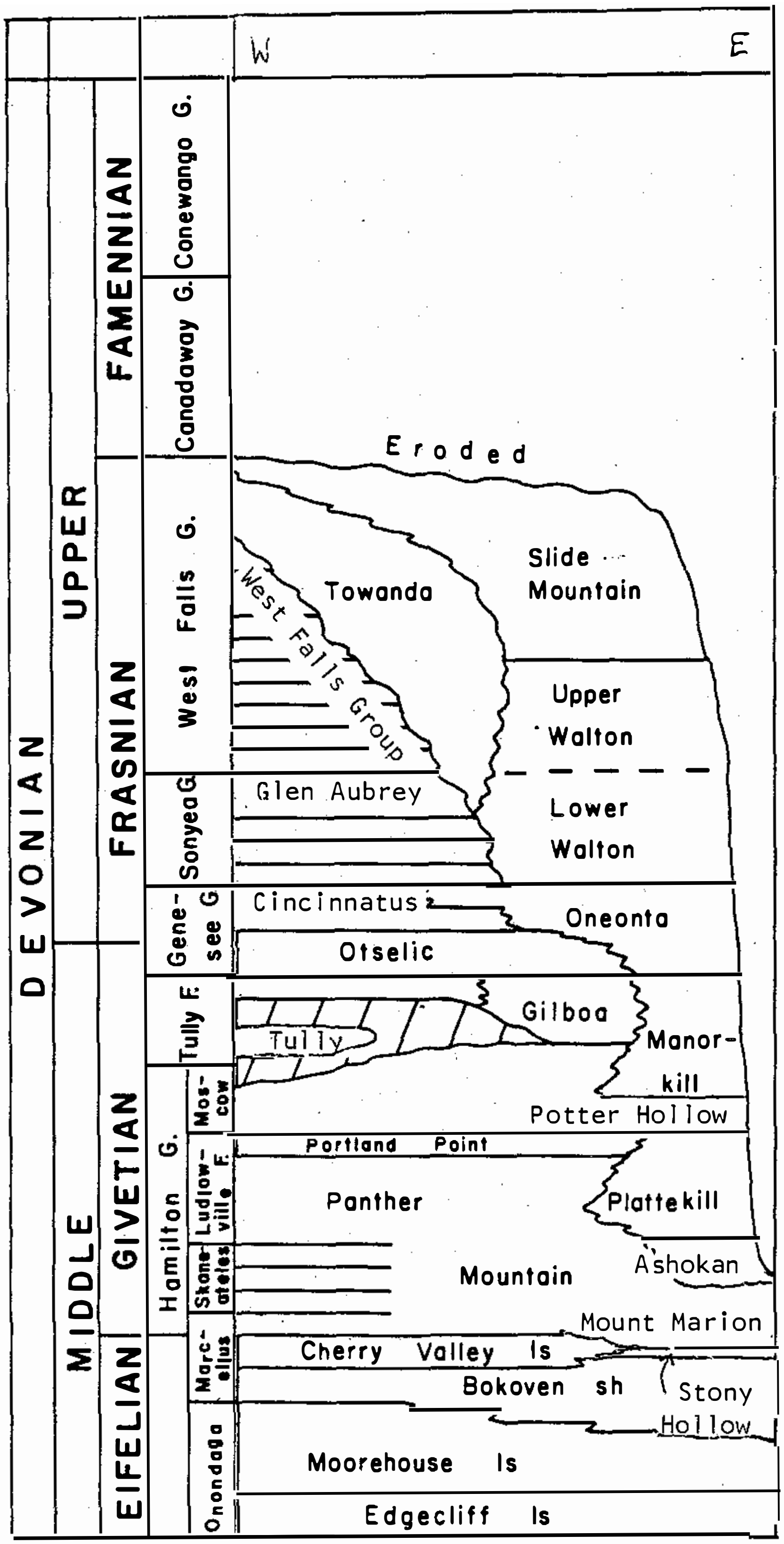

Fig. 1. Stratigraphic Diagram for the Middle and Upper Devonian in study area (modified after Rickard, 1975).

STOP 3: Quarry in Mt. Marion. This quarry is probably in upper Mount Marion shales and siltstones. Fossils are exceedingly abundant in one horizon with articulate brachiopods and bivalvia most abundant but many other types of fossils also occur. Some of these are very small and some are exceptionally large - especially two inarticulate brachiopods, Roemerella grandis and Lindstroemella aspidium.

Sheets of illustrated fossils will be passed out to help you identify your discoveries. A mug-shot of the fractal-like trace fossil Aristophycous will also be distributed. This specimen, obtained from this quarry, appears to be the only Devonian find recognized and is curerntly in private hands. Please help us find the other half of this specimen or another equally well-preserved. The specimen appears to have come from within six inches of the glaciated pavement at the north end of the quarry. Sandstones, possibly representative of the Ashoken formation, can be seen across the road to the west. The strata in the quarry may represent sediments deposited on the shallow, marine shelf of an advancing delta marine platform. The Ashoken sands may represent further shelf advance as intertidal shelf deposits. Return to NY 28 by retracing route.

18.2	8.5	Turn left (west) onto NY 28.
22.9	4.7	Traffic light. Proceed on NY 28.
23.2	0.3	At some point in the next 1.6 miles we will pull off highway and park on right.

STOP 4: Plattekill Formation. In the 1.6 miles there are many good road cuts where the red and green sandstones and shales of the Plattekill formation can be seen. Look for lithologic changes and sedimentary structures which might indicate a piedmont floodplain environment.

24.8	1.6	Continue west on NY 28.
44.8	20.0	Turn right (north) onto NY 42 at Shandaken.
56.1	11.3	Turn left onto 13A.
56.4	0.3	Turn left onto NY 23A.
62.2	5.8	Continue straight onto NY 23.
68.3	6.1	TURN RIGHT ONTO NY 30N IN GRAND GORGE
75.9	7.6	TURN RIGHT INTO LANSING MANOR AND BLENHEIM-GILBOA POWER STATION.
76.1	0.2	Drive to visitor parking lot.

STOP 5: Blenheim-Gilboa Power Station. Hidden in the Schoharie Valley at this location, and designed to blend in with the natural landscape is one of six power stations operated by the New York Power Authority. The facility is located on the Lansing Manor Estate property, and the Lansing Manor Museum, housed in the 19th Century Manor House is nearby. A dam has been built to block the north flowing Schoharie Creek (compare Figure 2 with Figure 3). Water is recycled between the lower reservoir and an upper one located on Brown Mountain to the east. The substation on the east side of the lower reservoir is not easily recognized from the visitors' center here, and the upper reservoir can not be seen at all. During times of high power demand, water is released from the upper reservoir to drive four turbine generators. Flow of Creek water northward beyond the dam is measured to match water intake into the lower reservoir whenever possible. The Creek here is underlain most likely by the Potter Hollow formation. The visitors' center contains a small museum that includes rock samples and one or two tree stumps. LUNCH STOP HERE.

76.3	0.2	RETURN TO NY 30 AND TURN LEFT ONTO NY 30S.
78.2	1.9	TURN LEFT INTO MINE KILL FALLS OVERLOOK.

STOP 6: Mine Kill Falls Overlook. This is in part of a recreational site located just south of Lansing Manor. We will stop briefly here. At the north end of the parking lot we can view waterfalls of the Mine Kill as it flows eastward into the Schoharie Valley. The Manorkill formation overlies Potter Hollow gray and red beds, but the contact cannot bee seen from the observation platforms.

78.3	0.1	TURN LEFT ON TO NY 30 S
78.6	0.3	TURN LEFT ONTO UNNAMED ROAD
79.9	1.3	STOP ON LEFT SIDE OF ROAD NEAR CREEK

STOP 7: Erosion in Bend of Schoharie Creek. This location is at a sharp bend in the Schoharie at the base of Bornt Hill, in marine facies of the Manorkill formation. Heavy rains during April, 1987 resulted in severe flooding of the Schoharie that caused much erosion in several places, sometimes undercutting nearby roads. This is what we see here on the west side

(undercut slope) of the bend. Moderate gullying also developed on the opposite (far) side of the road in this area, but road crews have repaired most of the damage. Please watch your step, and do not walk too close to the edge of the rock ledges.

81.2	1.3	T-junction. Cross road to small park.

<u>STOP 8</u>: <u>Tree Fern Trunk Display</u>. A well known display, about a half dozen stumps that are identified by Banks et al. (1985) as progymnosperms which represent typical remains of the Gilboa Forest, uncovered during quarrying operations near here. The trees probably grew to a height of about 60 feet (18 meters), and the specimens we see are mostly <u>Eospermatopteris</u>. The stumps were found in the lower Manorkill beds (and upper Potter Hollow?), which are assigned to the upper Hamilton Group. Although we will not make the attempt, a trek across the bridge and then southward along the Schoharie Channel leads to the east side of the Schoharie Reservoir (see Figure 3), where, during times of lower water levels, cross-bedding and occasional molds of small stumps may be seen in the light gray sandstone near the water's edge. TURN RIGHT FROM T-JUNCTION OR LEFT FROM DISPLAY OF STUMPS.

82.4	1.2	TURN LEFT ONTO NY 30 S
85.4	3.0	TURN LEFT ONTO NY 23 (east) in GRAND GORGE
91.5	6.1	Continue Straight onto NY 23A
95.6	4.1	TURN LEFT ONTO NY 296
95.7	0.1	TURN LEFT INTO LANE AND STOP

<u>STOP 9</u>: <u>Fluvial Facies (?) Red Beds</u>. NO ROCK HAMMERS, PLEASE! This small outcrop is unique in terms of what it has to offer in one package. It consists primarily of three lithologic divisions in a coarsening-upwards sequence with distinct cross-bedding in the uppermost unit, and a small channel cutout on the left (west) side of the outcrop. The top surface of this rock exposure shows a top view of the cross-bedding structures, and a glacially smoothed and striated surface. Buttner (1977) referred to this outcrop as possibly representing a transitional facies (we assume transitional between meandering and braided fluvial systems). What interpretation can you obtain from this outcrop? (Oneonta formation here.)

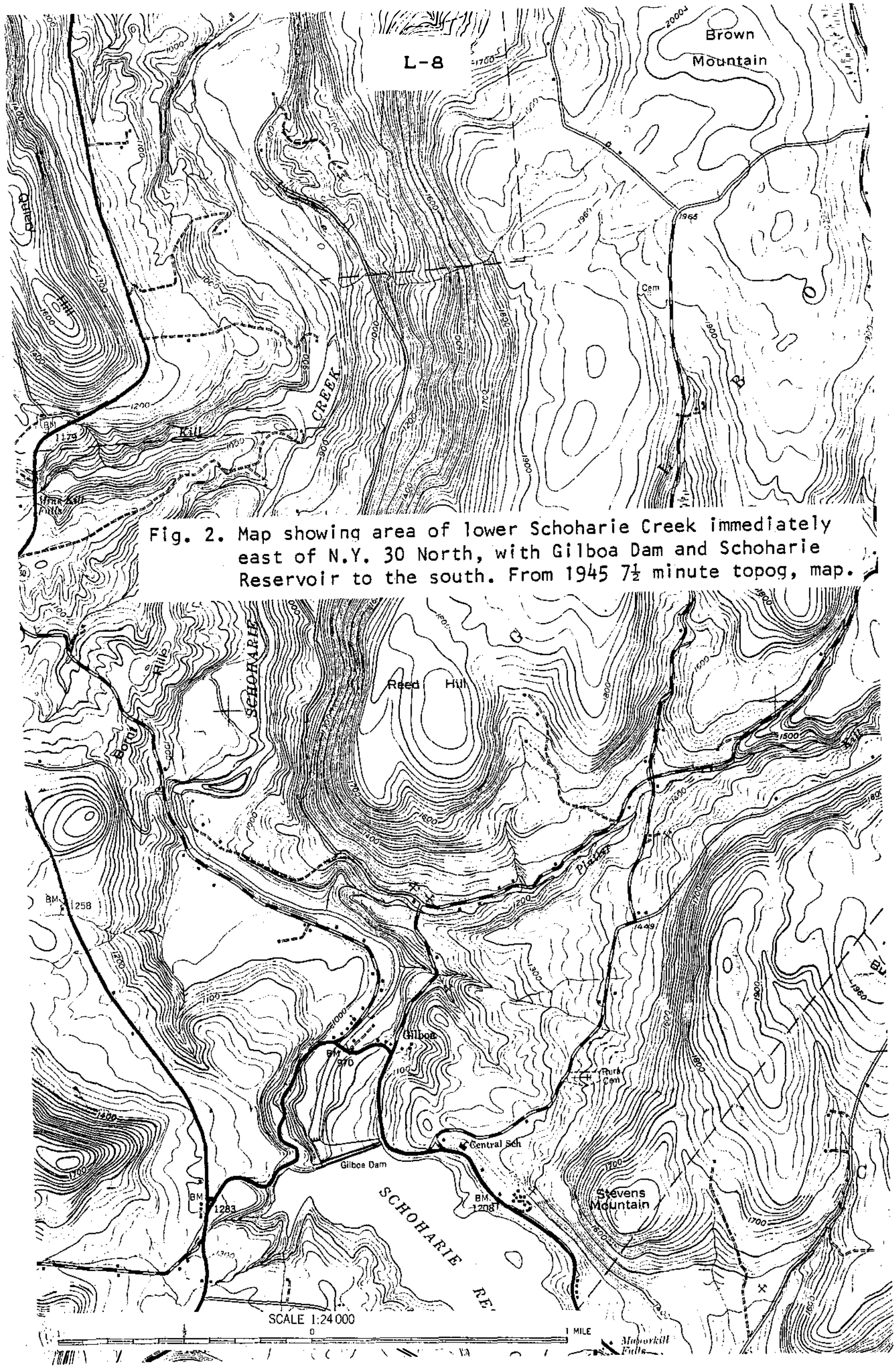

Fig. 2. Map showing area of lower Schoharie Creek immediately east of N.Y. 30 North, with Gilboa Dam and Schoharie Reservoir to the south. From 1945 7½ minute topog, map.

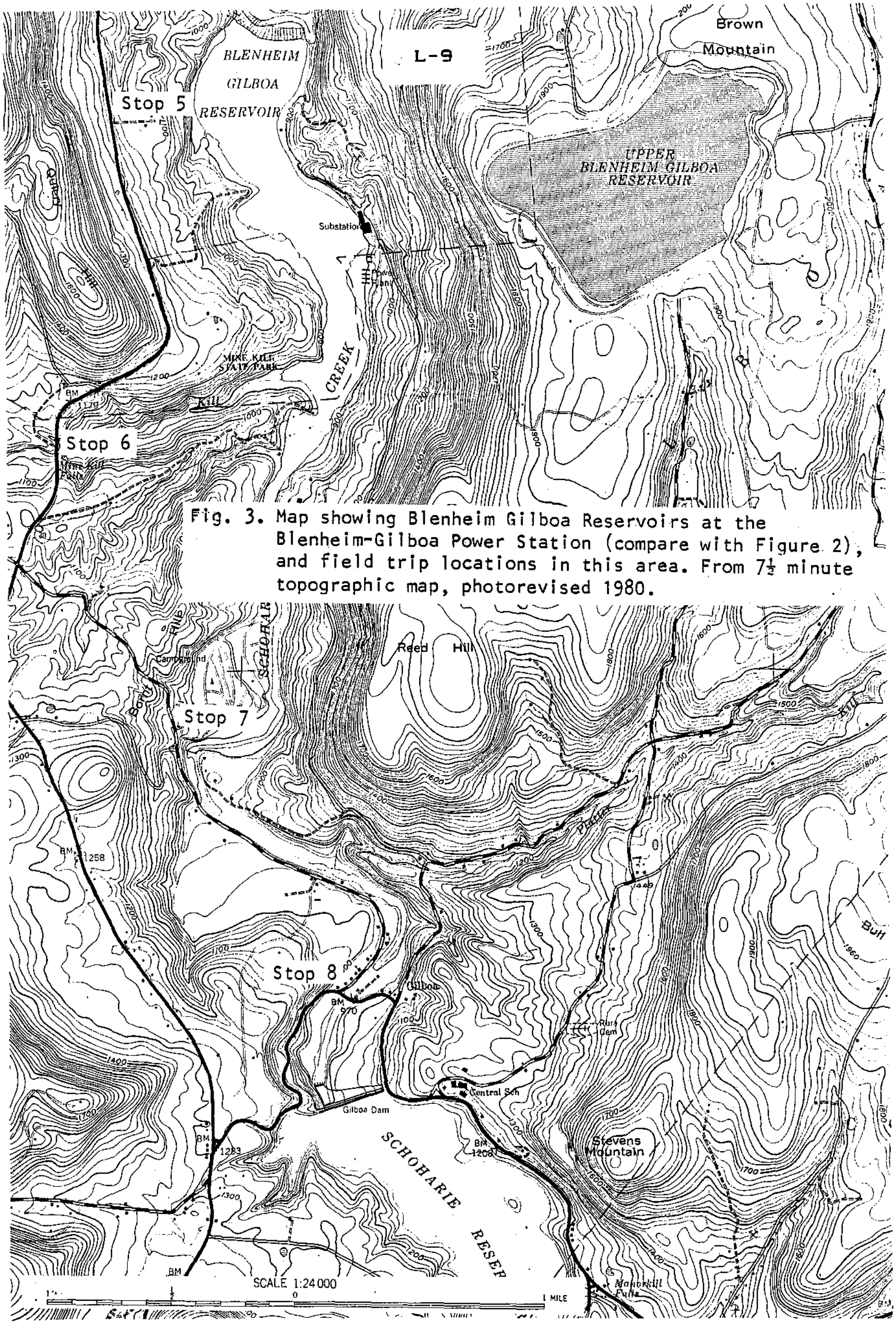

Fig. 3. Map showing Blenheim Gilboa Reservoirs at the Blenheim-Gilboa Power Station (compare with Figure 2), and field trip locations in this area. From 7½ minute topographic map, photorevised 1980.

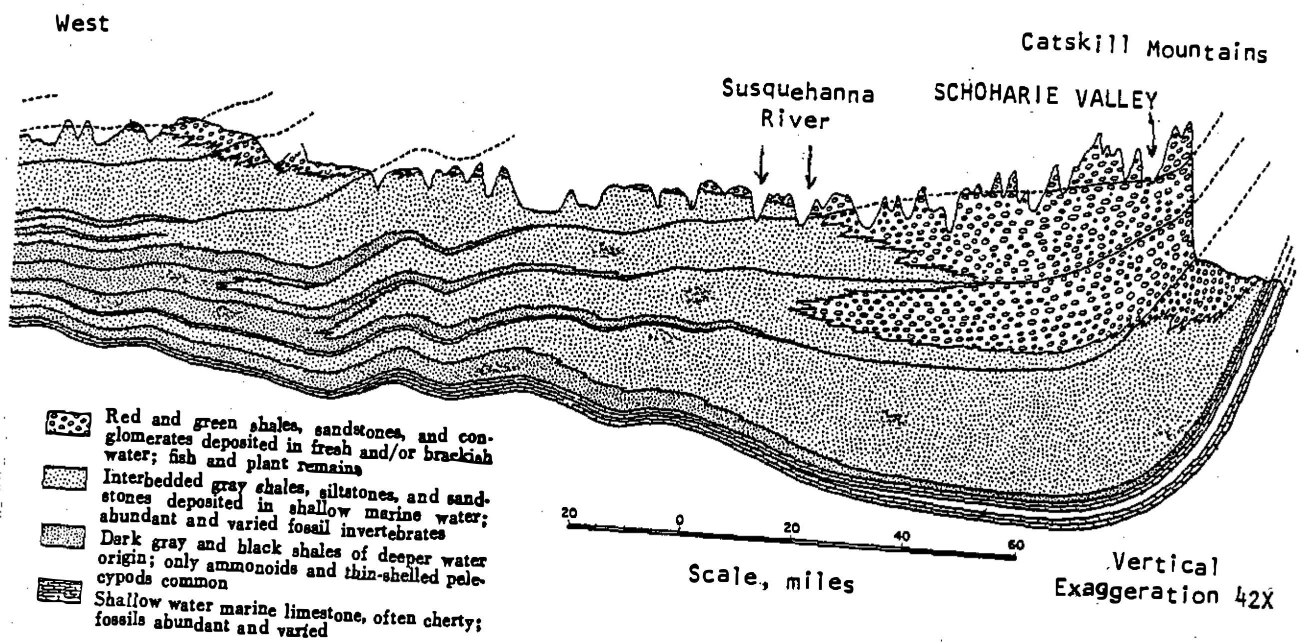

Fig. 4. Cross section of Devonian System along New York - Pennsylvania border (modified after Fig. 17, Broughton et al., 1962).

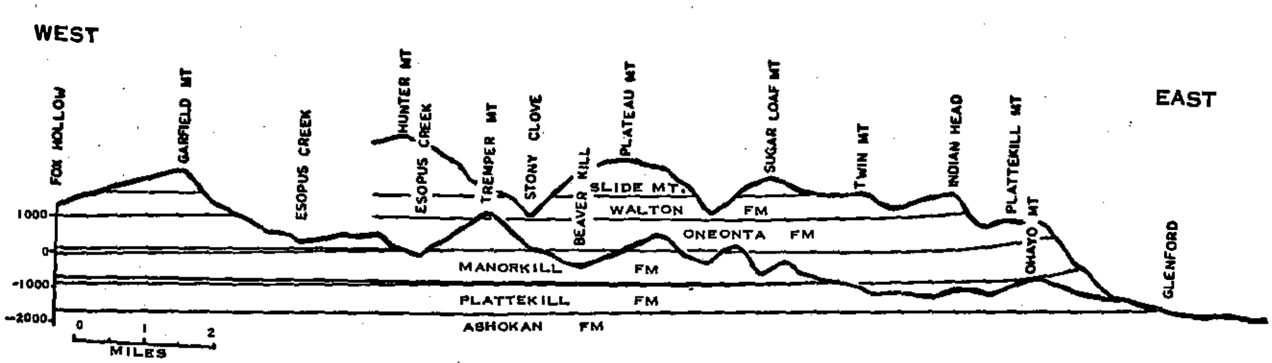

Fig. 5. Geologic cross section of the Catskill Front (after Fletcher, 1967).

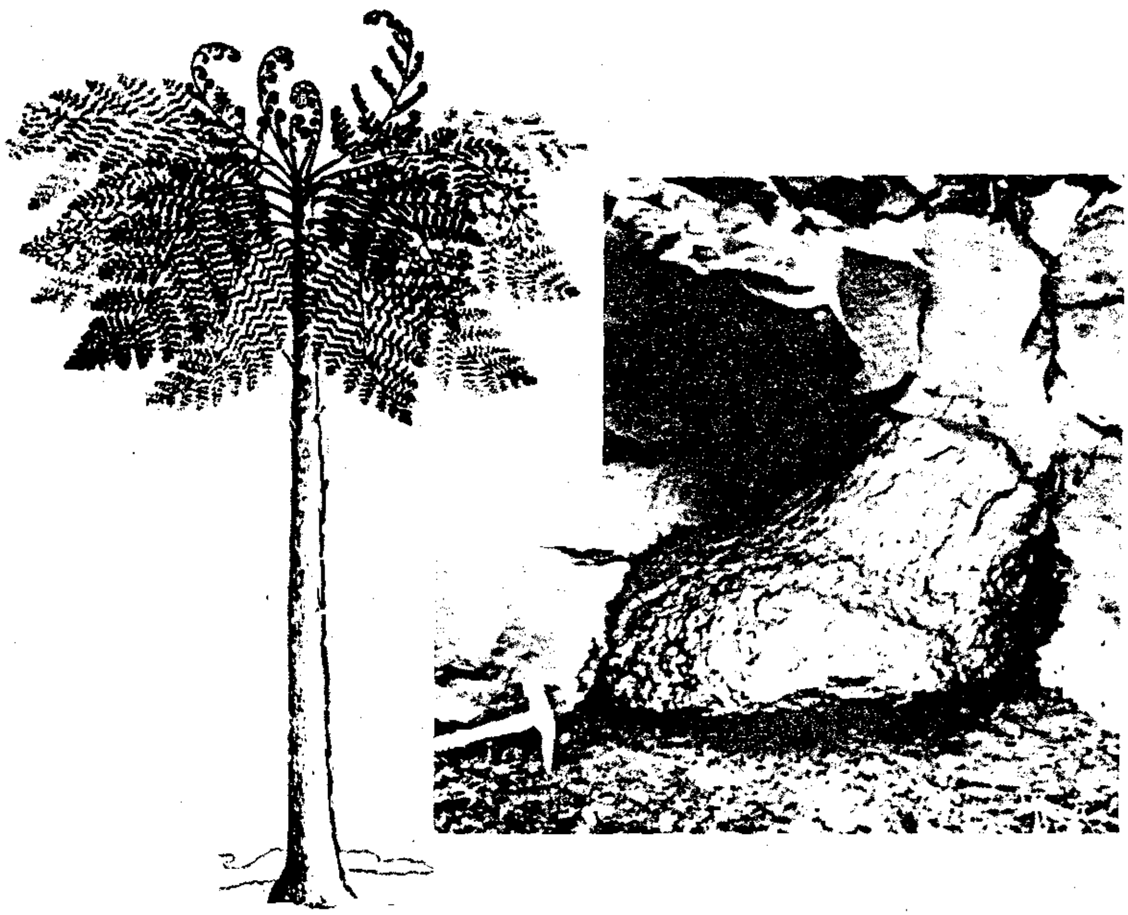

Fig. 6. Goldring's reconstruction of the progymnosperm Eospermatopteris (left) possibly as much as 90 dm tall, and a stump of the same about 5 dm in height (right) (after fig. 2b and 2c in Banks et al., 1985).

95.8	0.1	TURN LEFT ONTO NY 23A (east)
103.2	7.4	TURN LEFT ONTO GREEN COUNTY 18 TO NORTH LAKE
105.5	2.3	PARK REGISTRATION BOOTH
107.0	1.5	Drive to farthest parking lot at east end of North Lake. Take trail for 1/3 mile to site 2, Catskill Mountain House.

STOP 10: Catskill Escarpment. NO ROCK HAMMERS, PLEASE! Site of Catskill Mountain House. Although Figures 4 and 5 show details of topography and stratigraphy of the Catskill Clastic Wedge and the Catskill Front respectively, we feel that Figure 71B on page 139 of Dunbar and Rodgers (1957) is unexcelled in depicting lithologic boundaries, and the Catskill facies crossing time lines, in a simple yet effective way. We are on the very edge of the escarpment, and Palenville is about 1700 feet (520 meters) below us, while the Hudson River farther to the east is at a level that is about another 165 meters lower. We can easily see (hope for a clear day) the Rowena Memorial School Building, built in 1899 in Palenville, and made of Becraft limestone (Helderberg Group). The Catskill Mountain House was a resort hotel first built here in the early 1800's, and enlarged over the decades to become one of the most notable vacation sites in the East. After the turn of the century, its popularity began to decline somewhat, and reportedly, the steel rails used for conveying passengers by a train system up to the level of the escarpment were torn up and scrapped for the war effort in World War I. Although there were changes of ownership, the hotel continued to serve tourists until the late 1940's. By the late 1950's the building was judged to be beyond repair, and on a pre-dawn winter morning in the early 1960's, it was set afire by State authorities. Whatever part of the wreckage that could not be removed was pushed over the escarpment to the slopes below. Today, the view to the east is as spectacular as it was for hotel guests who sat on the front porch which was located very near the edge of the escarpment. At this location during late Devonian time, there was perhaps another mile of sediments above us. Projecting, in our minds, the trend of these sediments upward to the east as we view the present

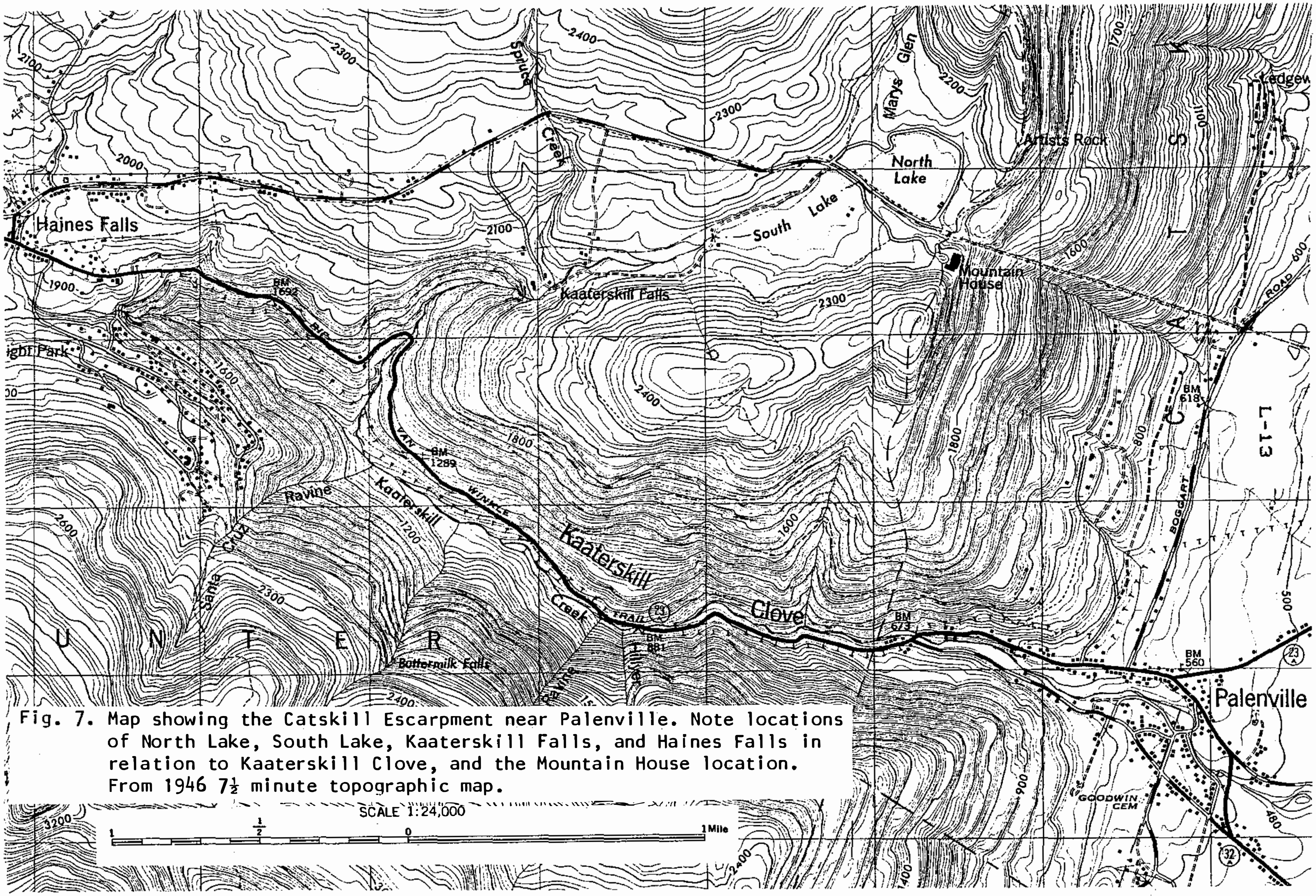

Fig. 7. Map showing the Catskill Escarpment near Palenville. Note locations of North Lake, South Lake, Kaaterskill Falls, and Haines Falls in relation to Kaaterskill Clove, and the Mountain House location. From 1946 $7\frac{1}{2}$ minute topographic map.

		Housatonic Mountains beyond the Hudson River, we can begin to comprehend the elevation of the Acadian Mountains source terrain. Red bed sandstones and conglomerates with much cross-bedding evident, can be seen along the escarpment here. Return to NY 23A
110.8	3.8	TURN LEFT ONTO NY 23A (east)
115.8	5.0	Veer right onto NY 32A. Rowena Memorial School - 1899, made of Becraft Ls. at junction of 23A and 32A.
117.7	1.9	Junction with NY 32S
123.5	5.8	TURN LEFT INTO TOLL BOOTH EXIT 20 NY STATE THRUWAY AND GO SOUTH TO KINGSTON, EXIT 19 AND RAMADA INN

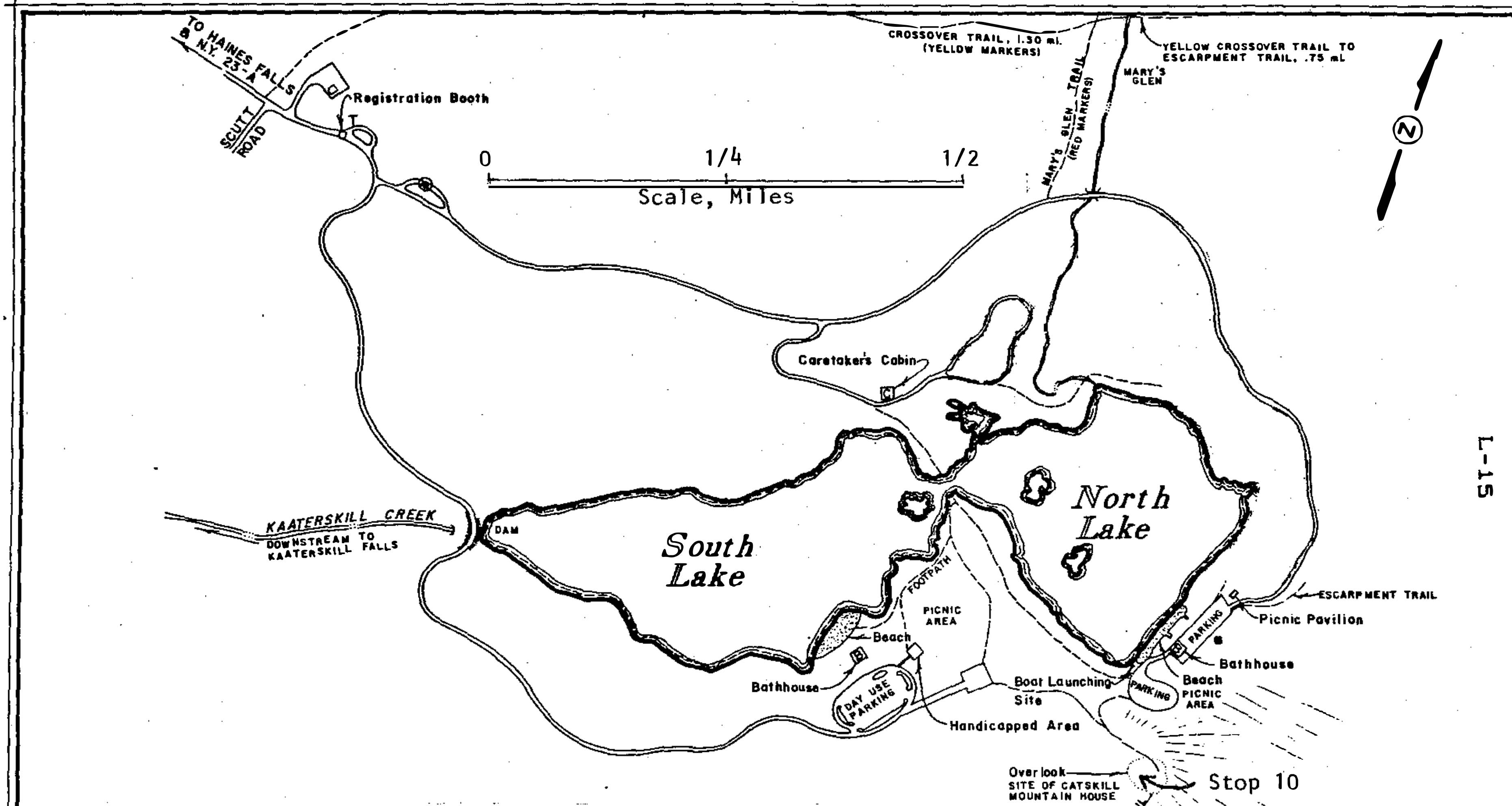

Fig. 8. Map of North and South Lakes. Dam at South Lake has outlet to Kaaterskill Falls. Escarpment overlook at site of Catskill Mountain House is marked as Stop 10 (modified from map by D. Berry, 1984).

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U.S.G.S., 1945, Gilboa, New York 7 1/2 minute quadrangle.

U.S.G.S., 1945, Gilboa, New York 7 1/2 minute quadrangle, photorevised, 1980.

U.S.G.S., 1946, Kaaterskill, New York 7 1/2 minute quadrangle.

Sec. 23 exit cut – see 1st paper

Fallbon

Bays

mud cracks

gastropod layer

gastropods

Stromatolite

Loperditian ostracodes

35 M – Top Koninat

2

1

Stromatolitic dolostone

Stromatolite

40 cm

45 cm