FIELD TRIP NO. 7

GENERAL GEOLOGY OF THE ADIRONDACKS

by

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Introduction

The purpose of this half-day trip is to take a broad, general view of the geology of the Adirondacks and bordering St. Lawrence Lowland in a traverse from Potsdam to the top of Whiteface Mountain. It is especially designed so that participants (in private cars) from east or south of the mountains will be that much closer to home at the conclusion of the trip, at about 1:00 p.m.

The route first follows N.Y. 11B from Potsdam to Nicholville, then N.Y. 458 to Meacham Lake junction, then N.Y. 30 to Paul Smiths, then N.Y. 192 and 192A to Saranac Lake, then N.Y. 86 through Lake Placid to Wilmington. From Wilmington, we will follow the Whiteface Memorial Highway to the "Castle," and finally climb the ridge trail on foot to the summit (or take the elevator, if you wish).

From Potsdam to Hopkinton, the route follows rolling farmland with fields locally littered with glacial erratics. The road lies just north of the Precambrian/Paleozoic boundary. At about Southville, it passes over the concealed Highlands-Lowlands Adirondacks boundary, which is principally tectonic and separates predominantly metasedimentary-metavolcanic rocks of the Lowlands from metaplutonic rocks of the Highlands. Nearing Hopkinton, and continuing to Nicholville, an elevated portion of the road permits excellent panoramic views northward to the low flat terrain of the St. Lawrence Lowland. At Nicholville, we pass over the east branch of the St. Regis River where, a short distance upstream, the Nicholville gorge exposes basal conglomerates of the Potsdam Sandstone (the Nicholville conglomerate). At the Fort Jackson gorge a few miles downstream, and north of Hopkinton, more "normal," well-bedded Potsdam is exposed.

Between Nicholville and Santa Clara, the road becomes much more rolling and winding as it passes over metamorphic Precambrian bedrock. There are not many bedrock cuts or open views in this section. At St. Regis Falls, the ledge that sustains the falls consists of dark amphibolitic gneiss with pink granitic veining. Beginning at Santa Clara, and continuing for 10 miles nearly to Meacham Lake junction (N.Y. 30), almost all of the rock cuts consist of dark green, massive, syenitic or mangeritic (pyroxene syenitic) gneiss. In this section also, and continuing to Paul Smiths, the views of Adirondack foothills become much more frequent and open, revealing a knobby, rounded, rather stream-lined topography that reflects extensive glacial scour. Very noticeable as we near route 30, is the pronounced assymmetry of the foothills that

is characteristic of this region, with gentle stoss sides facing north and cliff sides south that betray a southward, overriding, ice advance. Another notable feature between Santa Clara and Paul Smiths is the abundance of cuts in very sandy, gravelly drift, with local boggy hollows between them. From Meacham Lake junction to McColloms, (about 4 miles) route 30 parallels the Osgood River, which flows alongside a well-defined esker as it empties northward into Meacham Lake. The road crosses a marshy segment of this short stream just south of McColloms.

From Paul Smiths to Saranac Lake, we pass through one of the most scenic, open regions of the Adirondacks. At Gabriels, the scene is decidedly western in character, with a 360° panorama across open potato fields that incorporates the High Peaks in a sweep from east to south, and the foothills in all other directions. The pointed summit and slide-scarred face of Whiteface Mountain stands out like a sentinel almost directly to the east. Gabriels is so blessed because it lies on a sandy lake plain where the soil and climate are well-suited for potato farming.

If anything, the views of the High Peaks are even more spectacular between Gabriels and the junction with N.Y. 86, where the road traverses an east-facing slope above hayfields and marsh bordering Twobridge Creek. The superior height of the High Peaks, which here seem close enough to touch, is largely a function of two factors: 1) the massive, weakly jointed anorthosite bedrock that underlies most of them resists erosion more than the surrounding rock types; and 2) they lie at the crest of the Adirondack Dome which, even now, is experiencing the most rapid uplift.

Saranac Lake lies near the eastern border of the Saranac Intramontane Basin, an anomalous structural depression that stretches for about 35 miles in a northeasterly direction, and varies from 10-15 miles wide. Nearly all of the basin lies between 1540 and 2000 feet. The few bedrock hills, jutting no more than 460 feet above the floor, are probably best described as umlaufbergs - bedrock knobs surrounded by glacial drift, and probably also, in this case, glacio-lacustrine deposits. There are about 50 lakes of a mile or more in diameter in this basin, and well over a hundred smaller ones, making it a canoest's paradise. There are, in fact, so many lakes, that it is commonly referred to as the "Lake Belt."

From Saranac Lake to Lake Placid, the visibility is not nearly so good as that of the Gabriels-Saranac Lake section, as trees and high mountains close in. One of the best open scenes is over the Saranac Lake golf course. The slide-scarred Whiteface summit and surrounding mountains again come into full view in approaching and passing through Lake Placid Village. The Village is situated on Mirror Lake, a much smaller lake south of the ladder-shaped Lake Placid.

Continuing on N.Y. 86 from Lake Placid to Wilmington, we pass through the lovely, narrow, and steep-walled rocky gorge called Wilmington Notch, and then out into the open again past the Whiteface Mountain Ski Center and the Flume. Up to that point, the road follows close alongside the West Branch Ausable River, one of the prettiest of the Adirondack streams,

and a favorite among fishermen. The Notch is one of the most conspicuous, narrowest, and deepest of the northeast-trending lineaments so prevalent in the central Adirondacks that have formed by erosion of fault zones. It played important roles in channeling ice movement during Wisconsin glaciation, and in the development of meltwater lakes during glacial retreat.

After leaving Wilmington, and passing through the toll gate on Whiteface, we will go directly to the "Castle" at the end of the road, and park for a climb to the summit. The climb, both by car and foot, represents a scenic climax of the trip. The vistas from the road, of the Saranac Intramontane Basin, Lake Placid (from the first hairpin turn, called the Lake Placid turn), the Wilmington Range, Wilmington Basin and High Peaks (from the second hairpin, or Wilmington Turn) and of the cirque-hollowed rock peak itself, are simply breathtaking. The ridge trail from the Castle to the summit surpasses even that, for here you are perched on a narrow arete between the steep headwalls of two large cirques (the route is well protected with railing). From the summit you will be able to see all of the features already mentioned and, in addition, you will be able to look right down into Wilmington Notch that we passed through earlier and to survey the scalloping of the mountain by the several alpine glaciers that once coursed down its sides. At this point, we will walk around the summit to survey the whole scene, and try to formulate a comprehensive picture of the geomorphic history.

One additional stop will be made on the road down the mountain, to examine a bank of glacial drift that contains suspected fragments of Potsdam Sandstone.

Field Trip Stops

No mileages will be logged for the following Stops. Instead, we will make the stops at the indicated times, holding to a fairly strict schedule, assuming that the trip started promptly at 8:00 a.m.

STOP 1. 8:30 a.m. (10 minutes) Fort Jackson gorge, located 2 miles north of Hopkinton on County 34. Go to the second bridge over the St. Regis River, and park. For about a mile before Hopkinton on 11B, there are open views to the St. Lawrence Lowlands, that give the distinct impression of looking out to the sea over a gently sloping coastal plain. Here, at Fort Jackson, are some clues as to why. The well-bedded and strongly cross-bedded (Keeseville member?) Potsdam Sandstone dips gently northward away from the Adirondack Dome, presumably as a consequence of its geologically recent and ongoing uplift. The gentle slope "to the sea" apparently is the dip slope developed on the resistant Potsdam Sandstone. A few miles upstream in the Nicholville Gorge, the Nicholville

Conglomerate rests directly on Precambrian gneisses, and represents either basal Potsdam or a sub-Potsdam unit.

STOP 2. 9:20 (10 minutes) Parking area 8 miles southeast of Santa Clara. The bedrock cuts here are dark green, massive, syenitic, or mangeritic (pyroxene syenitic) gneiss, like those seen in passing Santa Clara and several more cuts to here. This peculiar rock-type is widely distributed in the Adirondacks, in association with anorthosite, charnockite (hypersthene granite) and various other members of the anorthosite clan. The large erratic boulders placed along the edge of the parking area display some of the other major rock types of the Adirondacks.

This is also a good place to view the low, knobby, glacially-scoured landscape of the foothills country. Extensive glacial polish and striae are visible in exposures about a quarter mile back from the parking area.

STOP 3. 9:55 (10 minutes) Gabriels, scenic camera stop.

STOP 4. 10:45 (30 minutes) High Falls Gorge. This is a commercial tourist attraction located at the north-east end of Wilmington Notch, where the West Branch Ausable River drops over 100 feet. The river follows the Wilmington Notch fault zone and cascades over a resistant mass of granite (Figure 1). Numerous fractures in the gorge are intruded by diabase dikes that weather in recess. Dikes like these (and sills) are extremely common in the Adirondacks. Sixty-one were recorded by W.J. Miller in his geologic study of the Lake Placid quadrangle (1919). Though definitely post-Grenville, their ages probably vary widely. Here, for example, they intrude fractures presumably related to the late Ordovician Taconic Orogeny. Elsewhere, as in the Lowlands Adirondacks, many are pre-Potsdam.

The rushing water has produced numerous potholes in the hard bedrock of the streambed, some of very large size.

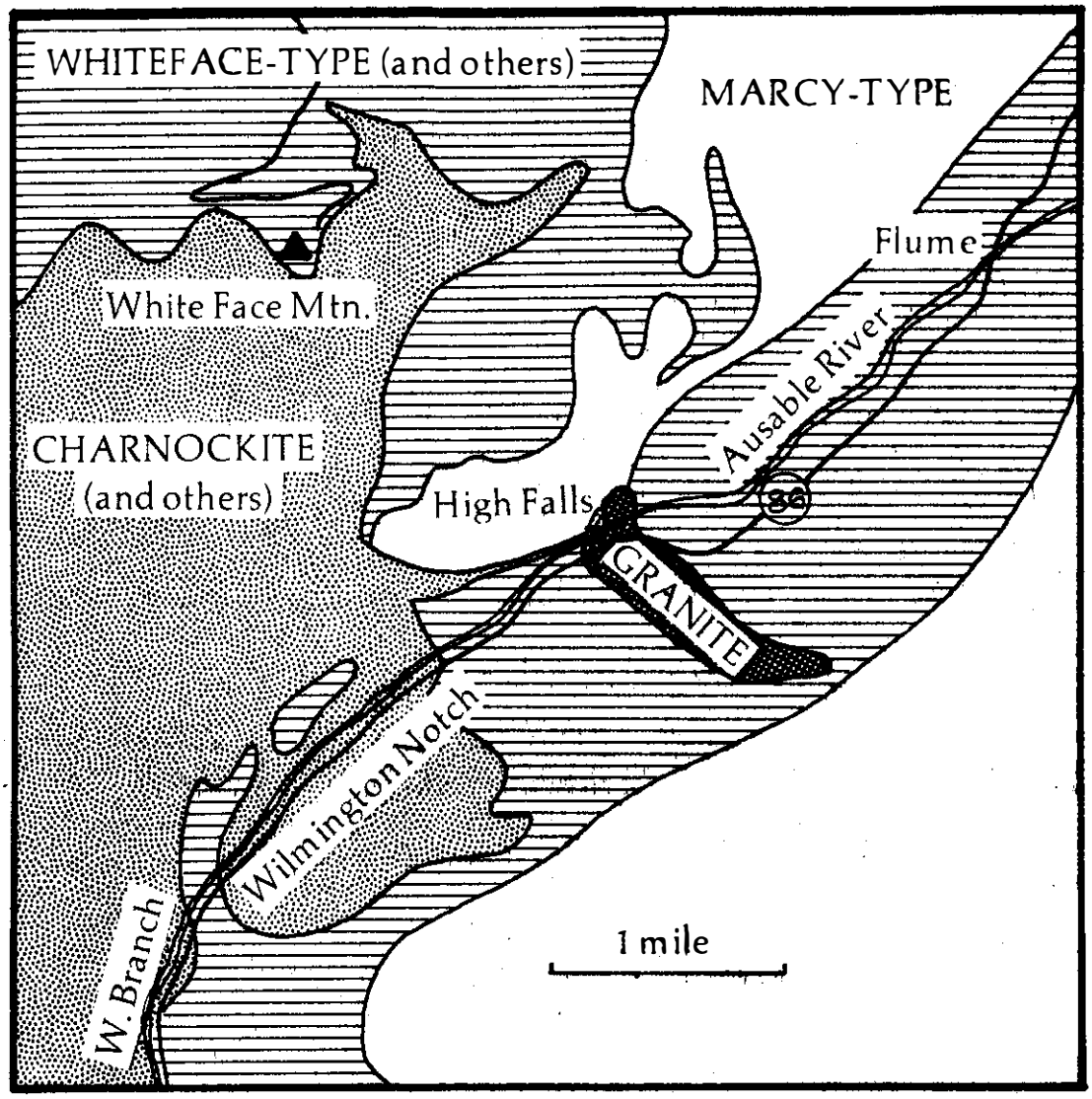

Figure 1. Simplified geologic map of the Wilmington Notch-Whiteface Mountain area, adapted from Crosby (1968).

Similar features may also be seen in the Flume and adjacent roadcut about 2 miles farther east, where N.Y. 86 crosses over the river.

STOP 5. 11:45 (30 minutes)

Whiteface summit. The rock of the summit is Whiteface-type metanorthosite. The Adirondack metanorthosite is a large, massif-type, anorthosite body of thick slab-like form that underlies most of the High Peaks region. Its igneous emplacement predates the Grenville Orogeny, and thus, it has been metamorphosed along with nearly all of the other Adirondack lithologies. Most of this large mass consists of a coarse-grained, porphyroclastic facies, called Marcy-type, in which plagioclase porphyroclasts commonly measure several inches in length, and rarely more than a foot. Whiteface lies near the northern border of the mass where, presumably, the shear and chill effects associated with emplacement are responsible for the finer grain size, more gneissic texture, and more gabbroic composition of the Whiteface-type (Figure 2). The structural and petrologic picture, however, may be considerably more complex, as indicated by Crosby (1968), who considers the rocks here to be part of the Jay-Whiteface Nappe, and who has mapped complex interstratification of Marcy- and Whiteface-types with charnockite, mangerite, other gneisses below the summit. Figure 1 gives a highly generalized picture of the distribution of the major rock types around the mountain.

The effects of alpine glaciation are well represented on Whiteface by several aretes, cirques, and U-shaped valleys downslope from them (Figure 3). In historical perspective, Wisconsin glaciation at climax about 20,000 years ago, covered the Adirondack peaks with a thick blanket of ice. The ice thinned during glacial recession until the higher peaks projected through, but residual ice masses remained in the existing mountain valleys. The resulting alpine glaciers persisted for long enough to carve the distinctive features noted here and present throughout

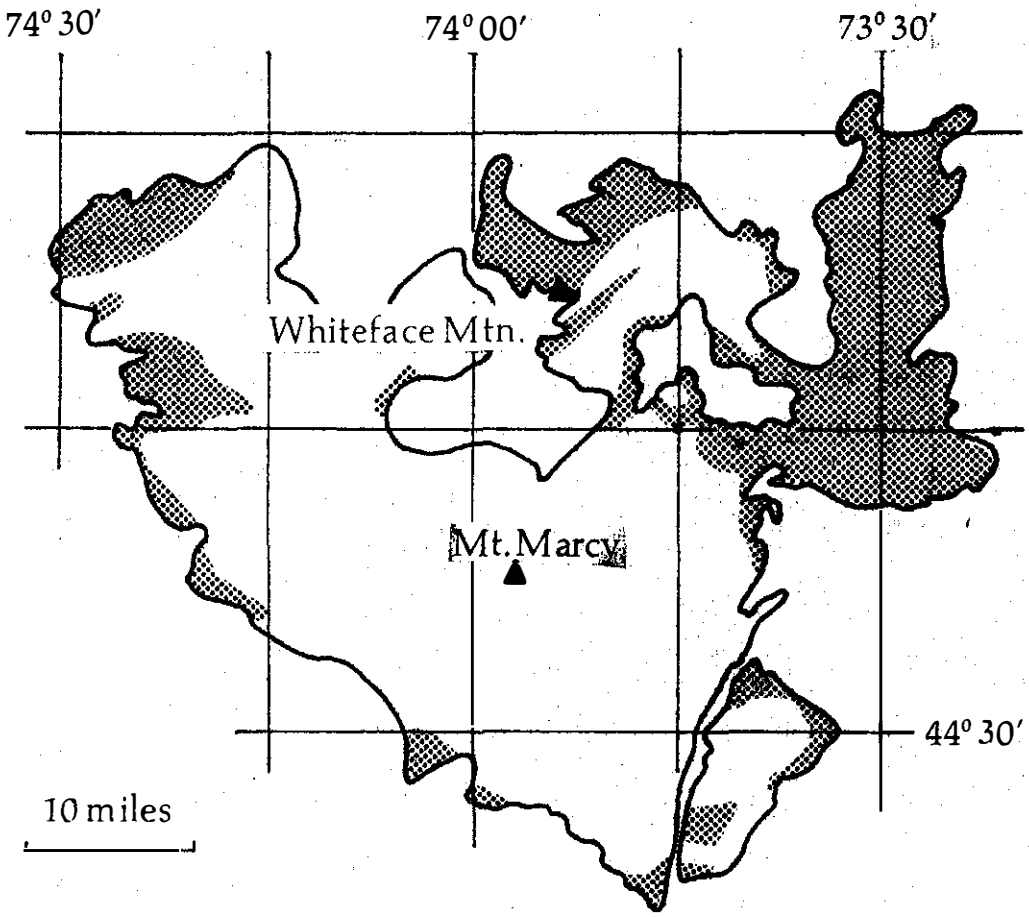

Figure 2. Simplified geologic map of the Adirondack Anorthosite (Marcy Massif), showing the distribution of Marcy-type (unshaded) and Whiteface-type (shaded). From Isachsen and Moxham (1968).

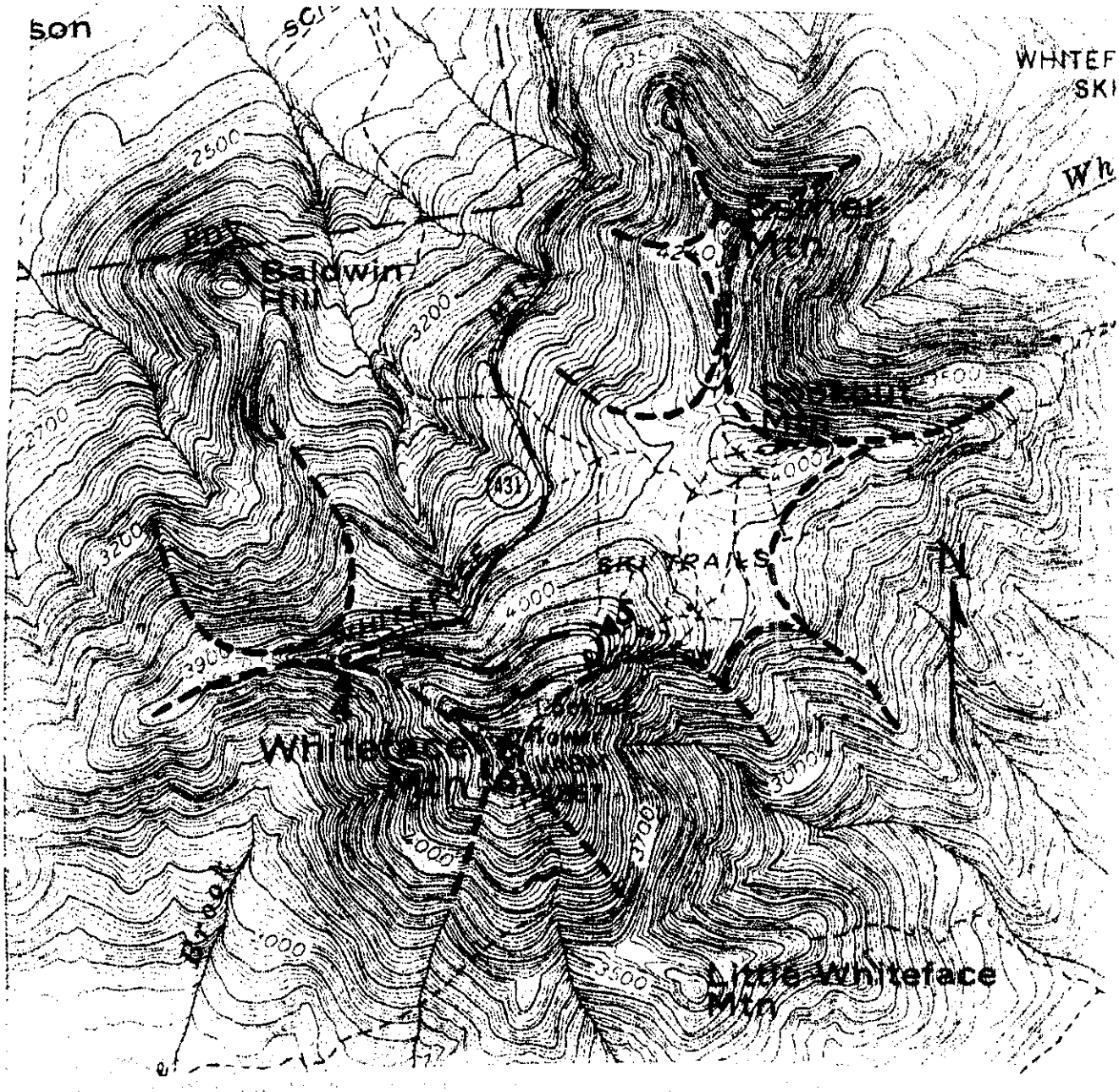

Figure 3. Section of the Lake Placid 15' guadrangle topographic map, showing Whiteface Mountain with the principal glacial cirques outlined.

the High Peaks region. In the Catskill Mountains glacial cirques formed contemporaneously are much better developed, owing to the lesser resistance of the sedimentary rocks there, and to their nearly horizontal stratification.

The peculiar, ladder-shape of Lake Placid, and in fact, its very presence, demand further explanation. The lake occupies a system of crossvalleys developed first by stream erosion of fault zones, and then later deepened and widened by ice advance. It is now dammed at its southwestern end around Lake Placid village by moraine.

The role played by Wilmington Notch in pro-glacial lake development can best be appreciated in the view from the summit. From here, it is seen as a very narrow constriction between two large moderately-level lake plains. Figure 4 shows three stages of deglaciation in this region, with ice first blocking drainage through the Notch, and later melting away to permit convergence of the impounded waters on either side of it.

Other features to note from the summit are:

1) Lake Champlain in the distance opposite to the Lake Placid direction.
2) The profile of the High Peaks region in a sweep from southwest (across Lake Placid) to southeast (ca. 90° to left of Lake Placid).
3) Northeast-trending notches and valleys other than Wilmington Notch.
4) Slide stripes on steep, smooth cirque walls, on Whiteface, and on some of the other peaks.
5) Sheeting of the summit rocks.
6) Representative rock types in the retaining wall near the "Castle."

STOP 6. 12:30

Glacial drift bank on Whiteface highway below the Lake Placid turn. This is a bouldery, sandy, well-washed deposit probably best described as a kame, but

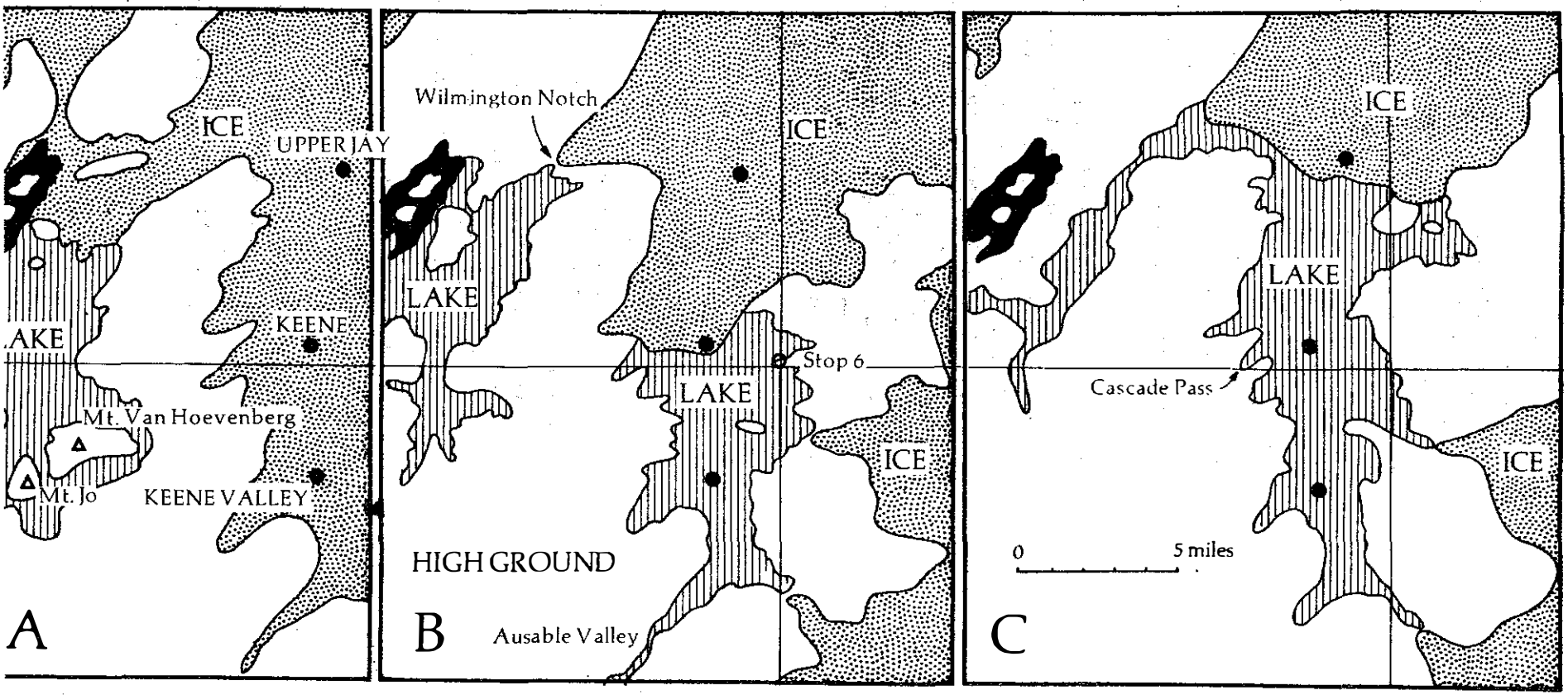

Figure 4. Three successive stages of deglaciation in the Lake Placid-Jay-Keene Valley region, after Alling (1919).

lacking visible stratification (concealed by slopewash?). Pick around among the fragments to see if you can find some Potsdam Sandstone. What would its presence mean in terms of glacial history?

End of trip. Have a safe journey home!

References

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