Trip F

THE PINNACLE HILLS AND THE MENDON KAME AREA: CONTRASTING MORAINAL DEPOSITS

by

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INTRODUCTION

The Pinnacle Hills, fortunately, were voluminously described with many excellent photographs by Fairchild, (1923). In 1973 the Range still stands as a conspicuous east-west ridge extending from the town of Brighton, at about Hillside Avenue, four miles to the Genesee River at the University of Rochester campus, referred to as Oak Hill. But, for over thirty years the Range was butchered for sand and gravel, which was both a crime and blessing from the geological point of view (plates I-VI). First, it destroyed the original land form shapes which were subsequently covered with man-made structures drawing the shade on its original beauty. Secondly, it allowed study of its structure by a man with a brilliantly analytical mind, Herman L. Fairchild. It is an excellent example of morainal deposition at an ice front in a state of dynamic equilibrium, except for minor fluctuations.

The Mendon Kame area on the other hand, represents the result of a block of stagnant ice, probably detached and draped over drumlins and drumloidal hills, melting away with tunnels, crevasses, and perforation deposits spilling or squirting their included debris over a more or less square area leaving topographically high kames and esker

segments with many kettles and a large central area of impounded drainage. There appears to be several wave-cut levels at around the ± 700' Lake Dana level, (Fairchild, 1923).

The author in no way pretends to be a Pleistocene expert, but an attempt is made to give a few possible interpretations of the many diverse forms found in the Mendon Kames area. Fairchild's work (1923) on the Pinnacle Range seems to need little in the way of additional interpretation.

THE PINNACLE HILLS

General Description:

Fairchild (1923) refers to the moraine as "The Pinnacle Hills or The Rochester Kame-Moraine." He divided it into three divisions based on form and composition. The "middle division" contains the "Pinnacle" or high point at 749' about 230' over the city plain. The eastern and central divisions show till capping and contorted layers on the north side indicating a re-advance of the ice.

The northern slopes of the range are irregular with steep ravines and spurs indicating ice contact with some erosion both natural and man-made.

There is a smaller recessional moraine to the north which contains more till indicating that perhaps the base of the Pinnacle Range is till although it is not (or was not) exposed in any cuts.

The lowest beds exposed were all horizontal sands and gravels. Blocks of Lockport dolomite occur on the apex of the Pinnacle and Cobbs Hill. They are angular and fresh indicating a short readvance, since Lockport is found only a few miles north.

The western division contains mound-and-basin or eggs-in-a-basket topography which is excellently displayed in Mt. Hope Cemetary and Highland Park. These deposits are similar to many on the west side of the Mendon Kame area.

Origin:

The greater part of the Pinnacle moraine is not till but stratified sands and gravels. The dip is southerly with southwest slightly more abundant. The last sentence, along with the sub-lacustrine outwash slope on the south side seems to negate the interlobate hypothesis of origin (Taylor, 1924). If there was a southern lobe it would have scraped off the sub-lacustrine slope and deposited northerly dipping sediments. Fairchild rejected the hypothesis in a footnote (1923, p. 165).

Most of this discussion is taken directly from Fairchild (1923), but the author questions one opinon on page 167 where Fairchild states:

> "Probably most, or all of the glacial drainage was subglacial, issuing from tunnels beneath the ice sheet."

It is hard to imagine a melting ice front having only subglacial drainage. The presence of ice contact kames on the eastern end of the moraine and eggs-in-basket kames with no possibility of their being scattered about by a few large streams, **mitigate** against this hypothesis. Also, the western end of the range shows no readvance, at least not on the top with the eggs-in-basket kames intact. There should be some evidence of eskerine deposits with all those sub-glacial tunnels.

According to Fairchild (1923), the Genesee River channel was cut northward to drain a small pro-glacial lake (Lake Scottsville). The Pinnacle Moraine was built into Lake Dana with a surface elevation of ± 700', (Fairchild, 1926). As Lake Dana was drained down through an eastward outlet toward the Mohawk-Hudson the waters south of the moraine and west of the East Henrietta Ridge were left as Lake Scottsville extending southward towards Avon. The lake level was at 540'. Since the waters of Lake Dawson, north of the moraine were at about 480' the post-glacial Genesee channel was cut though at the lowest point in the moraine where it is presently situated. Although not mentioned by Fairchild it is still (the Genesee River) at about the same elevation (512') due to the temporary base-level provided by the Lockport dolomite bench.

THE MENDON KAME AREA

General Description:

The Mendon Kame area is unusual in that it consists of stagnant ice features in an anomalous topographic setting. Usually ice stagnates by a block of ice melting down between hills, ridges , or in a valley and becomes separated from the main ice mass by the topographic highs. By contrast, the Mendon area is "setting up" above the surrounding terraine and contains some of the highest hills, with radial drainage away from the deposits.

The area is divided topographically into three north-south zones (fig. 1). The central zone is characterized by low ground with impounded drainage producing three "ponds" and a few scattered kames and kame clusters among swampy areas. The east and west zones, although quite different in detail, contain kames, eskers and eskerine segments with kettles and various puzzeling stratified drift areas.

General Description of Kinds of Deposits:

Eskers:

Giles (Giles, 1918) in a paper describing the eskers in the vicinity of Rochester, New York went into a long and detailed description of eskers all over the northern hemisphere

replete with pros and cons about esker origin. His main conclusion was that most eskers are sub-glacial in origin. On page 217 Giles described the east esker as: "probably the finest esker in western New York." On the other hand, Fairchild (1926, p. 207), stated: "The eskers in the two ranges of kames are so irregular in form and so confused with or surrounded by the kames that they are not readily recognized."

Both Giles and Fairchild were of the opinion that the kames surrounding the eskers were probably products of the same stream. Unless they are directly connected to an esker segment, this, to the author, seems like a physical impossibility.

Kames:

There are, in the Mendon Ponds area, kames with great variation in size, shape, and location. Again Giles and Fairchild only recognized "eggs-in-a-basket" type kames formed at the debouchure of the subglacial stream along re-entrants as the ice wasted away. Since kames are so diverse in size, shape, and origin, I will discuss them later under "Origin."

Kettles-(not "deposits" but intimately related):

Kettles are found intermixed with the kames and eskers, especially bordering the esker, with "Devil's Bathtub" (end of walk along wesk esker-stop #2), surrounded by the southernmost esker-fan of the west esker the most famous, but certainly not the largest. Some are dry, others "ponds" according to the water table level.

Drumlins:

No drumlins outcrop in the park in a recognizable form although there may be several buried ones. Fairchild (1926) called the hill between Hundred Acre Pond and Deep Pond a "diminutive drumlin." The shape, size, and orientation make it appear more like a kame with ice-contact steepness, especially on the west side bordering Deep Pond.

There are many drumlins and drumloidal hills surrounding the area, especially to the southwest in an area enclosed by Clover Street and Sheldon Road.

ORIGIN OF MENDON PONDS PARK AND SURROUNDING STAGNANT ICE FEATURES

General Statement:

The author undertook this brief report with very limited time available because any field trip in the Rochester area would be missing something if a trip to the area was not included; and because a few traverses through the park and new gravel pits surrounding the park raised more questions than were answered in the literature.

The first and most striking characteristic of the park is its elevation above the surrounding drumloidal till plain. The only logical explanation seems to require a stagnant and eventually detached very dirty ice block draped over drumlins and drumloidal hills with its original southern terminus marking the ice-marginal drainage channel of Lake Warren II to the south (fig. 1).

The trend of the drumlins is northeast toward the Irondequoit Bay area. This may have been the source of the englacial debris needed for the formation of the high level melt-water deposits. It also may explain the abrupt ending of the eastern end of the Pinnacle Hills.

The debris was left at Mendon Ponds, leaving cleaner ice to rapidly retreat north to the Rochester parallel.

Another strange feature was the sloping away from the area in many directions of what appears to be outwash grading into swell and swale topography. John H. Cook (Cook, 1946a) described a similar relationship in the Hudson Valley area in which streamlined forms were apparently produced by undermelting. In figure 2 I've attempted to show a possible similar relationship along the west side of Mendon Ponds. Slight ice movement of the clean block would produce more streamlining. Undermelting and perforation deposits can form because water is densest at 3.9°C and therefore sinks and has heat energy to expend melting ice (Cook, 1946b).

This process would stop if an impervious clay layer were deposited. It would insulate the ice below from further melting. Since N.Y. State tills are usually high in clay content, perforation probably becomes suspended in most instances (Holmes, 1947).

The diversity of form, shape and distribution of the kames, eskers, kettles and outwash calls for a polygenetic origin. The central zone was probably higher and cleaner, or just higher, and the superglacial and englacial debris was washed off to the sides contributing to the deposits of the east and west zones.

The few kames and compound kames found south of Hundred Acre Pond were probably formed early, by pothole drilling. If the east and west zones were insulated by superglacial drift the cleaner central zone would melt away leaving little trace (figs. 3 & 4).

Specific Deposits

Eskers

The most glamorous deposits in Mendon Ponds are the two segmented eskers with their railroad embankment appearance in the woods where they can be seen and Indian trails and bridal paths along their crests.

The West Esker

The esker on the west side of the park is divided into three traceable segments each ending in an esker fan or cone. Throughout much of its length it is bordered by large kettles that in places show ice-contact kames on the opposite side. It varies in height from 5 or 10 feet to over 100 feet. The origin, at first glance, seems to be a simple melting "back" that is, northward, with a fan or cone deposited at each prolonged "stand" of the ice (fig. 5). This may well be the way it was formed, but if the ice block was detached the northern most segment that ends abruptly north of the thruway, may have formed contemporaneously with the two southern segments, spilling its large cone termination into water (or partly under ice. fig. 2). Stop #1. The large kettles that parallel the

esker terminate with ice-contact steepness with a mixture of ice-contact kames and smaller kettles on the opposite side. The sharp break in slope at the top of kettles and irregular gradation to swell and swale may be due to some variation of the conditions illustrated in figure 2.

The East Esker-Kame-Kettle Complex

The continuous nature of "the esker" described by Giles as "not being in any place discontinuous" (Giles, 1918) for 2 1/2 miles completely baffled the author in the field. Fairchild's description (Fairchild, 1926), quoted above, concerning their irregular and confused nature is more accurate.

The area bounded by Canfield Road on the north and Pond Road on the south, the swampy area on the west and Pittsford Mendon Road on the east, contains an extremely complex mixture of kames, kettles, esker segments and eskerine ridges. The origin of the many features seems most likely to be polygenetic, not the product of a single stream as postulated by Fairchild (1926), although he does mention that the esker is "confused by subsequent kame construction."

The ice covering this area must have been more highly fractured and covered with suspended perforation deposits, perhaps due to a more irregular till basement. John H. Cook, (1946b), argues the case in favor of much "kame" construction

being due to perforation deposits working their way down through the ice. Chauncey D. Holmes (1947) counters with the argument that, in New York State at least, they would become suspended by the insulating effect of a layer of clay which would leave them suspended in the ice mass. Holmes considers pot-hole action to be responsible for most individual kames.

This eastern area of the park contains such a jumbled up mixture of deposits that all the processes discussed by Cook and Holmes, along with subglacial esker formation, could be responsible in different individual depositional forms - Stop #5. The esker segments, kettles, and some ice-contact kames indicates much fracturing and deposition in, around, and under ice blocks. On the other hand, many small "eggs-in-a-basket" kames indicate no ice-contact and must have been poured into the water from small crevasses and perforation deposits as the final melting of the stagnant ice occurred - Stop #3. These last deposits may be found in between, on top of, or contiguous to, any of the previous deposits (fig. 6). Where two perforation deposits are connected by a filled crevasse a saddle would be found connecting two kames.

The area north of Canfield Road and east of Wilmarth Road is now being quarried for sand and gravel revealing an interesting

structure. Stop #4. The section on the east and southeast appears to be kame-kettle topography similar to that south of Canfield Road, but is being cut into for private home construction and appears to be mostly sandy in consistency.

The quarry reveals torrential bedding, some zones so coarse-grained that they could almost be called catastrophic, to a depth of around 100' to ± 700' above sea level. There is no water except in the deepest excavation which may be near the top of a drumlin. (This deep water table is found in all of the new excavations in topographic high areas, indicating that the gravels do not hold water for long, or it is shed off their grass-covered slopes.) There appears to be a till capping, although it has been farmed and bull-dozed considerably and may be a man-made deception. The bedding has apparent dips in all directions indicating that this large deposit may have been draped over a drumlin or drumloidal hill.

A similar but smaller deposit occurs 3/10's of a mile east of Round Pond (which is the highest elevation in the park at 820'+.) This one has many branches like a giant amoeba. A possible explanation for these large hill-mantled kames is that with down-melting the tops of the hills were exposed allowing the entrance of gravel-charged water which subsequently worked its way down around the hills by convection melting (fig. 7.)

South of Woodchuck Hollow a pit was cut (and is being filled for reclamation-not a land-fill) showing torrential bedding with a "catastrophic zone" as revealed at different horizons in all the new cuts. Due to their great permeability the very coarse gravels are mostly cemented with lime leached out of the "rock flour".

Across the road (north of Pond Road, east of Pittsford Mendon Center Road), several large kames are being dissected and also show "catastrophic zones." (Stop #6). These cobble-sized deposits are so prevalent it makes one think there must have been one or several mini-alti-thermal periods.

Another "catastrophic" zone is found south of the park north of the ice-drainage channel in Russo's pit and appears to overlie pre-glacial Genesee River sediments. This unusual deposit consists only of pebbles, cobbles, and coarse sand as though flushed clean of all other size grades. It is also truncated by an ice-marginal drainage channel which makes it even more interesting.

A possible explanation for these relationships may be found by considering the two deglaciations of Lake Warren I and Lake Warren II (Fairchild, 1932). During the deglaciation of Lake Warren I the catastrophic layers could have been formed at an earlier, higher level, ice-marginal drainage channel. During the deglaciation of Lake Warren II, at a

slightly different location of the ice-front, the second, deeper, channel could have been cut truncating the first.

If time is available a look at the catastrophic bedding on top of the pre-glacial Genesee River with the above described possible relations could be made (Stop #7). This is located south of Bulls Sawmill Road.

The above descriptions and interpretations are based on a study of the available literature, study of the 7 1/2 minute contour maps (not available to Giles and Fairchild) with a five foot contour, and a few days traversing the area to get a closer look at the tree-covered deposits.

The author takes full responsiblity for any interpretations that may seem, to the glacial expert, as wildly illogical.

ACKNOWLEDGEMENTS

The writer would like to thank Richard D. Hamell for help in the tedious "kame-climbing" and gravel-pit digging in the field and Thomas X. Grasso for critically reading the manuscript.

The following sketch diagrams are an attempt to put into visual perspective the ideas in the text.

Figs 9-10-11 were added later to explain STOP #3. Maps - fig 1 - at the end.

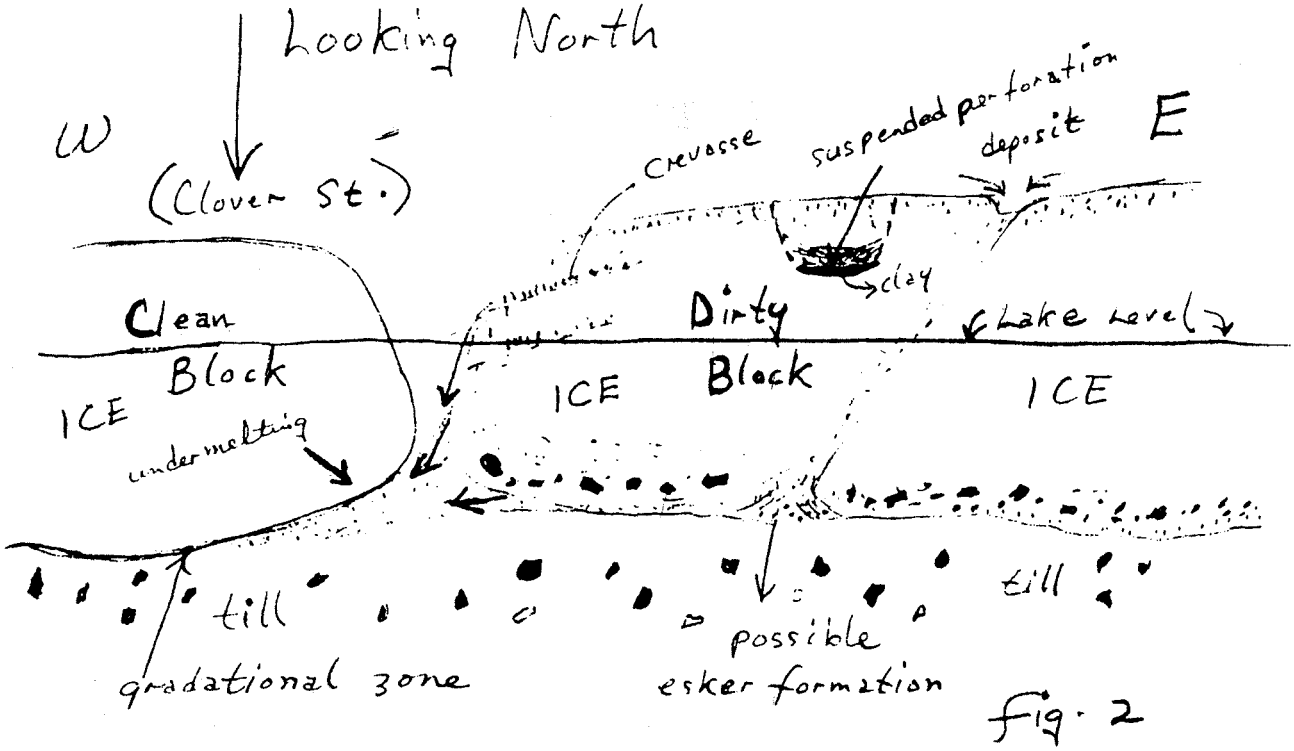


fig. 2

Looking North

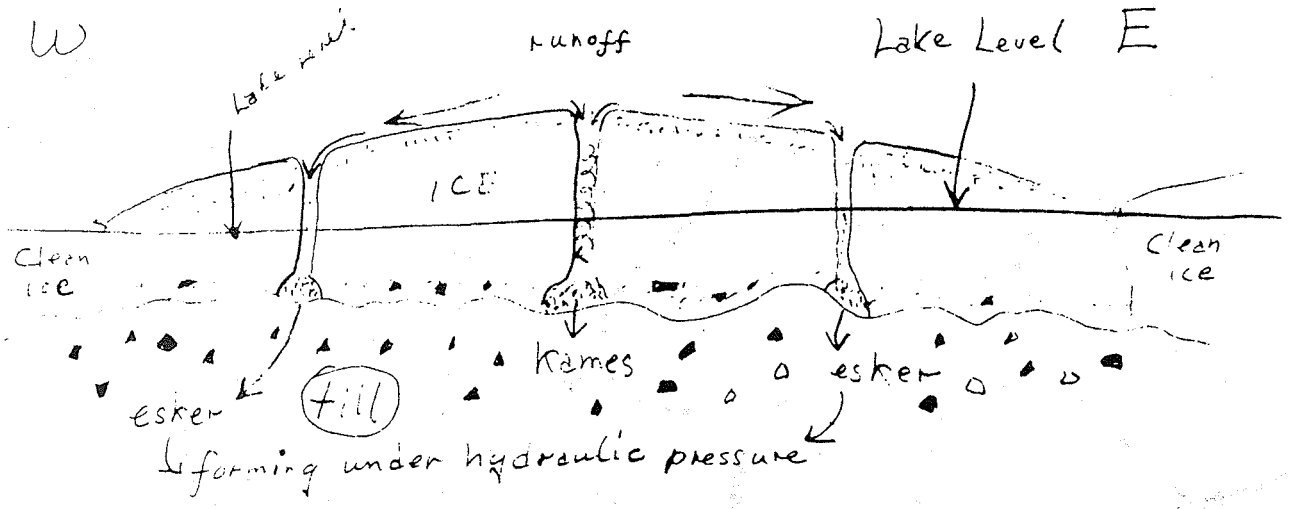


fig. 3

Looking North

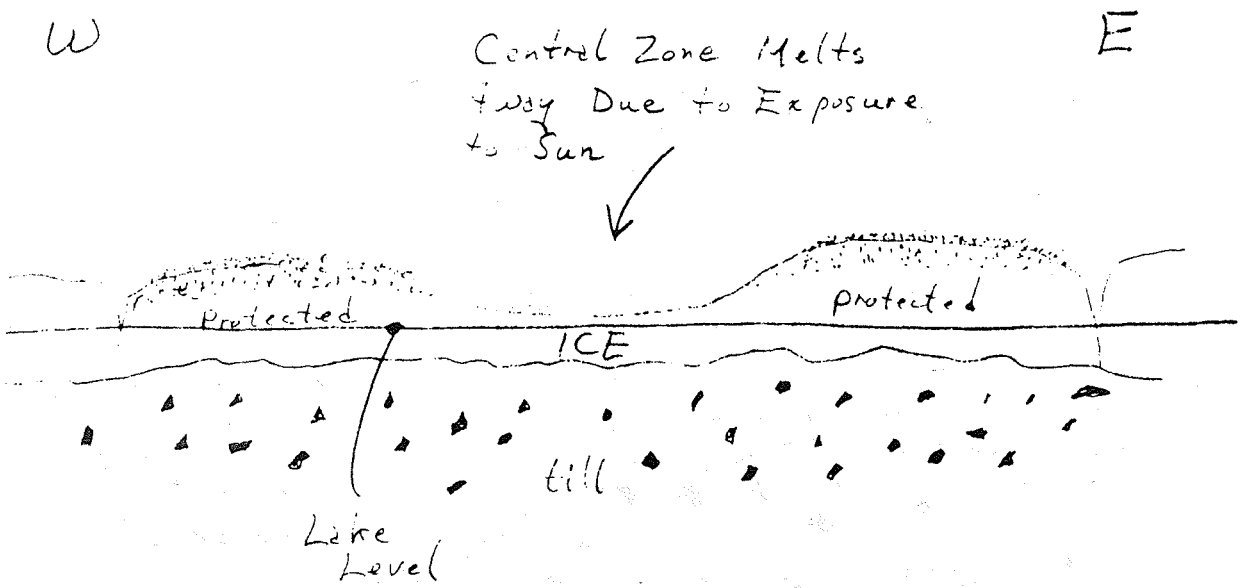


fig. 4

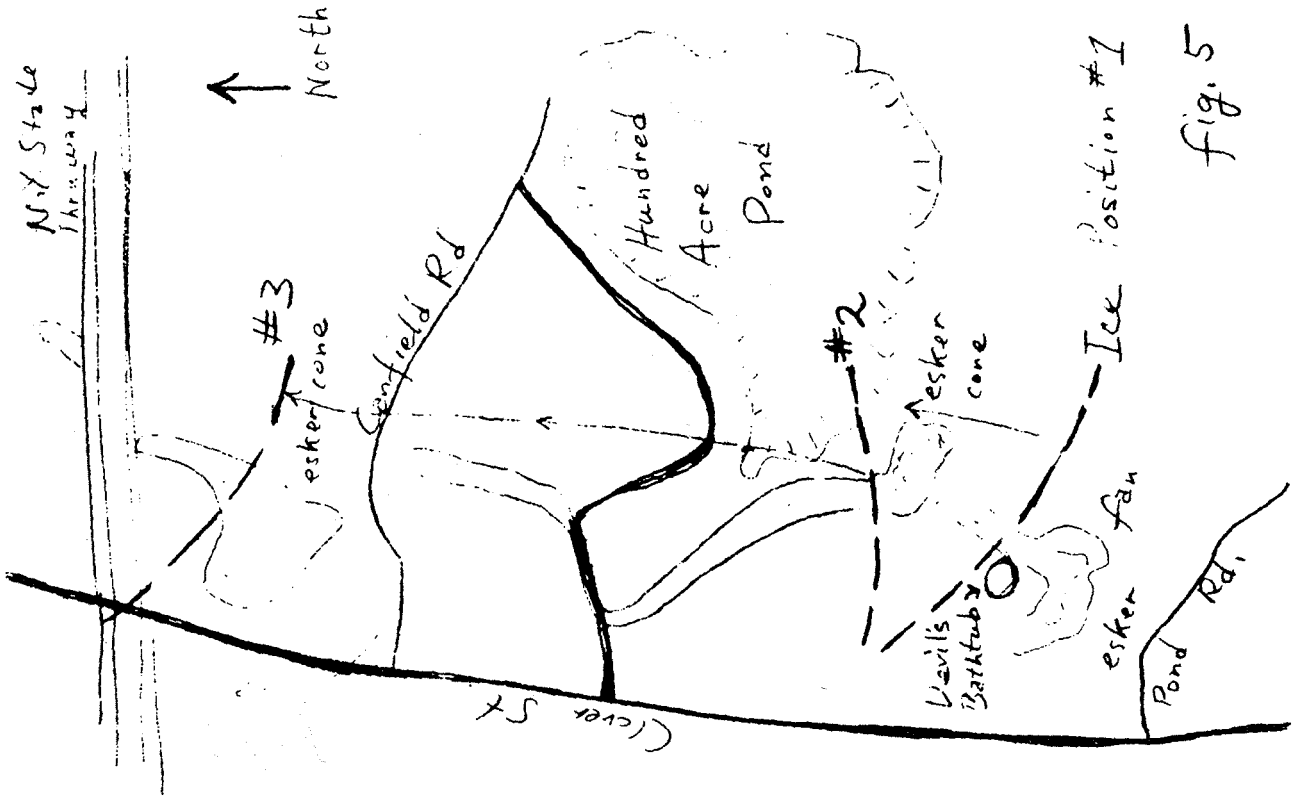

N.Y. State Thruway
North
#3
esker cone
Centerfield Rd
Hundred Acre Pond
#2
esker cone
Ice Position #1
Devil's Bathtub
esker fan
Pond Rd.
Center St

fig. 5

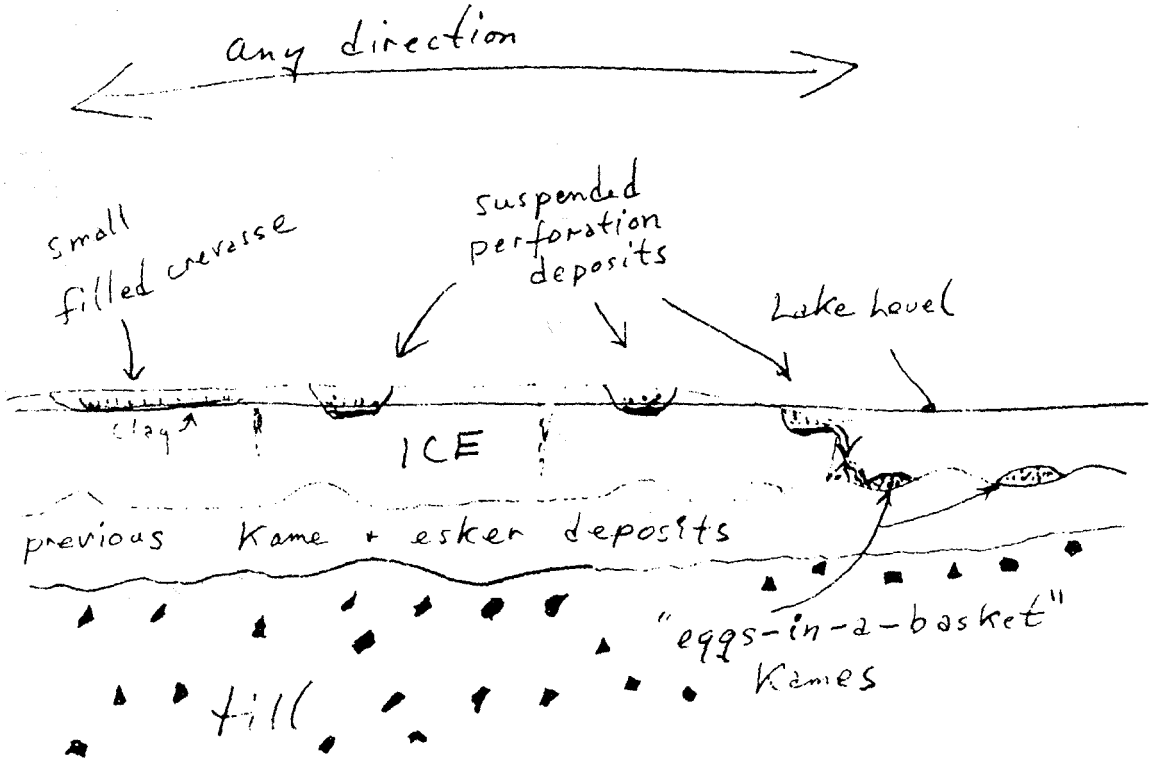

any direction
small filled crevasse
suspended perforation deposits
Lake level
clay
ICE
previous Kame + esker deposits
"eggs-in-a-basket" Kames
till

fig-6

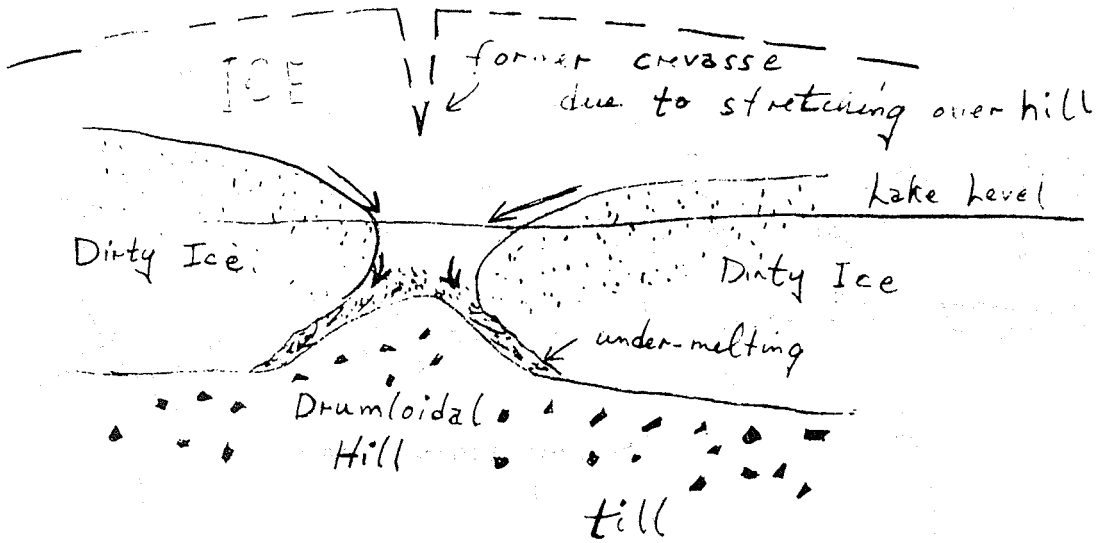

ICE
former crevasse
due to stretching over hill
Lake Level
Dirty Ice
Dirty Ice
under-melting
Drumloidal
Hill
till

fig. 7

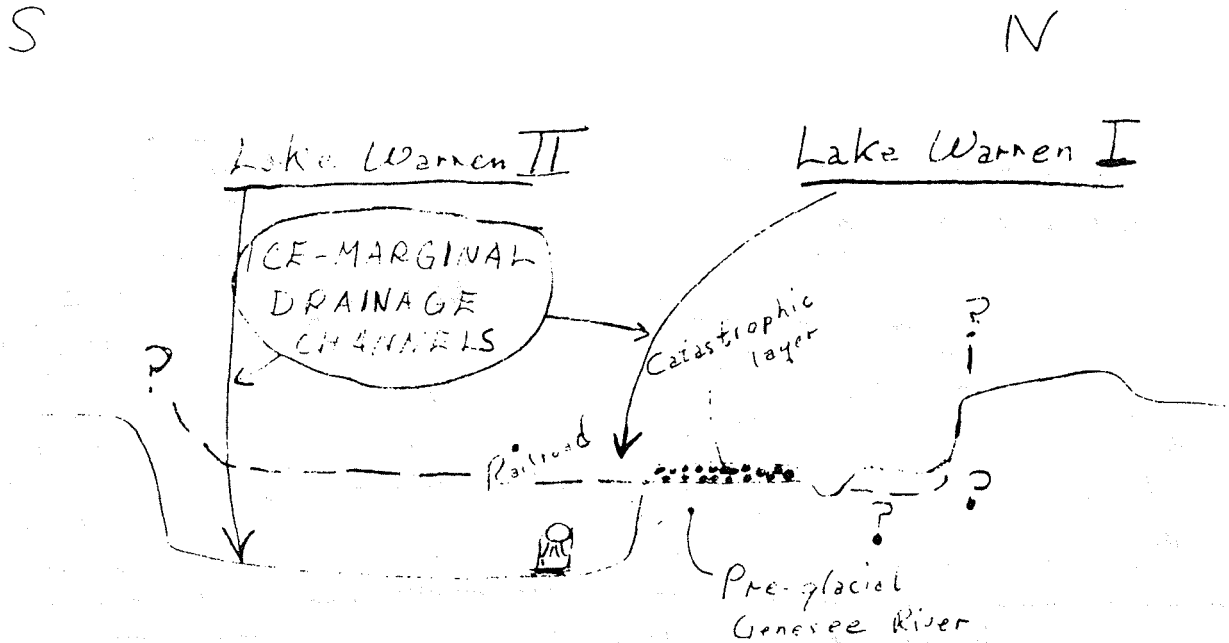
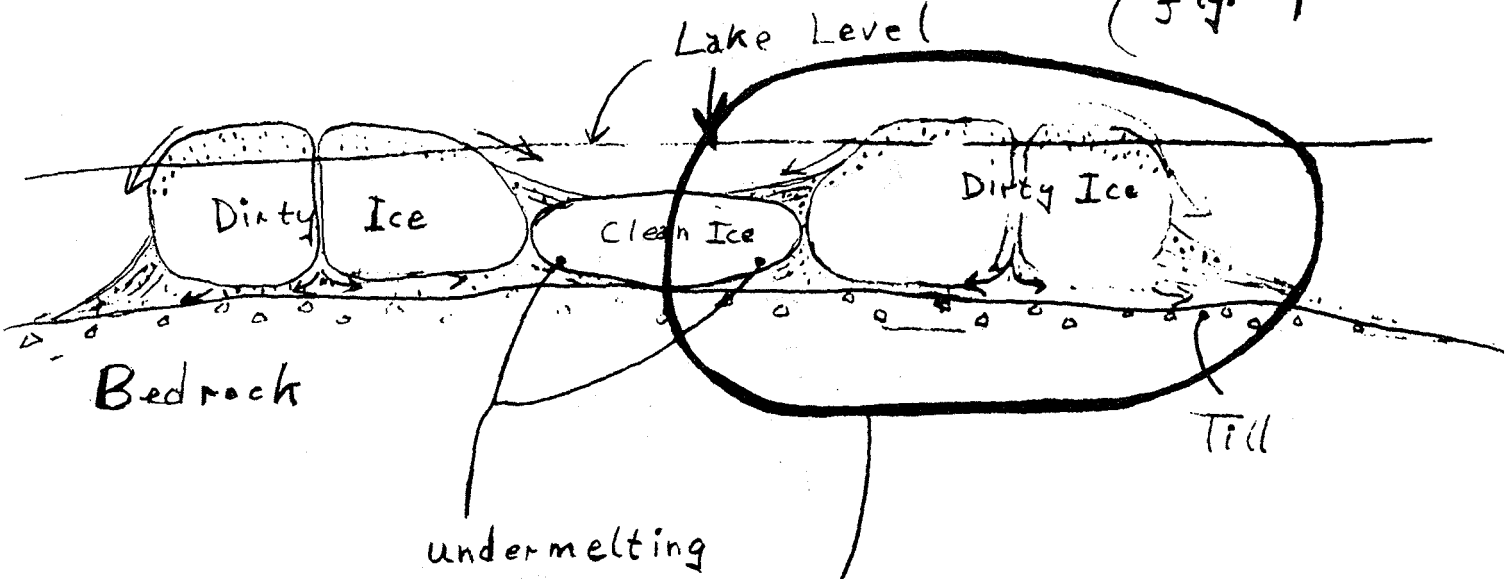

S
N
Lake Warren II
Lake Warren I
ICE-MARGINAL
DRAINAGE
CHANNELS
Catastrophic
layer
?
?
?
?
?
Railroad
Pre-glacial
Genesee River

fig. 8

Looking North -(Mendon Ponds Park)

fig. 9



STOP #3

figs 9, 10, 11

Later Stage -(enlarged inset)

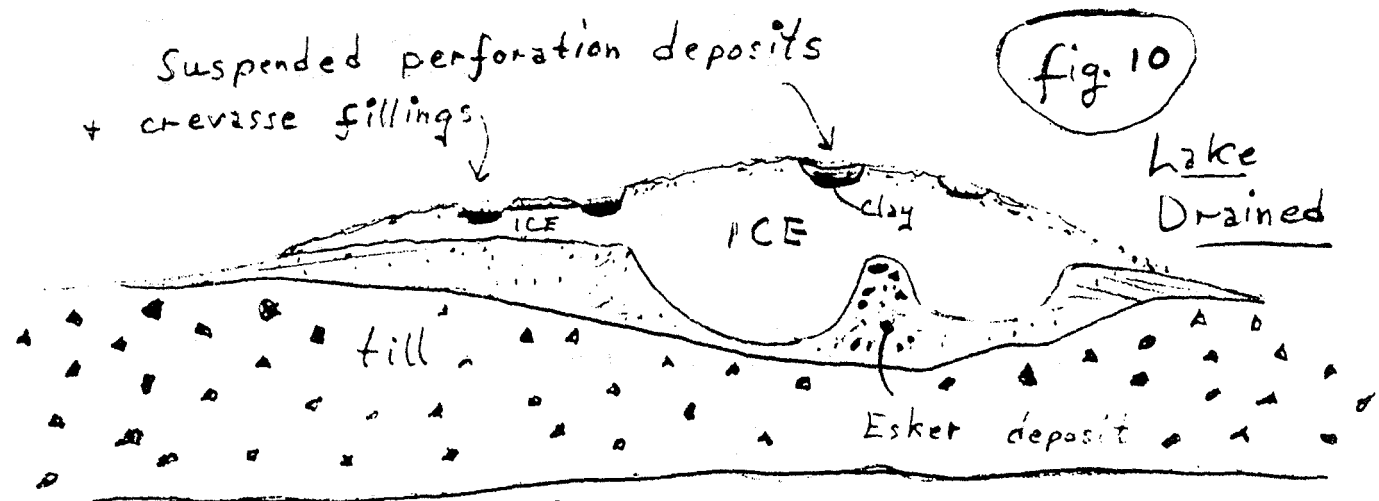


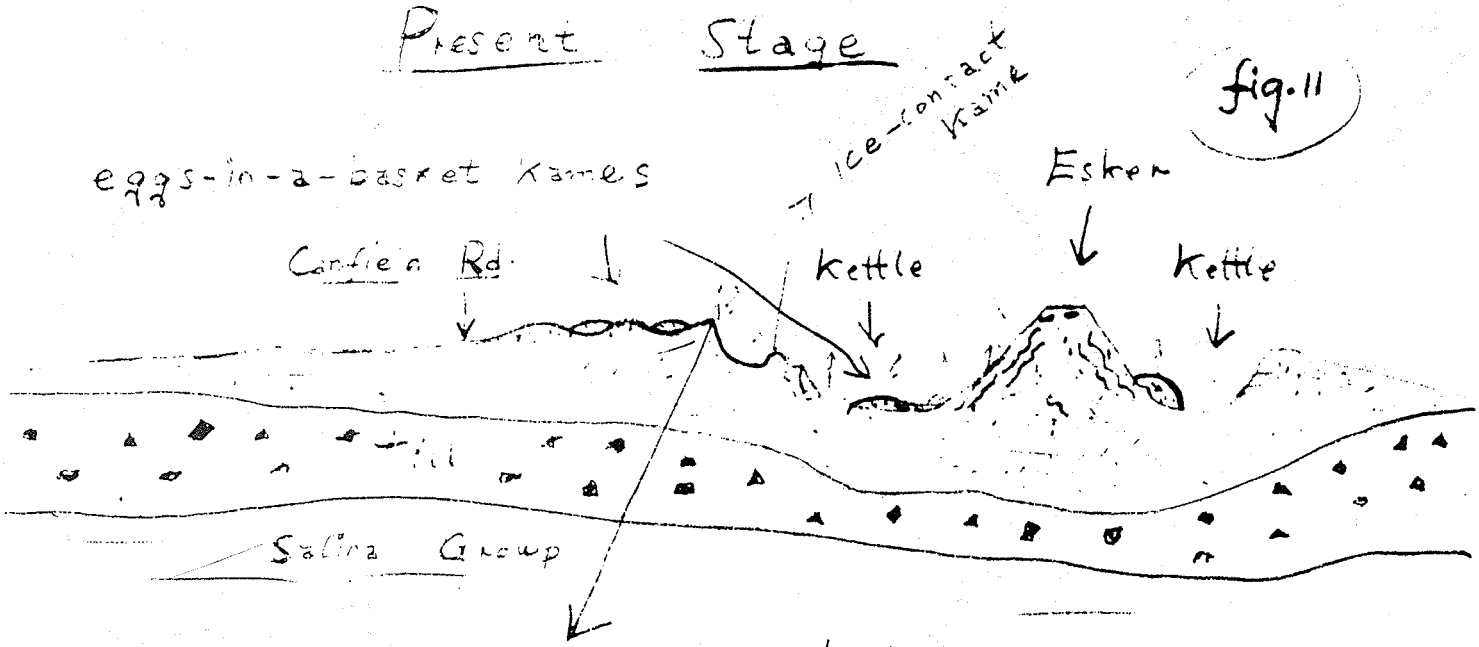
fig. 10

Lake Drained

(next page → Present)

Present Stage

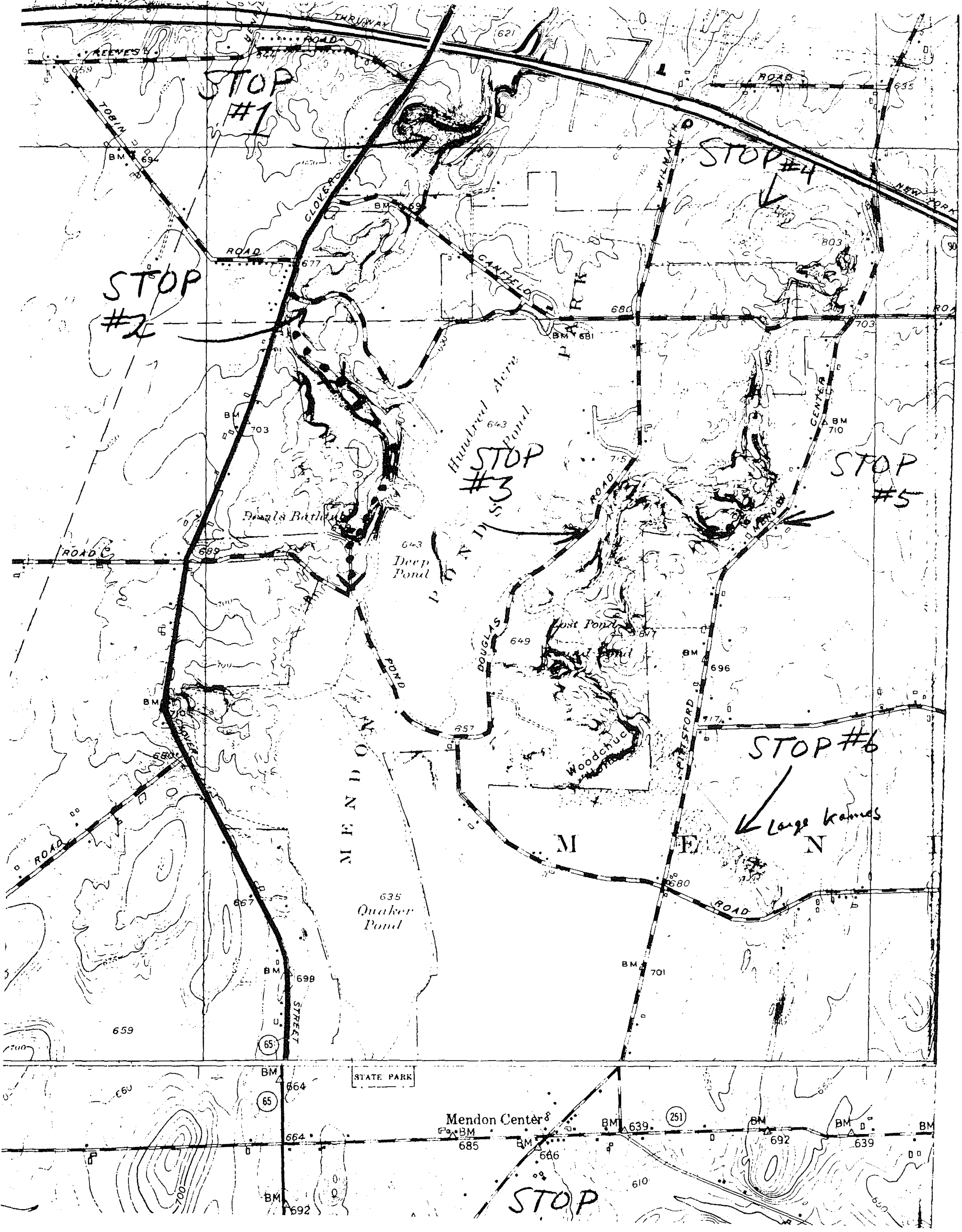
fig. 11



sharp break between:

ice-contact (right, in kettle-esker area) features —and— non-ice contact eggs-in-a-basket Kames dumped wherever supraglacial debris was concentrated as seen at STOP #3

Fig. 1a


STOP #1
STOP #2
STOP #3
STOP #4
STOP #5
STOP #6
Large kames
STOP
THRUWAY
NEW YORK
REEVES
TOBIN
ROAD
CLOVER
CANFIELD
PARK
WILMARTH
Hundred Acre Pond
Deep Pond
PONDS
POND
DOUGLAS
ROAD
Lost Pond
Woodchuck
PITTSFORD
CENTER
MENDON
M E N
Quaker Pond
STREET
STATE PARK
Mendon Center
BM
659
694
697
677
680
681
703
710
643
715
689
649
657
696
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639
692
610
803
635
621
90
65
251

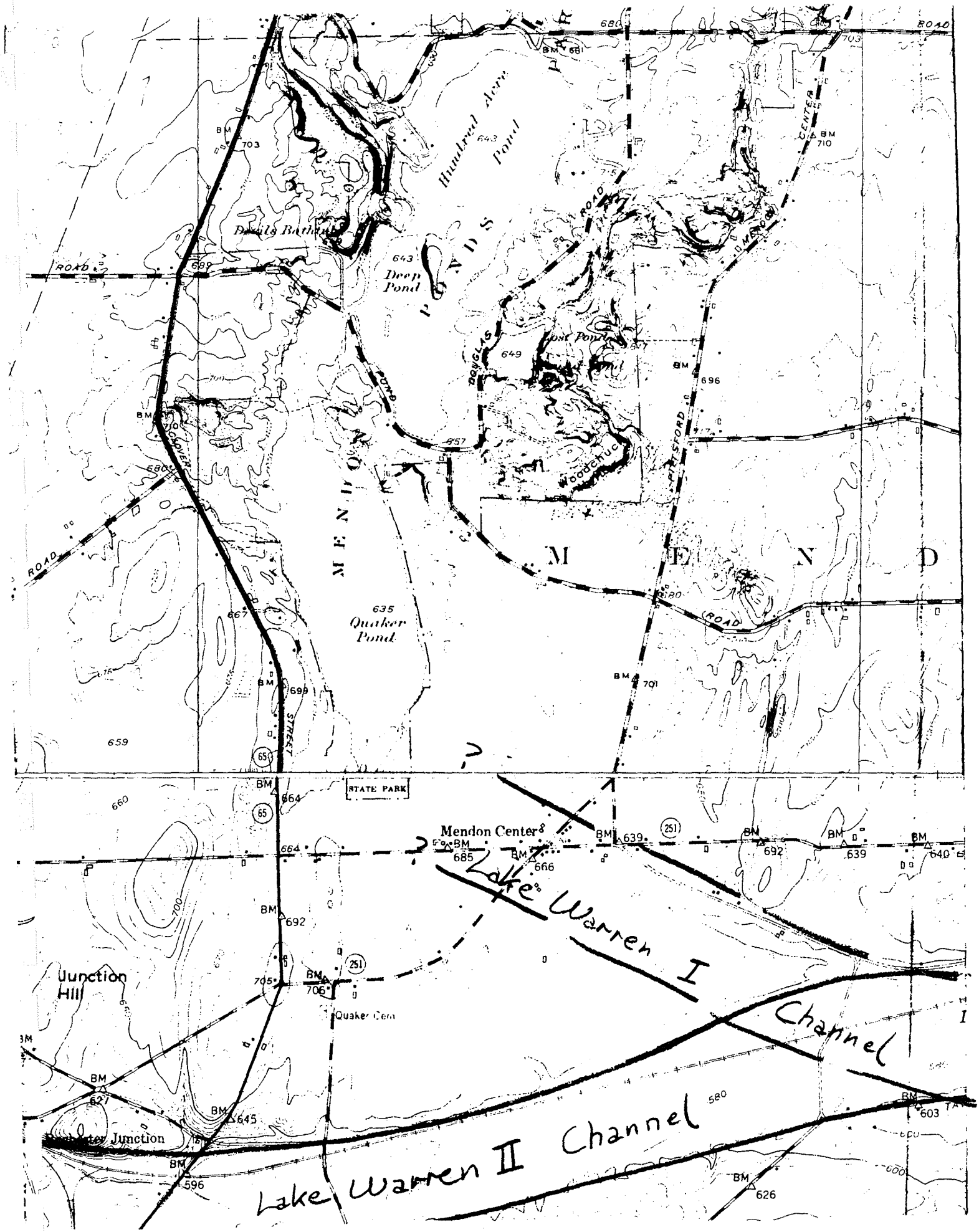
Hundred Acre Pond
Deep Pond
Quaker Pond
Woodchuck
MENDON PONDS
MENDON
Mendon Center
STATE PARK
Junction Hill
Quaker Cem
Lake Warren I Channel
Lake Warren II Channel

Plate I

Till capping lake sand. Near Winton Road, looking west in 1922. (Fairchild, 1923).

Plate II

Cobbs Hill. North side of Hill by Erie Canal widewaters east end of pit, looking southeast, in 1903. (Fairchild, 1923).

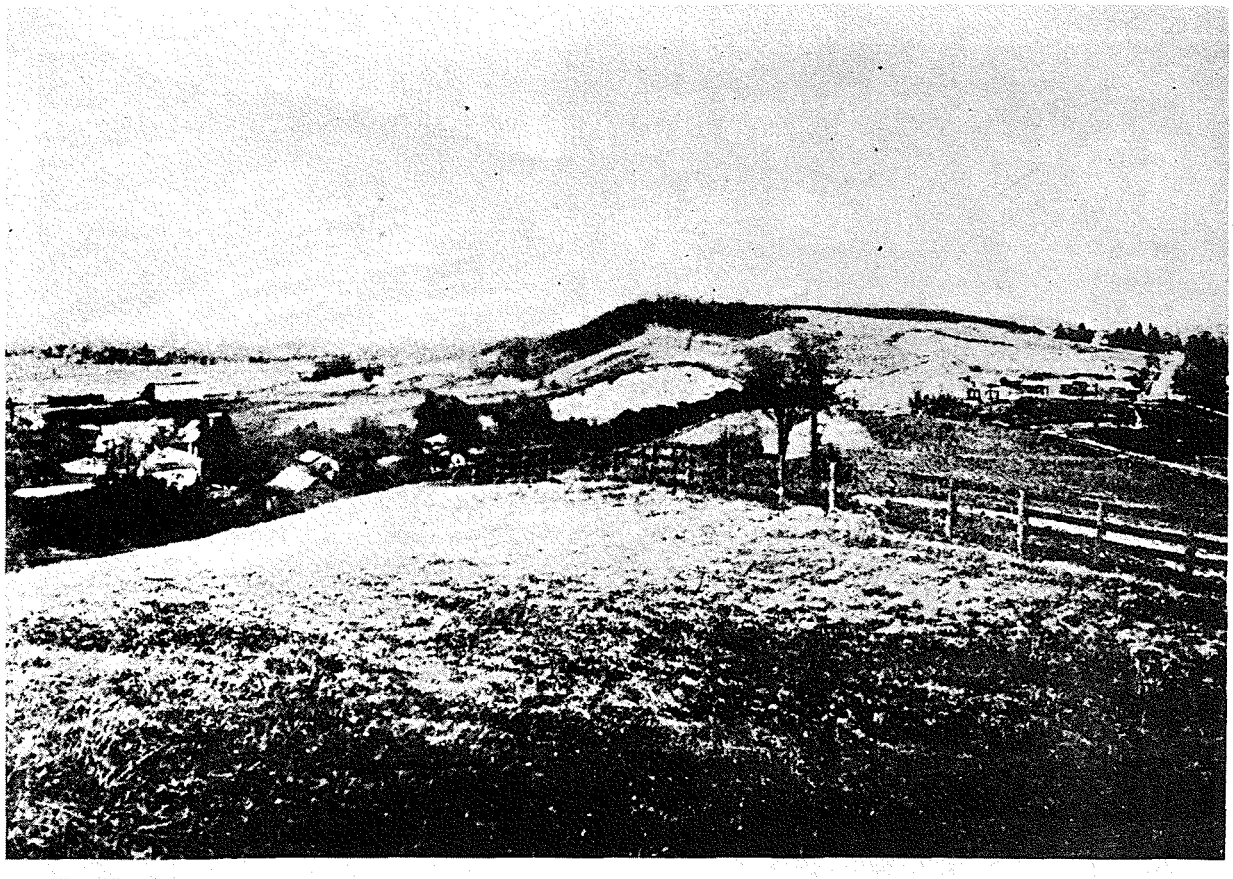

Plate III

Cobbs Hill. Looking east from Klinck Knoll on Pinnacle Hill in 1895. (Fairchild, 1923).

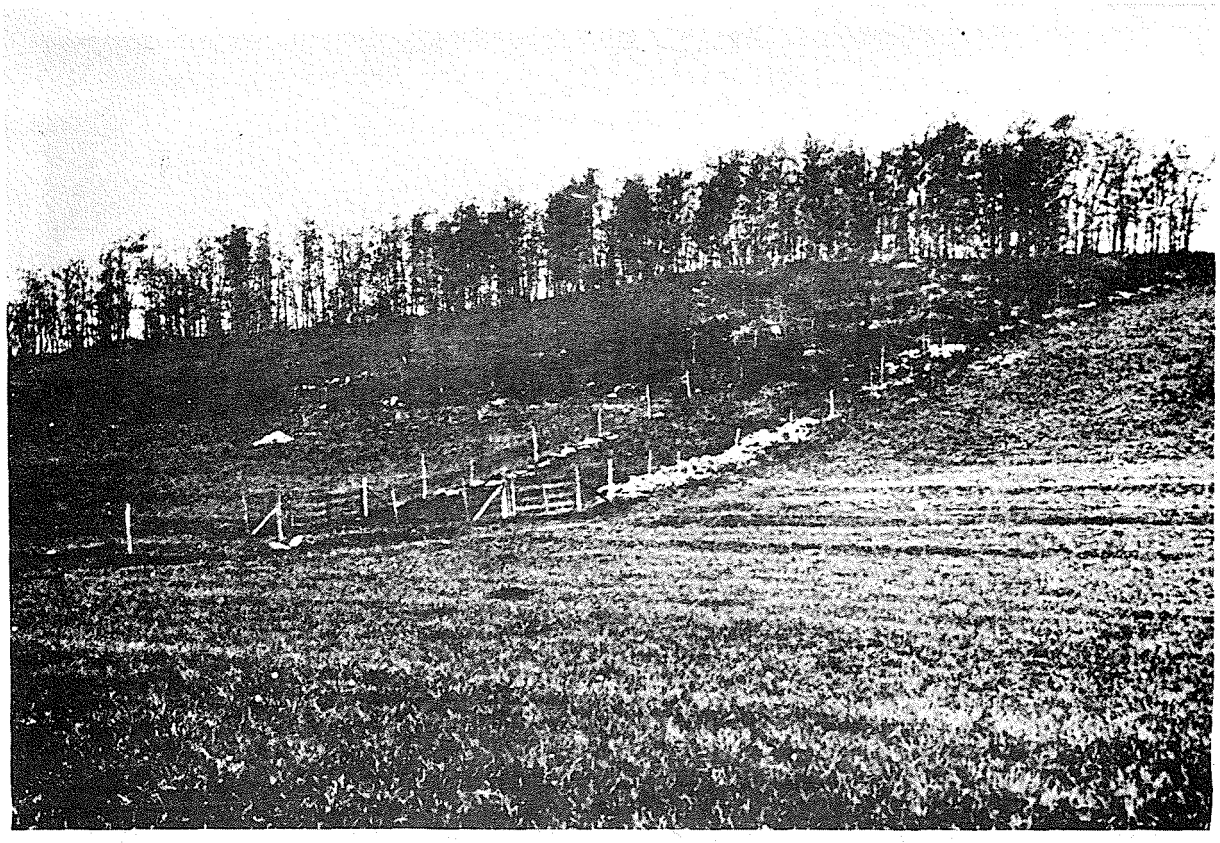

Plate IV

Cobbs Hill. Looking northwest from south ridge in 1903. (Fairchild, 1923).

Plate V

Section at South Clinton Street. View of west slope of the Pinnacle looking west, in 1895. (Fairchild, 1923).

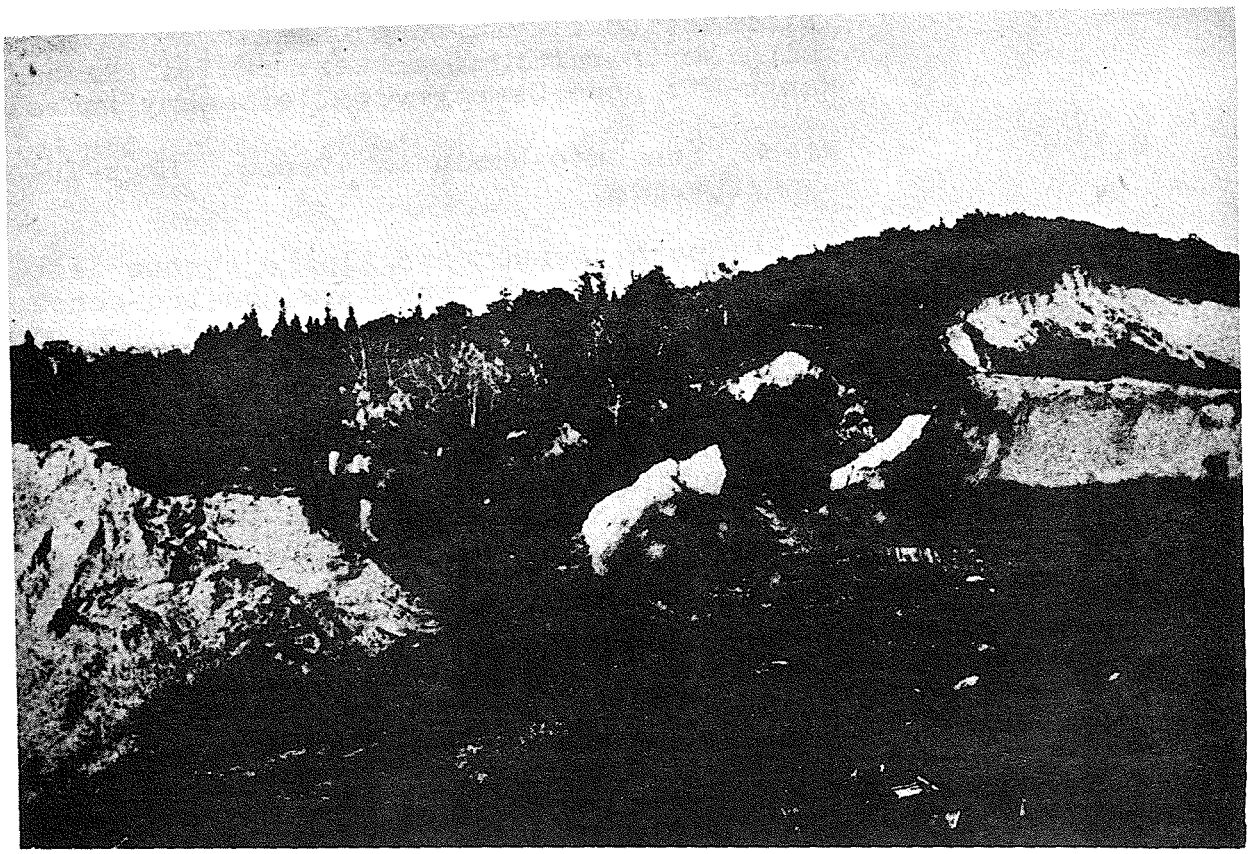

Plate VI

Section at South Clinton Street. View looking north of east toward the Pinnacle, in 1894. (Fairchild, 1923).

TRIP LOG

Miles-Cumulative	
-0-	Intersection of Mt. Hope and Elmwood Avenues going North rising over west end of Pinnacle Range-Mt. Hope Cemetery on left-many kames.
0.7	Right turn onto Robinson Avenue. Eggs-in-a-basket kames.
1.0	Cross South Avenue onto Alpine Avenue left then right through park more non-ice-contact kames.
1.5	Right turn on South Goodman Street.
1.7	Left turn on Highlnad Avenue. Driving along sub-lacustrine outwash slope.
2.2	Cross Clinton Avenue South pit on left.
2.4	Stop bus just before Winslow Avenue. Kame appears to ice-contact on north outwash slope.
3.0	Light at intersection of Highland Avenue and Monroe Avenue.
3.1	Cross on Highland Avenue. Take left fork up Cobbs Hill, circle Reservoir overlooking Rochester till plain to north and Lake Dana basin to south (if clear, may see Bristol Hill-south shore of Lake Dana) Pinnacle Hill high point to west with T.V. towers.
4.0	Back down to Highland Avenue. West to intersection of Monroe and Highland Avenues.
4.1	Take sharp left going southwest Monroe Ave.
5.0	Cross Winton Road.
5.9	Cross Westfall Road.

Trip Log — Page Two

6.4	Right turn going south on North Clover Street (Rt. 65S).
7.1	Cross French Road.
7.7	Cross Barge canal.
8.0	Cross Jefferson Road west to Clover Street outh (still going south) climbing up Salina Group.
8.7	Cross Stone Road-notice swell and swale topography-both sides.
9.3	Cross Calkins Road.
9.7	Notice Drumlins on both sides of road.
11.1	Cross thruway. Notice collection off erratics on house below on right.
11.4	Stop #1. Clover Sand & Gravel Co. Large cut in esker cone showing torrential bedding.
12.1	Left turn into second park entrance, Hopkins Point Road. Pull off to right, get out of bus for walk on esker. Stop #2, bus will pick us up at base of Devil's Bathtub parking lot on Pond Road. BUS: (circle around to left, left on Canfield Road, left on Clover Street, left at third entrance to park-Pond Road-stop at bottom of Devil's Bathtub parking lot.)
15.5	Continue SE on Pond Road-west on Pond Road; north on Douglas Road-pull off to right by telephone booth.
17.0	Stop #3. Look at eggs-in-a-basket kames (non-ice-contact) and edge of kettle with sharp break in slope-(ice-contact). Get back on bus. Continue north on Douglas Road.
17.7	Cross Canfield Road.

Trip Log — Page Three

18.1	Stop #4. Stop at entrance to Shafer's Pit in large-till-capped? kame, probably draped over drumlin. Get back on bus.
18.7	BUS: Proceed north to turn-around. Pick us up at entrance.
19.0	South on Wilmarth Road to Canfield Road, turn left on Canfield Road.
19.7	Turn right (south) on Mendon Center Road.
20.4	Stop #5. Pull off to right for walk on esker segment in east side of park. Get back on bus.
	Proceed south to entrance of Spezio's pit in kames east of Mendon Center Road, north of Pond Road.
21.1	Stop #6. View of dissected ice-contact kames.
21.3	Cross Pond Road going south. Proceed south on Mendon Center Road.
21.8	Left turn on Bulls Sawmill Road.
22.0	Cross Rush-Mendon Road (Route 251).
22.9	Stop #7-Optional. Right turn in Russo's pit. Look at catastrophic bedding overlying pre-glacial Genesee River (?), truncated by ice-marginal drainage channel of Lake Warren II, get on bus for trip back to motel.
±25 miles	Left on Bulls Sawmill Road.
	Left on Route 251 going west.
	Right on Route 15 going north back to motel.
TOTAL:	± 50 miles-END OF TRIP.

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