LEXINGTON AND THE ICE AGE

A FIELD GUIDE

BY ARTHUR J. LATHAM
AND WINSTON YELLAND

PURPOSE AND SCOPE OF THE FIELD GUIDE

This field guide is an additional resource to Dr. Robert Shrock's publication, "The Last Billion Years Of The Geological History Of The Town Of Lexington." The purpose of this guide is to give interested citizens and school students an expanded view of Lexington's ice age history by examination of geological evidence found in the local area. The resources developed for the guide were designed to help the reader achieve this goal. The source materials in addition to the text include pictures, illustrations*, maps, and a site list of glacial features. Interested readers are encouraged to visit these listed glacial features for their own verification of Lexington's ice age evidence.

ATTENTION The authors urge users of this guide to show respect and consideration to property owners when visiting some of the field sites that are located on private property. View those particular glacial features that are located on private property from a distance or ask permission of the site owner before making a closer examination.

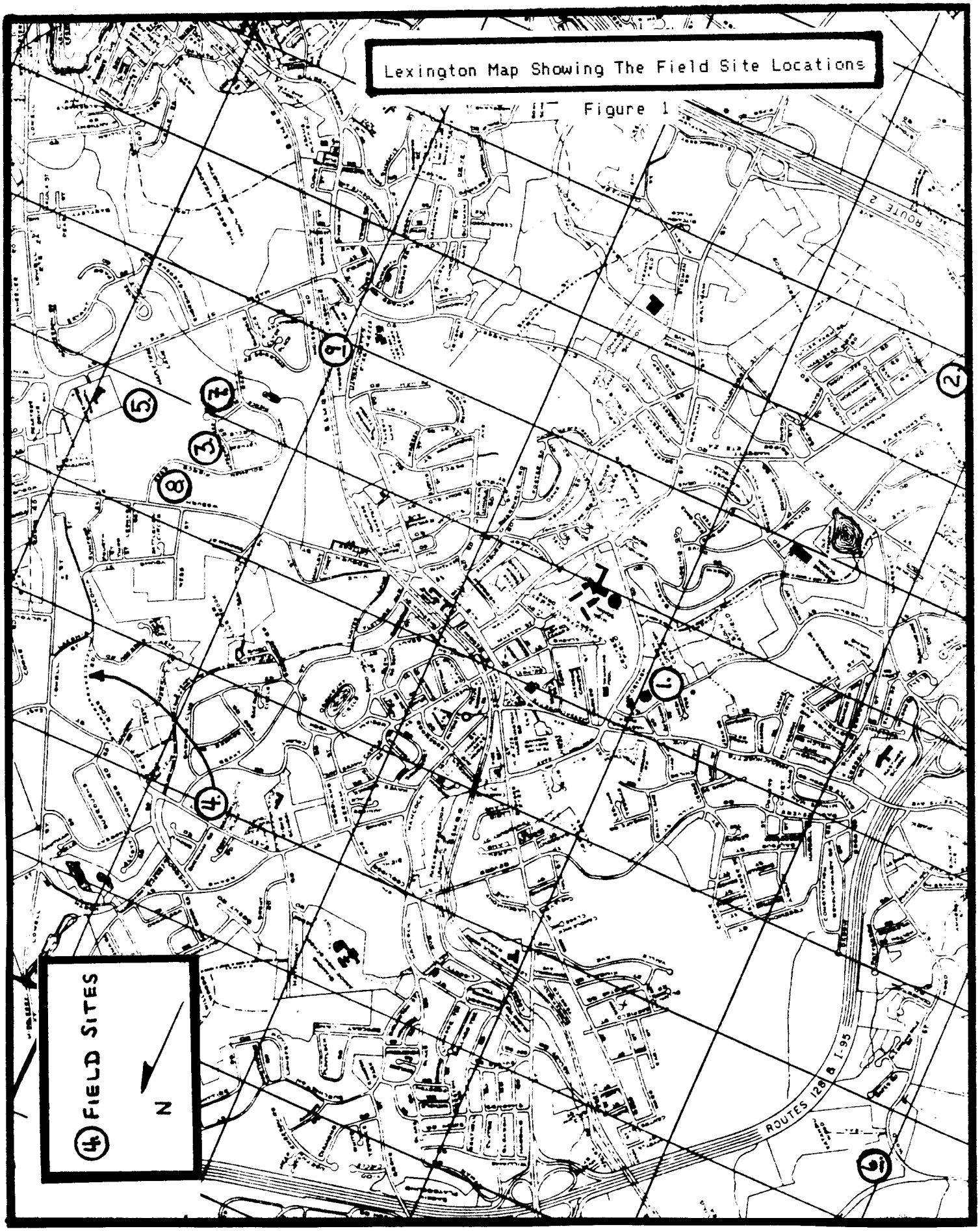
This guide is not a complete or detailed study of the glacial history in Lexington. It is rather a general overview of how the Lexington landscape may have appeared and changed at several stages during the final advance and retreat of the continental glaciers some 10,000 years ago.

Evidence for the ice age in this guide was chosen after conducting field observations and researching several geological publications which describe ice age history near and within the town of Lexington. These sources are cited in the reference section. In many instances it was necessary to dig below the earth's surface at the field locations to substantiate evidence of specific glacial deposits. The approximate boundary limits for the study area include Route 128 (95) to the north and west, Route 2 to the south, and Lowell Road in Lexington to the east. A separate town map of the study area (Figure 1, Page 2) is included in the guide designating all the photo locations.

BRIEF OVERVIEW OF THE GLACIAL RETREAT IN LEXINGTON

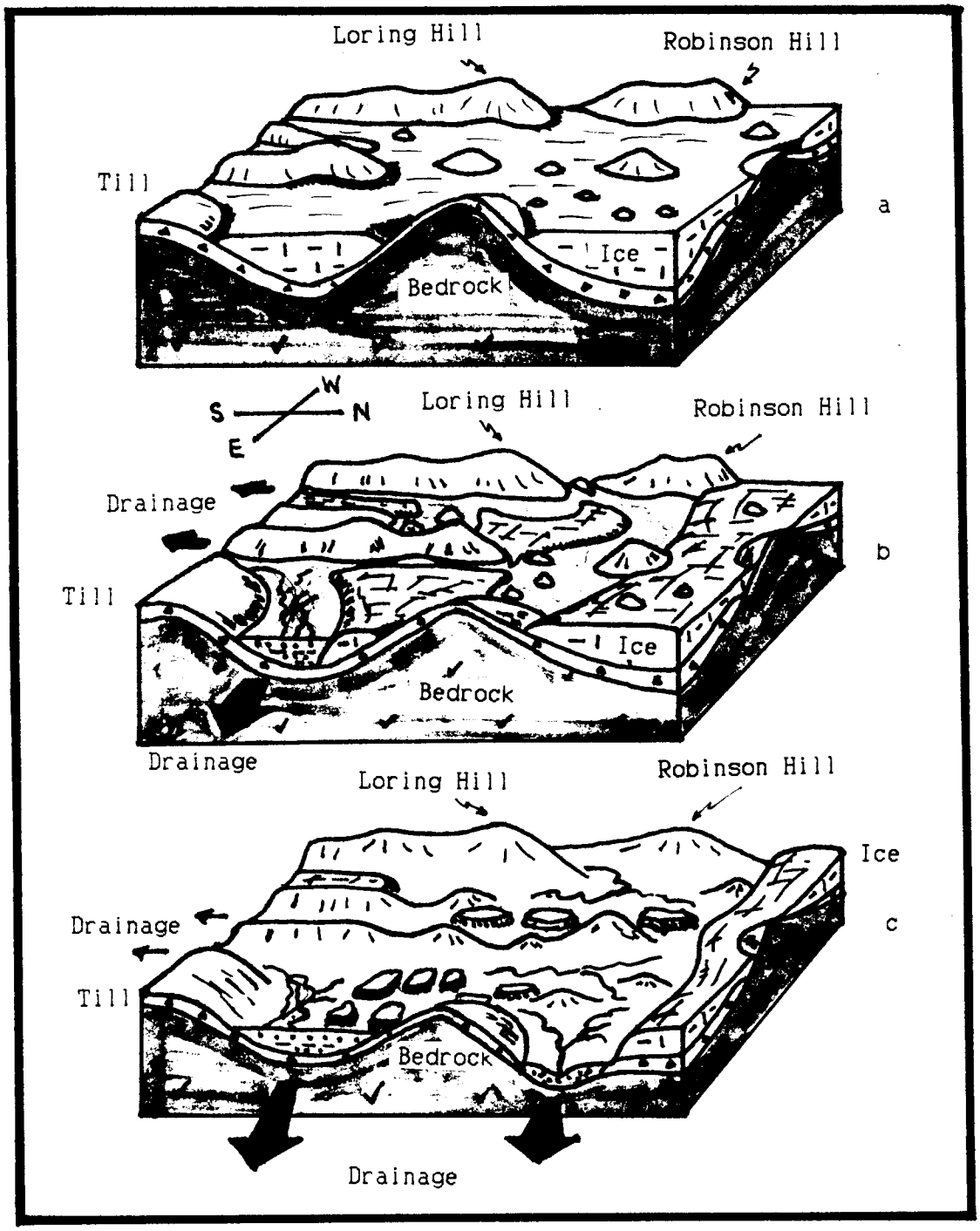
Geologists believe that during the last glacial retreat the bedrock hills of Lexington protruded through stagnant ice blocks which were separated from the receding ice sheet. As time passed and melting progressed, the shrinking ice blocks remained in the Lexington lowland areas. The series of block diagrams prepared for the guide (Figures 2a,b, and c, page 4) represent one possible view of the Lexington landscape emerging from melting ice to its present day appearance.

*The cover drawing for this guide was designed by Lexington High School student David Berger, Class of 1992.


Lexington Map Showing The Field Site Locations
Figure 1
(4) FIELD SITES
N
ROUTES 128 & I-95
ROUTE 2

MAP & SITE KEY

SITE	FIGURE	PAGE	LOCATION	FEATURE
1	3	5	Lincoln Street near Hayden parking lot	glacially grooved, scratched and polished bedrock (striations)
2	4	6	off Spring St Raytheon parking lot	glacial till overlies bedrock
2	5	7	"	closeup of contact between till and bedrock
2	6	7	"	closeup of glacial till
2	10	10	"	glacial erratic resting on till
3	7	8	45 Solomon Pierce Rd	layered and sorted channel fill
3	8	9	"	suggested sequence of glacial deposition in Pheasant Run area
3	9	9	"	map of Pheasant Run area
4	none	8(text)	Ridge Rd	channel fill (esker?)
5	none	8(text)	wooded area behind Harrington	sandy glacial outwash
6	none	10(text)	corner of Wood and Hartwell	glacial erratic
7	11	10	Solomon Pierce	glacial erratic
8	12,13	11	Solomon Pierce	kettle hole lake
9	14	12	Tower Park off Mass Ave.	suggested development of knob & kettle topography
Lexington	2	4	Lexington	suggested overview of glacial meltback in Lexington



Possible Appearance Of An Emerging Lexington Landscape At The End Of The Ice Age

Figure 2

EVIDENCE FOR THE ICE AGE IN LEXINGTON

Scratched and Grooved Bedrock

During the glacier's advance from the north, great amounts of earth materials (fine broken pieces of rock to large boulders) were picked up and dragged along the bottom of the moving ice sheet which may have been more than a mile thick. The results of this glacial advance in evidence today are smooth rounded hills and scratched bedrock surfaces. An example of scratched and grooved bedrock is shown in the photo below (Figure 3). The edge of this outcrop, to the right and just outside the photo view, drops steeply and exhibits a broken, jagged surface. This indicates that the ice moved over the area from left to right and plucked out rock fragments on the steep side of the rock exposure. A bedrock area sculptured by glacial action in this fashion is called a roche moutonnée. The picture was taken at the large bedrock exposure located near the Hayden Recreation Center.

Figure 3

Glacial Till

In addition to the rock debris gathered at the bottom of a glacier a variety of rock fragments collect on the surface of the ice. As the ice advances some of these collected materials move below the surface and are incorporated throughout the glacier. When a glacial advance ceases the ice melts and releases its wide assortment of broken earth materials. These deposits, dropped in place by the melting ice, appear in a variety of shapes and sizes, from tiny fragments to large pieces of broken angular rock; the distribution of particles is jumbled and unordered. Such material is called glacial till. Since buildings, pavements, trees, and other vegetation cover most of the Lexington landscape, good inspection sites of glacial deposits are not always available. An exception is an exposed area of till located at the Raytheon parking lot on Spring Street. Here, a large exposure of bedrock and glacial till are found to be in contact with each other. An overall view of this area is shown in the photo below (Figure 4). Figure 5 (Page 7) represents a direct view facing the exposure. This picture clearly shows the boundary between the weathered bedrock (to the left) and the glacial till (to the right). Figure 6 (Page 7) is a close up of the till which shows various shapes and sizes of rock material in a jumbled arrangement.

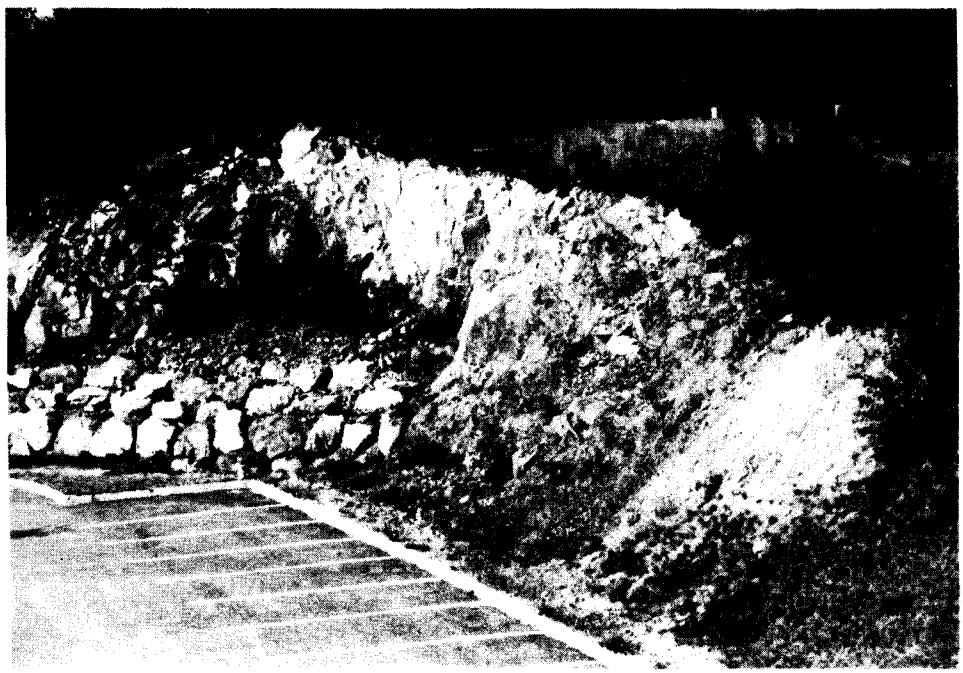


Figure 4

Figure 5

Closeup Of Glacial Till

Figure 6

Glacial Outwash

Broken rock materials are also released from glaciers by running water. As the ice melts and the glacier front retreats, flowing water rushes over the glacial surface. Running water penetrates the glacier at all levels and streams move over earth surfaces below the ice. These streams, called meltwater, collect and transport rock particles which are deposited in areas below and away from the retreating ice. Sediments transported and deposited by glacial streams are called outwash. Outwash material like till exhibit a wide particle range; unlike till, outwash particles are rounded and distributed in orderly arranged layers. Exposed areas of glacial outwash within the limits of this field guide are not easily found. Figure 7, shown below, is an outstanding example of very large and coarse outwash deposits. This picture was taken near the excavation of a house foundation located at the Pheasant Run housing development. Most of the outwash shown is no longer available for inspection since it was used to refill the excavation area. Site locations, within the study area, showing the distribution of only sand size outwash particles are difficult to visit. Small areas of sand outwash may be found by crossing the open field behind Harrington School. A narrow path at the western edge of the field passes through a wooded area and leads to the outwash deposits. Another example of outwash (an assortment of coarse to fine sized particles) may be observed at Ridge Road. This very narrow dirt road, a bridge of glacial deposits, connects East St. to Laconia St. In order to make a distinction between till and outwash compare the deposits shown in Figures 6 and 7.

Figure 7

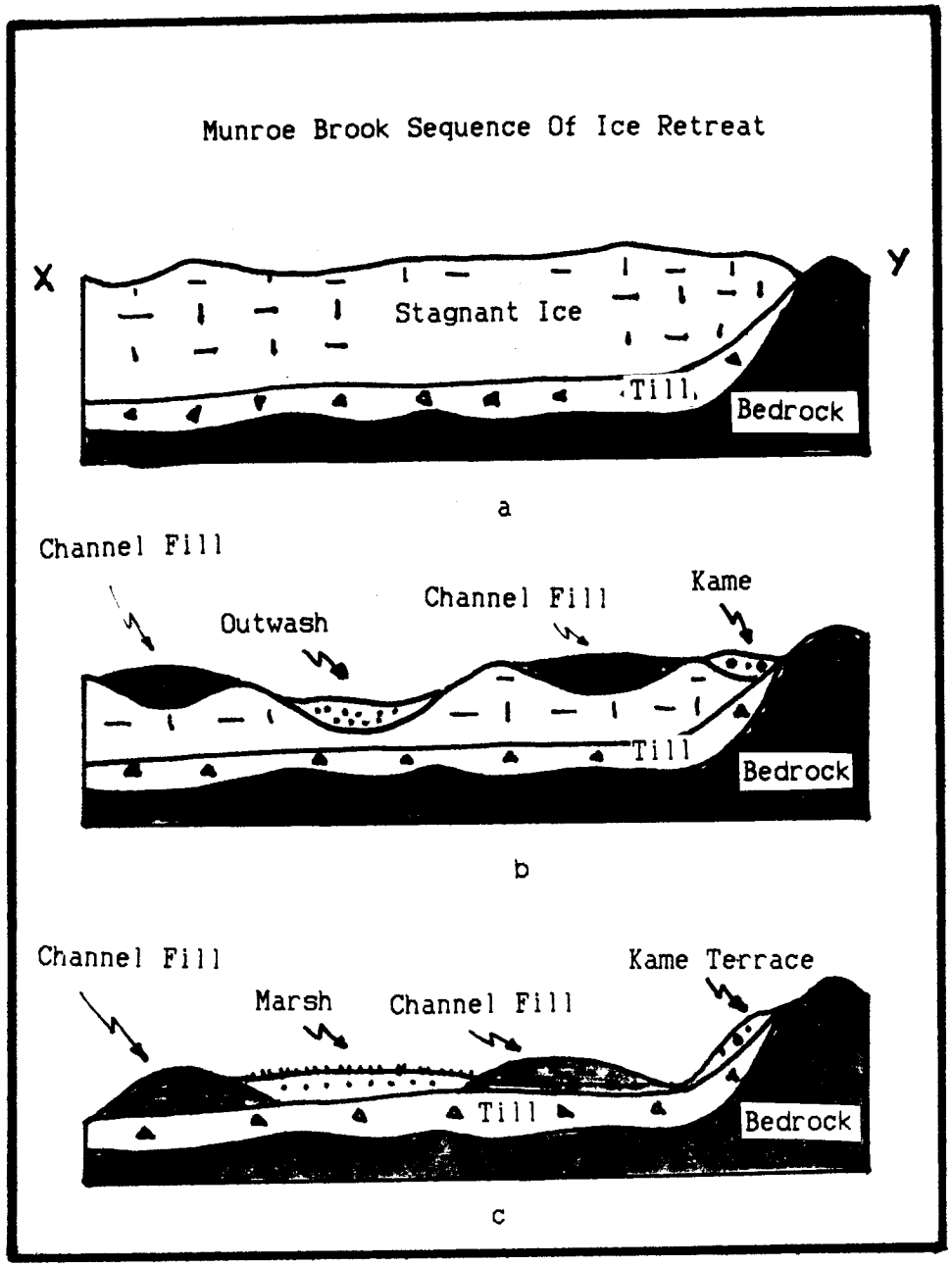


Figure 8

The drawings shown on this page, Figures 8a, b, and c are included to provide the reader with a schematic view of glacial till and outwash placement at the Pheasant Run housing development. This profile or cross-section shows the relative position of glacial deposits as they might appear above and below the ground surface from Lothrop Circle to Clyde Place. Clyde Place, south of Lothrop Circle, is located just outside the Pheasant Run development. The profile orientation, designated by an X-----Y line, is shown on the map (Figure 9) below.

Figure 9

Glacial Erratics

Today a number of large boulders scattered throughout Lexington may be found in fields, wooded areas, and other places where people have not disturbed the landscape. These boulders, collected by the ice during a glacial advance, were transported and deposited at their present position when the ice melted; these particular boulders which are usually different from the underlying bedrock are called erratics. Figure 10 shows a glacial erratic as seen from the Raytheon parking lot on Spring Street, the same location area for Figures 4, 5, and 6. The boulder in place on the grass has a different composition from the bedrock material just below the surface. The glacial erratic shown in Figure 11 is located between 2 houses (street addresses, numbers 3 and 5) on Solomon Pierce Road. Another outstanding erratic may be seen at the corner of Wood Street and Hartwell Avenue. The large boulder in front of the Hayden Recreation Center was not transported to Lexington by glacial ice; it was carried by truck from New Hampshire!!

Figure 10

Figure 11

Kettle Holes and Kettle Hole Lakes

The numerous swampy depressions often found in the wooded areas of Lexington are former locations of large ice blocks. These chunks of ice, separated from the receding glacier, were embedded in glacial deposits left behind by the retreating ice. In some instances these ice blocks were completely buried under sediments transported by meltwater rushing from the receding ice front. When the buried ice blocks melted, bowl shaped depressions or kettle hole landforms resulted. Figures 12a and 12b show the development of typical kettle or kettle hole.

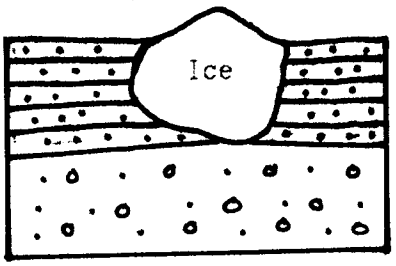


Figure 12a

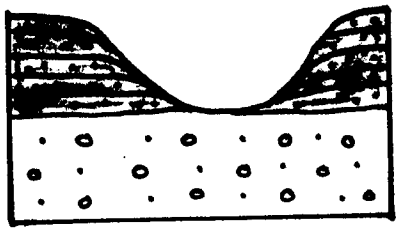


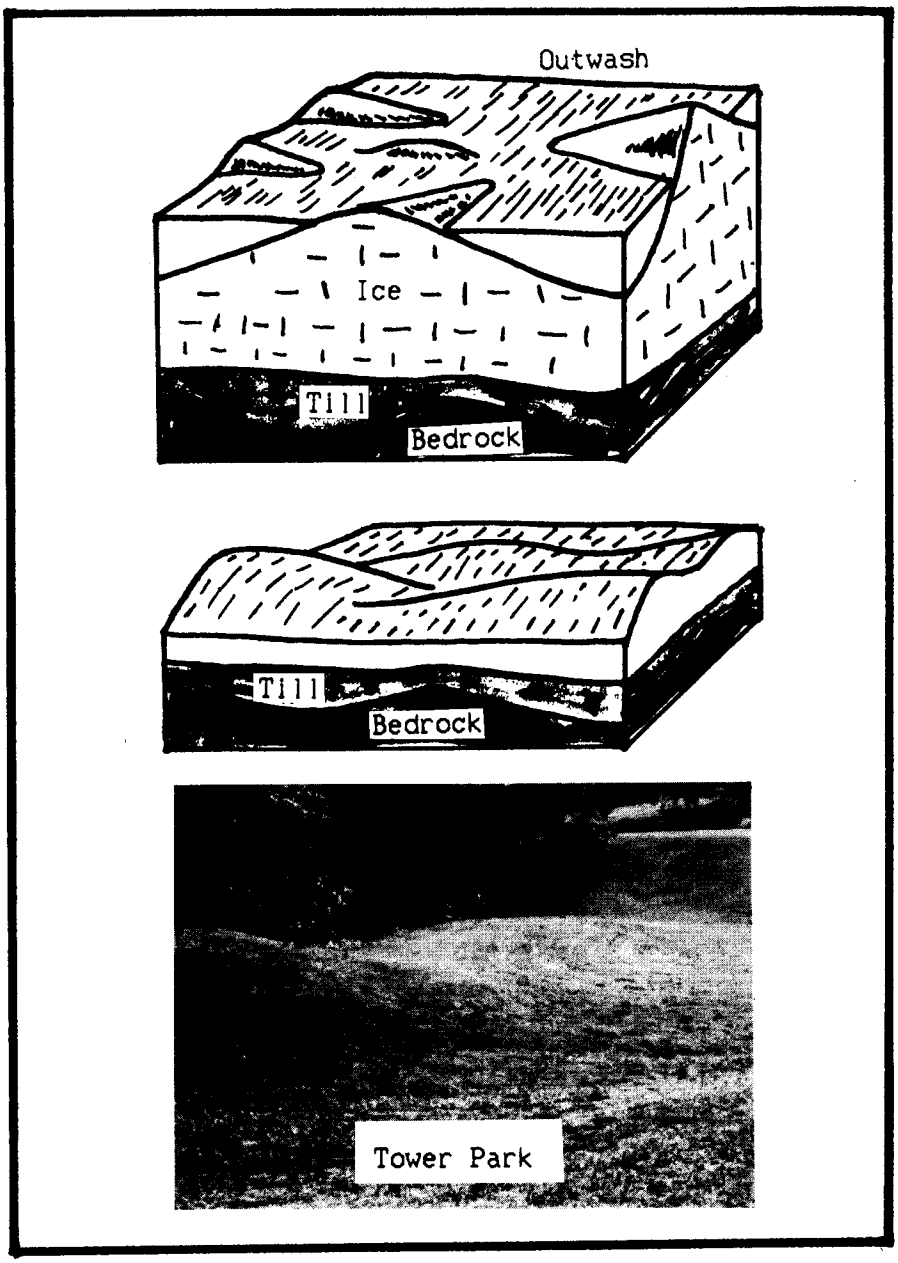
Figure 12b

Most of the undisturbed Lexington kettle holes are located in areas covered by woods and underbrush; these places are difficult to photograph. The small pond shown in Figure 13 is at the head of Munroe Brook located near Solomon Pierce Road and Woburn Street. This pond represents a kettle which was later filled with water, a kettle hole lake. Another example of a water filed kettle is the Lexington Reservoir.

Figure 13

Kettle and Knob Topography

Tower Park, shown in Figure 14c, is located east of Massachusetts Avenue and almost directly across from the Heritage Museum. Figures 14a and 14b above the photo represent a scene of probable park development after the recession of the ice front. Tower Park today shows the same gentle hills and dips which formed when ice blocks melted in buried glacial deposits some 10,000 years ago. Because of its particular appearance this landscape is called kettle and knob topography. Several paths wind through the wooded area of the park passing over this small hill and valley terrain. Since trees and brush were not cleared from this location, the glacial kettles and knobs are not as distinctive as those found in the groomed area of the park.



GEOLOGIC PERSPECTIVE

For a greater appreciation of the glacial evidence in Lexington it is necessary to examine relationships between our local geologic history and other ice age events in surrounding areas. In Lexington there are no outstanding views of glacial deposits to indicate positions of the glacier's retreating ice front. Clear evidence of the glacier's terminus exists in the Concord area east of Lexington. Here, glacial Lake Concord formed when the ice front paused several times. During each halt, a continuous flow of meltwater from the glacial front poured into a confined area causing ice dammed Lake Concord to develop and expand. This lake may have extended into the present Burlington Mall area. As the glacier continued to recede, the water from Lake Concord eventually drained into Lexington and the Burlington Mall areas. The best evidence of standing ice near the field trip study area exists at the intersection of Bedford Street and Hartwell Avenue. This is the former site of the Hartwell Delta, a glacial outwash deposit created during the development of Lake Concord. Excavation and construction activies have so changed the nature of this area that small sand deposits are the only remains of the delta. Outstanding evidence of glacial deposits at Havenville, just north of Burlington, indicate the former presence of a standing ice front: the Shawsheen River is also an ancient glacial ice front boundary location.

The ice age evidence in Lexington indicates a final glacial retreat to the north with no further ice sheet advance. In the Mystic Lakes area, to the east and south of Lexington, glacial studies suggest that a minor glacial advance occurred when the ice was melting in Lexington.

SUMMARY

The authors hope that readers of the guide who investigate the various site locations understand that scratches and grooves in bedrock represent evidence for the advance of glacial ice. Till, outwash, erratics, kettles, kettle lakes, and kettle and knob topography are all remnants of a glacial retreat. For those with a greater interest in Lexington's glacial geology, the authors suggest visits to current local construction sites and building excavation areas. At such locations observers may conduct their own glacial history investigations. The references included with this guide offer valuable information to the interested investigator.

Glossary

bedrock - any rock ledge exposed at the surface of the earth or underlying unconsolidated sediment

channel fill - sands and gravels that have been deposited in cracks or meltwater channels in and on the ice; sometimes geologists lump features like kames, kame terraces and eskers into this category

glacial erratics - large rock fragments that have been transported and deposited by a glacier; these fragments are usually seen as isolated boulders and are frequently made of material different from the bedrock

galcial outwash - sediments of various sizes (clay, sand, pebbles, cobbles) that have been deposited by streams flowing from the melting glacier; outwash may show evidence of sorting and layering

glacial till - non sorted, non layered, subangular sediment of all sizes carried and deposited by a glacier

meltwater - waters made by the melting of glaciers; these waters carry sediments through and away from the glacier or are temporarily trapped between topographic high points and the ice front to make proglacial lakes

kettle hole - a depression left upon the melting of a block of ice embedded in unconsolidated sediments

kettle hole lake - a kettle hole that has filled with water

kame - a hill or irregular knob or ridge of partly sorted material deposited by streams next to a glacier

kame terrace - a terrace-like ridge deposited by a stream between a glacier and a valley wall

roche moutonnée - a sheepback rock; bedrock so sculptured by a large glacier as to have its long axis parallel to ice movement, its upstream side smoothed and striated and its lee side steepened by plucking

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