

State of Illinois
Department of Registration and Education
STATE GEOLOGICAL SURVEY DIVISION
Morris M. Leighton, Chief

GEOLOGICAL SCIENCE FIELD TRIP
GUIDE LEAFLET
BLOOMINGTON-NORMAL AREA

MCLEAN COUNTY:

DANVERS, NORMAL, LE ROY, AND MCLEAN QUADRANGLE



Leader
George E. Ekblaw

Urbana, Illinois
April 24, 1954

Bloomington-Normal Area

Itinerary

<u>Mileage</u>	
<u>Interval</u>	<u>Total</u>
	0.0
	Assemble at central parking area, Illinois Wesleyan University.
	Leave parking area, headed north. Turn left (west) on East Emerson St.
0.1	0.1
	North East St. Turn right (north).
0.1	0.2
	East Kelsey St. Turn left.
0.1	0.3
	Stop. North Main St., U. S. Highway No. 51. Turn right (north).
0.6	0.9
	Railroad underpass with traffic light just beyond, at Hovey Avenue. Turn left (west).
0.3	1.2
	Stop. Adelaide St. Straight ahead.
0.3	1.5
	Gravel pits to left (south), in valley-train of glacial outwash along Sugar Creek.
0.6	2.1
	STOP 1. Weathering profile on Bloomington glacial drift exposed along north side of road.

Like many other things, rocks and minerals suffer changes when they are exposed to the weather. Although these changes are relatively slow, they become evident in earth deposits that are not disturbed over long periods of time and develop what is known as a weathering or soil profile in the surficial part of such deposits.

Following the practice established about 30 years ago by the Russian Glinka, soil scientists usually consider that the soil or weathering profile consists of 3 zones, designated A, B, and C from top down. The A zone is the "soil" zone, which is normally black or gray in color. The B zone is the "subsoil" zone, and the C zone is the unaltered parent material.

The zonal effect results from the fact that the four principal processes which effect soil weathering all progress with the downward movement of groundwater but at different rates. These processes, listed in order according to their rate of progress, beginning with the most rapid, are (1) oxidation, (2) leaching of carbonates, (3) decomposition of more resistant minerals, and (4) accumulation of humus.

Consequently, in the A zone, in which the humus material derived from decaying plants has accumulated, the rock minerals are oxidized, leached, and decomposed. In the upper part of the B zone they are oxidized and leached and in the lower part of the B zone they are only oxidized. The oxidation zone is shown by the reddish or yellowish color resulting from the oxidation of iron minerals. The leached zone is determined by the absence of carbonates, as revealed by tests with a solution of hydrochloric acid.

At this stop the soil profile is developed partly on loess and partly on glacial till that includes small deposits of sandy gravel.

- 0.2 2.3 Turn right (north) on T-road.
- 0.5 2.8 Stop. Road intersection. Straight ahead.
- 0.8 3.6 Outer edge of Normal moraine.
- 2.3 5.9 STOP 2. Crest of Normal moraine.

Tens and hundreds of thousands of years ago most of Illinois, together with most of northern North America, was covered by huge ice-sheets or glaciers. These glaciers expanded from centers in what is now eastern Canada. They developed when, for some reasons not yet determined, the mean annual temperatures in the region were somewhat lower than now, so that not all of the snow that fell during the winters was melted during the summers. The snow residues accumulated year after year until they became a sheet of ice so thick that as a result of its weight the lowermost part began to flow outward, carrying with it the soil and rocks on which it rested and over which it moved. The process continued until the glacier extended into our country as far south as the Missouri and Ohio Rivers.

At this time the temperatures moderated. The meeting of the ice first balanced its accumulation and expansion, so that its margin remained stationary. Later the melting exceeded the accumulation and expansion, and the ice front gradually melted back until the glacier disappeared entirely.

As the glacier melted, all of the soil and rocks which it had picked up as it advanced were released. Some of this material or drift was deposited in place as the ice melted. Such material consists of a thorough mixture of all kinds and sizes of rocks and is known as till. Some of the glacial drift was washed out with the melt-waters. The coarsest outwash material was deposited nearest the ice-front and finer material farther away. The finest clay may have been carried all the way to the ocean. Where the

outwash material was spread widely in front of the glacier it forms an outwash-plain; where it was restricted to the river valleys, it forms what are called valley-trains.

Some sand and gravel was also deposited at the edge of or actually within the glacier by streams of melt-water flowing on, in, or under the glacier. Deposits along the courses of such streams now appear as ridges of gravel and are known as eskers. Deposits made where such streams emerged at the edge of the glacier or emptied into holes in the glacier now appear as more or less conical hills of gravel and are known as kames.

At times, especially in the winters, when the outwash-plains and valley-trains were exposed as the melt-waters subsided, the wind picked up silt and fine sand from their surfaces, blew it across the country, and dropped it to form deposits of what is known as loess. Glacial loess mantles most of Illinois. Near the large river valleys it may be as much as 60 or 80 feet thick. Far from the valleys it may be measured only in inches, if it can be identified at all.

It is now commonly known that there were four major periods of glaciation during the Pleistocene or Great Ice age (see accompanying table) and that between each period there was a long interglacial period in which conditions were as they are to-day. It is also commonly known that during each major glaciation there were a number of retreats and readvances. This was particularly true during the last or Wisconsinan glacial stage.

The position of the ice-front at each advance is marked by a ridge of till or moraine. The moraine represents the accumulation of drift at the ice-margin while the advance and melting were essentially in balance, when more and more material was being brought to the edge by the advancing ice. When melting exceeded advance, so that the ice-front retreated, the resulting drift deposits form a drift-plain or till-plain, whose surface may be almost level or more or less billowy.

This stop is on the top of the Normal moraine, one of the moraines of Wisconsinan age. To the southwest another moraine, the Bloomington, can be seen and between them is the Bloomington drift-plain. To the northeast is a third moraine, the Cropsey, and between it and the Normal moraine lies the Normal drift-plain. As shown on the accompanying map of moraines in northeastern Illinois, these are only three of several of Wisconsinan age.

The surface relief of moraines is generally greater than that of the drift-plains. It is generally referred to as swell-and-swale, but on some moraines it is termed

knob-and-kettle topography. Generally the outer slope and edge of the moraines is interrupted by valleys and re-entrant angles marking the courses of glacial rivers. At some places there are gaps in the moraines where subglacial streams presumably carried away most of the drift. Subglacial valleys may be distinguished from valleys developed by erosion in postglacial time by the fact that morainic topography occurs all the way down to valley slopes.

- 0.5 6.4 Road intersection. Turn left (west).
- 0.5 6.9 Sharp jog right and left.
- 0.6 7.5 Road intersection. Sharp jog right and left. Continue west.
- 0.5 8.0 Crest of Normal moraine. Good view to southwest.
- 1.5 9.5 T-road intersection. Turn right (north).
- 0.5 10.0 T-road intersection. Turn left (west). Good view southwesterly across Bloomington drift-plain to Bloomington moraine.
- 0.4 10.4 Stop. U. S. Highway No. 150. Straight ahead on gravel road.
- 0.6 11.0 Outer edge of Normal moraine. Bloomington drift-plain ahead.
- 0.7 11.7 Railway crossing. CAUTION.
- 3.2 14.9 STOP 3. Loess deposit.

At this locality the loess at and near the top of the hill is 8 feet and more thick, so that in contrast with STOP 1 it is not entirely leached, and at a few restricted places calcareous loess may be found at the base. The calcareous loess lies on calcareous till, showing that there was no weathering interval between their depositions.

- 0.1 15.0 Stop. Paved road. Straight ahead.
- 3.6 18.6 Turn right (north).
- 0.8 19.4 Note "badland" erosion on hillsides.
- 0.2 19.6 Turn left (west).
- 0.3 19.9 Turn right (north).
- 0.4 20.3 STOP 4. Park along road north of bridge. Exposure along south side of Rock Creek east of bridge.

Succession:

	Thickness	
	Ft.	<u>In.</u>
Wisconsinan		
Till, calcareous, brownish-pink	20+	
Iowan		
Loess, calcareous, bluish gray, with iron-stained streaks and mottling	2	
Farmdalian		
Loess, noncalcareous to slightly calcareous in places, brownish gray to yellowish gray; iron-stained joints; contains humus streaks and layers; wood fragments at top.	5	
Silt, noncalcareous, dark brown, peaty		10
Silt, noncalcareous, dark gray, carbonateous	2	
Sangamonian (on Illinoian)		
Soil, noncalcareous, dark brown, friable (Horizon 1)	1	6
Gumbotil, noncalcareous, dark gray, plastic tough; blocky fracture; (Horizon 2)	4	
Till, noncalcareous, yellow (Horizon 3)	7	

As listed above, this exposure reveals a succession of glacial deposits beneath more than 20 feet of till of Wisconsinan age, of which at least the lower part should be Shelbyville. First, there is a 2-foot layer of gray calcareous loess that is correlated as of Iowan age. This loess was derived by the wind from outwash deposited in Illinois River valley either from the Iowan glacier in Iowa or from the advancing Shelbyville glacier in Illinois.

Beneath the Iowan loess there is about 8 feet of loess and silt of Farmdalian age. It is distinguished from the Iowan loess by its darker and brownish color, by the fact that it is partly leached, and by the abundance of humus, peaty material, and wood fragments. The Farmdale loess and silt are derived from or related to outwash deposited in Illinois River valley by a glacier of Wisconsinan age earlier than either the Iowan or Shelbyville glacier.

The mild leaching of the Farmdale deposits shows that there was a brief period of weathering between the Farmdale and Iowan-Shelbyville glaciations. This in turn is evidence that between these glaciations there was an interstadial period of significant duration in which the Farmdale glacier must have receded far if it did not entirely disappear before the Iowan and Shelbyville glaciers advanced.

Below the Farmdalian deposits there is about 12 feet of Illinoian till greatly weathered during the succeeding Sangamon interglacial stage. Geologic studies of the soil profiles developed on the older drifts - Illinoian, Kansan, and Nebraskan - reveal that they can be divided into 5 zones, or horizons, instead of the 3 first recognized by Glinka in the soil profile developed on the Wisconsinan drift. In order to avoid confusion they have been designated by numbers instead of by letters.

Horizon 1 is the old "soil" or humus zone. Horizon 2 is a dense layer, very gummy and plastic when wet, very hard when dry. Horizon 3 is the leached and oxidized zone, and Horizon 4 is the oxidized but calcareous zone. Horizon 5 is the unaltered parent material.

The development of 5 instead of 3 recognizable zones in the old drifts results from the fact that they are much more weathered. The total thickness of the weathering on the old drifts is much greater than on the Wisconsinan drift, even where they are overlain by younger drifts. Oxidation, leaching, and decomposition of minerals have all progressed deeper. In addition, another process, the downward transfer of clay minerals derived from the decomposition of other minerals originally in the drifts, has not only left Horizon 1 more silty than it was originally but has made Horizon 2 much denser and more plastic than it was originally. This dense, plastic, "gumbo" horizon is so little developed on Wisconsinan drift that it is not differentiated.

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| 0.4 | 20.7 | Wisconsinan till in road cuts. |
| 0.3 | 21.0 | T-road. Turn right (east). |
| 0.2 | 21.2 | T-road. Turn left (north). |
| 1.5 | 22.7 | Turn right (east). |
| 0.4 | 23.1 | Stop. U. S. Highway No. 150. Continue east on highway. |
| 0.6 | 23.7 | Pink Bloomington till on right. |
| 0.6 | 24.3 | Railway crossing. ALERT. |
| 0.3 | 24.6 | Congerville. Slow. |
| 0.5 | 25.1 | Leave Congerville. |
| 1.2 | 26.3 | Outer edge of Normal moraine. |
| 0.8 | 27.1 | Yellowish-buff, stony Normal till along north side of road. Also good view across Shelbyville drift-plain to south. |
| 1.4 | 28.5 | Turn left (east) on gravel road (Hudson road). |

- 0.5 29.0 Crest of Normal moraine.
- 0.3 29.3 Sharp jogs left and right.
- 1.7 31.0 Inner edge of Normal moraine.
- 2.7 33.7 T-road. Turn left (north).
- 0.5 34.2 T-road. Turn right (east).
- 2.2 36.4 Stop. U. S. Highway No. 51. Turn left (north).
- 2.0 38.4 Turn right (east) on paved road to Lake Bloomington.
- 0.3 38.7 Railway crossing. CAUTION.
- 3.3 42.0 Stop. T-road. Turn left (north).
- 1.0 43.0 STOP 5. Lake Bloomington spillway. Turn around before parking. This exposure is relatively unique in that at least 4 separate drifts of Wisconsinan age may be differentiated, one above the other.

Succession:

	<u>Thickness</u>	
	Ft.	In.
Normal till, clayey, gravelly, buffish gray in upper part, reddish gray in lower third; discontinuous layer of yellow oxidized sand and silt, up to 6 inches thick about 6 feet above base	18	
Interstadial: Clay, pink to purple, laminated over clay, silty, greenish; discontinuous	4	
Bloomington till, gravelly, light gray, partly oxidized to brownish gray	6	10
Interstadial: peat and peaty silt, calcareous, fossiliferous with mollusks and wood fragments, discontinuous	6	18
LeRoy till, clayey, greenish gray	6	8
Shelbyville till, hard, jointed, purplish gray, upper 8 inches slightly leached, humus darkened, and marked by a pavement of pebbles, cobbles, and boulders, all faceted, polished, and striated on top, base not exposed	8	

The distinct breaks and the interstadial materials deposited between the tills are convincing evidence that

(1) after the deposition of each of the lower tills the glacier must have retreated a considerable distance and
(2) an appreciable interval of time elapsed before the succeeding glacier advanced over the area.

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| 0.5 | 43.5 | Turn left (east) off highway, to picnic grounds. |
| 0.2 | 43.7 | STOP 6. Lake Bloomington picnic grounds. <u>LUNCH</u> . After lunch return to public road. |
| 0.2 | 43.9 | Turn left (south). |
| 0.8 | 44.7 | Turn right (west). CAUTION. |
| 0.5 | 45.2 | T-road. Turn left (east). |
| 0.3 | 45.5 | T-road. Turn right (south). |
| 1.0 | 46.5 | T-road. Turn right (west). |
| 0.5 | 47.0 | T-road. Turn left (south). |
| 1.5 | 48.5 | Stop. County road, paved. Straight ahead. |
| 0.8 | 49.3 | Inner edge of Normal moraine. The Normal moraine here actually consists of two ridges, separated by a narrow intraglacial valley. Parts of this valley are now occupied by the upper courses of Sixmile and Money creeks, with an abandoned portion between, extending two miles westerly from Towanda. |
| 1.0 | 50.3 | Crest of inner-ridge of Normal moraine. |
| 0.6 | 50.9 | Sharp hill half a mile west (right) is a kame. |
| 0.5 | 51.4 | Intraglacial valley. |
| 0.4 | 51.8 | Inner end of subglacial valley through principal Normal moraine. The route follows this valley for a little more than half a mile. |
| 1.5 | 53.3 | Stop. U. S. Highway No. 66. Caution. Turn right (west) on highway. |
| 0.3 | 53.6 | Again crossing subglacial channel near point of drainage divide between waters flowing northward through Sixmile Creek and those flowing southward to Sugar Creek. |
| 0.2 | 53.8 | Y-junction. Bear left (easterly). |
| 0.5 | 54.3 | Overpass over railway. |
| 0.2 | 54.5 | Axis of crest of Normal moraine, but not apparent because of subglacial channel which the route here follows for nearly a mile. |

1.5	56.0	Railway crossing. CAUTION.
1.0	57.0	Caution. Traffic light. Intersection with State Highway No. 9. Straight ahead.
0.5	57.5	Outer edge of Normal moraine.
2.0	59.5	Traffic signal. Turn left (south) on U. S. 150.
0.6	60.1	Railway crossing. Caution.
1.9	62.0	Inner edge of Bloomington moraine.
2.0	64.0	Crest of Bloomington moraine.
0.4	64.4	Turn right (south) on gravel road.
0.8	65.2	Gillum. Caution. Jog left and right over unguarded railway crossing.
0.5	65.7	Outer edge of Bloomington moraine.
0.9	66.6	Kickapoo Creek. Valley-train terrace about 10 feet high is conspicuous on the southeast side of the stream.
0.3	66.9	On valley-train terrace.
0.3	67.2	Lower terrace level.
0.3	67.5	Inner edge of LeRoy moraine.
1.3	68.8	Sag between back and principal ridges of LeRoy moraine.
0.7	69.5	STOP 7. Crest of LeRoy moraine.

The LeRoy moraine is a low but broad moraine. East of here it consists of two ridges -- a relatively prominent frontal one and a less prominent, wider ridge on the back slope. West from here the back ridge increases in size and prominence. It trends northwesterly to the vicinity of Shirley, whence it trends southwesterly along the southeast side of Sugar Creek, following what was evidently a re-entrant angle in the ice-front.

A third component ridge of the moraine exists for a short distance in front of the principal ridge also west of here. It diverges from the main ridge northwest of Heyworth and reemerges with it south of McLean. (See topographic map of McLean quadrangle.)

There are several subglacial channels across the LeRoy moraine. Kickapoo Creek follows one of them.

0.7	70.2	Outer edge of LeRoy moraine.
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- 0.9 71.1 Note general level but undulatory surface of Shelbyville drift-plain which is now being traversed.
- 0.9 72.0 Stop. Turn right (west) on U.S. Highway No. 136.
- 3.6 75.6 Heyworth. Slow.
- 0.4 76.0 Railway crossing. Caution.
- 0.2 76.2 Stop. U. S. Highway No. 51. Straight ahead.
- 1.5 77.5 Turn right into field.

STOP 8. Van Horn's gravel pit.

This pit, like many others along Kickapoo Creek, exploits the glacial outwash that was deposited as a valley-train along the stream. The genesis of the deposit is revealed by the general horizontal attitude of the beds and by the size-gradation of the materials, which are not only uniformly graded at any one horizon but decrease in average size from bottom up. Sand, silt, and finally clay comprise the surficial materials.

It may be noted that the gravel occurs at three levels. The lowest level is the alluvial flood-plain of the stream. Above this is a low terrace, and then the terrace in which this pit is located 12-15 feet above the flood-plain. This terrace appears to represent the top surface of the original valley-train. Subsequent erosion by the stream has reduced parts of it to the lower levels.

What appears to be a still higher terrace level along the sides of the valley is believed to be the original slope of a subglacial channel in the Shelbyville drift. The valley of Kickapoo Creek was maintained as a subglacial channel through both the LeRoy and Bloomington moraines. Consequently it served as an escape route for the melt-waters not only from these two but also from the Normal glacier. This accounts partly for the abundant outwash deposits now in the valley. Conditions existing at the time these glaciers melted must have been another factor, as outwash from the Bloomington and Normal glaciers is abundant in all valleys that served as drains for their melt-waters.

- 0.1 77.8 Return to highway. Turn right (west).
- 0.6 78.4 Low-level terrace on left (south) side, high-level terrace on right side of highway.
- 2.0 80.4 Turn right (north) on gravel road.
- 0.2 80.6 Outer edge of extra fore-ridge of LeRoy moraine.

- 0.6 81.2 Crest of fore-ridge of LeRoy moraine.
- 1.1 82.3 Sag between fore and principal ridges of LeRoy moraine.
- 0.9 83.2 Crest of principal ridge of LeRoy moraine.
- 0.8 84.0 Sharp jog right and left.
- 0.4 84.4 Turn left (west) into lane leading to Mr. LaFayette
Funk's home.

STOP 9. Examination of Mr. Funk's collection of minerals
and rocks.

Mr. Funk's generous invitation to include this
examination on the trip is greatly appreciated.

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Time Table of Pleistocene Glaciation
 (after M. M. Leighton and H. B. Willman, 1950, J. C. Frye and H. B. Willman, 1960)

Stage	Substage	Nature of Deposits	Special features
Recent		Soil, youthful profile of weathering lake and river deposits dunes, peat	
Wisconsinan	5,000 yrs.		
	Valderan	Outwash	Glaciation in northern Illinois
	11,000 yrs.		
	Twocreekan	Peat, alluvium	Ice withdrawal, erosion
	12,500 yrs.		
	Woodfordian	Drift, loess, dunes lake deposits	Glaciation, building of many moraines as far south as Shelbyville, extensive valley trains, outwash plains, and lakes
	22,000 yrs.		
Farmdalian	Soil, silt and peat	Ice withdrawal, weathering, and erosion	
28,000 yrs.			
Altonian	50,000 to 70,000 yrs.	Drift, loess	Glaciation in northern Illinois, valley trains along major rivers, Winnebago drift
Sangamonian (3rd interglacial)		Soil, mature profile of weathering, alluvium, peat	
Illinoian (3rd Glacial)	Buffalohartan	Drift	
	Jacksonvillian	Drift	
	Paysonian (terminal)	Drift	
	Loveilandian (Pro-Illinoian)	Loess (in advance of glaciation)	
Yarmouthian (2nd interglacial)		Soil, mature profile of weathering, alluvium, peat	
Kansan (2nd glacial)		Drift Loess	
Aftonian (1st interglacial)		Soil, mature profile of weathering, alluvium, peat	
Nebraskan (1st glacial)		Drift	