GUIDE LEAFLET
GEOLOGICAL SCIENCE FIELD TRIP

YORKVILLE AREA

Kendall and La Salle Counties
Yorkville, Sandwich, Marseilles, and Morris Quadrangles

Leaders
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Urbana, Illinois
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HOST: Yorkville Community High School
Glacial History of Illinois

A knowledge of Illinois glacial history and the glacial deposits is necessary for full appreciation of many points of geologic interest in the Yorkville area. The following summary is a brief introduction to these subjects and should be read before the field trip begins.

Thousands of years ago much of northern North America was covered by huge glaciers. These glaciers, which advanced from centers in eastern and central Canada, developed when the mean annual temperatures were a few degrees lower than they are now, and the winter snows did not completely melt during the summers. After many years a sheet of ice accumulated that was so thick its weight caused it to flow outward, carrying with it the soil and rocks on which it rested and over which it moved.

The Pleistocene Epoch or "Great Ice Age" began about one million years ago and ended about five thousand years ago. During this epoch, there were four major ages of glaciation, each followed by a long interglacial age characterized by climatic conditions much as they are today.

The oldest glacial age is the Nebraskan, named after the state of Nebraska where extensive Nebraskan deposits are buried beneath the younger glacial deposits. In Illinois the Nebraskan deposits are also buried. A warm climatic interval, called the Aftonian (interglacial) Age, followed the retreat of the Nebraskan glacier.

The next glacial climate produced the Kansan glacier which left thick deposits of fine rock materials and outwash sand and gravel in Illinois when it melted away. The Kansan Age was followed by the Yarmouthian (interglacial) Age. During this age erosion carved valleys and hills, and soils were formed in the Kansan deposits.

The third glacial age, the Illinoian, is particularly important to the residents of Illinois. It covered 80 percent of the state, reaching southward to Carbondale and Harrisburg. After several thousand years, a warm age caused the Illinoian ice sheet to melt. During this warm age, the Sangamonian, the upper part of the deposits left by the glacier was weathered and soil developed, as in the preceding Yarmouthian interval. These ancient Sangamonian soils resemble present-day soils in color, texture, and depth, suggesting that the climate during interglacial times was similar to our present climate.

The last and most recent glacial age in Illinois was the Wisconsinan, which began about 70,000 years ago. The Wisconsinan comprised three major glacial advances--the Altonian, the Woodfordian, and the Valderan. Little is known about the extent of the Altonian glacier, as its deposits were overridden by later glaciers, except in northern Illinois. The Woodfordian glacier advanced southward from the Lake Michigan basin to the present sites of Shelbyville, Decatur, Charleston, and Peoria. The Valderan glacier reached its maximum extent near Milwaukee, Wisconsin, and did not enter Illinois.

When the glaciers melted, they released the rock materials they had picked up as they advanced. These materials are called "glacial drift." Some of the glacial drift was washed out with the meltwaters. The coarsest material carried by the meltwater was deposited nearest the ice front, and the finer material was carried farther away, with the finest clay possibly carried all the way to the ocean. Where the outwash material was spread widely along the front of the glacier, it formed an outwash plain. Where the outwash was restricted to the stream valleys, it formed valley train deposits.
SEQUENCE OF GLACIATIONS AND INTERGLACIAL DRAINAGE IN ILLINOIS

1. NEBRASKAN inferred glacial limit
2. AFTONIAN major drainage
3. KANSAN inferred glacial limits
4. YARMOUTHIAN major drainage

5. LIMAN glacial advance
6. MONICAN glacial advance
7. JUBILEEAN glacial advance
8. SANGAMONIAN major drainage

9. ALTONIAN glacial advance
10. WOODFORDIAN glacial advance
11. WOODFORDIAN Valparaiso ice and Kankakee Flood
12. VALDERAN drainage

(From Willman and Frye, "Pleistocene Stratigraphy of Illinois," ISGS Bull. 94, fig. 5, 1970.)
Glacial drift deposited directly by the ice is called till. It consists of a mixture of all kinds and sizes of rock fragments. As the Wisconsinan glacier retreated, the ice withdrawals and readvances created a complex sequence of till deposits in northeastern Illinois, the most outstanding of which are end moraines. More than 50 successive end moraines were formed by the Wisconsinan glacier in Illinois alone. The major ones are shown on the accompanying glacial map of northeastern Illinois.

An end moraine is an accumulation of drift at the ice margin when the rate of advance and the rate of melting of a glacier are essentially in balance. As more and more rock debris is brought to the edge of the glacier, it piles up and forms a ridge.

The surface relief of end moraines is generally greater than that of the surrounding area and is referred to as swell-and-swale or knob-and-kettle topography. At some places there are large gaps in the moraines where subglacial streams presumably carried away most of the drift. The flatter areas behind end moraines are called ground moraines or till plains.

At times, especially in the fall and winter, the meltwaters subsided, exposing the valley trains. The wind picked up silt and fine sand from their surfaces and deposited them on bluffs and uplands to form deposits of loess. Loess mantles most of Illinois. Near the large river valleys it may be as much as 60 to 80 feet thick. It thins away from the valleys.

The importance of the Pleistocene Epoch is emphasized by the rich soils formed from the glacial deposits and by the abundant deposits of sand and gravel. The state would not have these valuable resources if the glaciers had not invaded Illinois.

**Itinerary**

Assemble in the driveway west of Yorkville High School, heading west.

- **0.0 0.0** CAUTION. Enter road and turn left (south).
- **0.1 0.1** City limits of Yorkville. Continue ahead (east) on curve heading into the center of town. Cross West Street. Continue ahead (east) on Somonauk Street.
- **0.1 0.2** Turn right onto King's Street (south). Proceed along the west side of the Junior High School building.
- **0.1 0.3** Crossing Center Street.
- **0.2 0.5** River Street. Turn right (west) onto River Street. CAUTION. Cross bridge over Blackberry Creek.

On the right above the dam note the outcrop of Maquoketa Shale. The Maquoketa forms the bedrock surface in the Fox Valley from Oswego to about three miles below Yorkville.

- **0.4 0.9** Abandoned gravel pit on the right in the West Chicago Terrace.
Abandoned quarry in dolomite of the Galena Group on the left side of the road.

In the distance along the Fox River floodplain is an abandoned gravel pit.

On the right is an abandoned quarry in Galena dolomite.

Stop 1. Abandoned quarry in dolomite of the Ordovician Galena Group. Walk down lane on left about 500 feet to quarry.

The buff to gray, coarsely-crystalline dolomite exposed here is the upper part of the Ordovician Galena Group. The rock is highly fossiliferous, but dolomitization has largely destroyed the fossils. Poorly preserved specimens of gastropods, cephalopods, trilobites, and corals can be collected.

The Galena dolomite exposed here is on the downthrown block of the Sandwich Fault, a major structural feature in northern Illinois (see fig. 3 and geologic map of Illinois). A fault is a fracture in the earth's crust along which there has been relative movement of the opposing blocks. The Sandwich Fault is not a single fault, but actually consists of a zone of fractured and disturbed rocks, so it has been named the Sandwich Fault zone. Between Stops 2 and 3 the itinerary crosses this fault zone. However, the fault has no topographic expression.

The northeast block of the fault has been downthrown as much as 900 feet relative to the southwest block, thereby placing younger rocks in juxtaposition with older rocks along the fault. Here in the Yorkville area the Galena Group is in contact with the Oneota, Shakopee, and New Richmond Formations, which usually lie well below the Galena Group. Such discordance of formational contacts is an important criterion used by geologists to detect the presence of faults.

Leave quarry and return to cars.

On the right of this lane leading to the old quarry is a large expanse of grass at a sod nursery. The mucky soil contains much organic (peaty) material and is excellent for raising sod.

Stop 2. Road cut in Pleistocene glacial drift.

Two Woodfordian tills, the Farm Ridge and the Bloomington, are exposed here at Stop 2 (see glacial map). The yellow gray till at the top of the cut is the Farm Ridge, and the pink till beneath is the Bloomington. About 6 inches of sand separates the two tills, and beneath the Bloomington till is several feet of Bloomington outwash.

Notice how the Bloomington till (pink) interfingers with the underlying outwash. There are also pieces of the pink till incorporated within the upper part of the outwash. The latter fact suggests that the outwash was deposited near the front of the advancing Bloomington glacier, because if transported very far the till fragments would have been destroyed by abrasion. The outwash is cross-bedded with wedges of
Fig. 2. Time-stratigraphic subdivision of the Wisconsinan Stage in the Lake Michigan glacial lobe. Only part of the named moraines in Illinois are shown. The inferred limit of glacial ice through time is shown diagrammatically on a vertical scale in radiocarbon years. The base of the Wisconsinan is plotted at 55,000 B.P. (Before Present); however, it is judged to be at least 50,000 and perhaps as much as 70,000 B.P. Under former classification, because the Roxana silts were not then known to be older than the Farmdale, the Sangamon was considered to end at about 28,000 B.P. (After Frye and Willman, 1960)
laminations tilted in various directions, indicating that the meltwater currents were continually shifting flow directions. The differences in texture are due to variations in the velocity of the meltwater currents.

Observe the tills closely and notice how similar they are in texture. Both tills are clayey and compact, and contain many pebbles, cobbles, and boulders. The only significant difference between the lithologies of the tills is their color.

This outcrop illustrates some of the criteria that geologists use to distinguish between the various Woodfordian till sheets. Weathered zones such as soils, leached zones, and oxidized zones in tills are useful when they are present, as in the older pre-Woodfordian drift deposits. However, the Woodfordian Sub-age lasted only about 11,000 years with very short intervals between the cycles of advance and retreat (melting back) of the ice front, so that there is a general absence of leaching and even oxidation between the successive Woodfordian drift sheets. Most of the Woodfordian tills have distinctive lithologies that can be traced easily, both in the subsurface and in surface outcrops. The lithological criteria include principally color, and texture, and sometimes mineralogy. Recent research by Survey geologists has revealed that many of the tills can be distinguished by their clay mineral compositions. In the absence of distinctive lithological differences geologists use such criteria as superposition of till sheets, overriding relations at end moraine intersections, and the occurrence of loess or outwash deposits between till sheets in order to differentiate the drift units.

Most of the Woodfordian moraines are not recessional moraines as once thought, but were deposited following readvances of the glacier, rather than during halts in the melting back of the ice margin. This idea is supported by the discordant (overriding) relations of many of the end moraines, and by the occurrence of outwash between successive till sheets as seen here at Stop 2.

0.2 7.2 T-road intersection with blacktop (Whitfield Road). Turn left (south) onto Whitfield Road.

0.2 7.4 Crossing the Sandwich Fault zone. Toward the east and southeast through the break in the trees, note the upland level of the Inner Marseilles Moraine.

0.7 8.1 Note sand and gravel in the drift along the right side of the road.

0.2 8.3 T-road intersection. Turn right onto Rogers Road. Proceed up hill. On the left the clump of willow trees in front of the old homestead on the hillside marks the site of an abandoned quarry in the Oneota Dolomite. The Oneota is the oldest stratigraphic unit exposed along the itinerary. The rock is a gray to buff, coarsely crystalline cherty dolomite.

The Oneota Dolomite is exposed here along the crest of the Ashton Arch, a major anticlinal structure which parallels the strike of the Sandwich Fault zone along most of its length (see fig. 3 and geologic map of Illinois). An anticline is a fold in which the rock strata have been bent into an arch. The strata on the limbs of an anticline dip
Fig. 3. Areal Geology and Cross Section of the Yorkville Area

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The diagram illustrates the geology and cross section of the Yorkville Area. Key points include:

- **Areal Geology**
  - Sandwich Formation
  - Oneota Formation
  - New Richmond Formation
  - Shakopee Formation
  - Millington Formation
  - St. Peter Formation

- **Cross Section**
  - Galena River
  - Yorkville
  - Maquoketa
  - Lisbon

- **Geological Features**
  - Fault Zone
  - Sandwich Fault

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This diagram provides a detailed view of the geological layers and the major geological features in the Yorkville Area.
downward away from the central axis. Erosion of an anticline exposes successively older formations along the top or crest, and erosion of the Ashton Arch produced the only exposures of Cambrian rocks in Illinois.

The Sandwich Fault zone and the Ashton Arch are old structures. There is evidence that they began to form in early Ordovician time before deposition of the St. Peter Sandstone. The time of major deformation, however, was at least post-Silurian, but it may have been post-Mississippian and pre-Pennsylvanian, the time of major deformation along the La Salle Anticline, another major structural feature in eastern and northeastern Illinois.

0.3  8.6  T-road intersection on the right with Oakbrook Road. Continue straight ahead (west) on Rogers Road.

0.1  8.7  T-road intersection. Turn left onto Finnie Road.

0.1  8.8  On the left is an abandoned quarry in the Oneota Dolomite.

0.3  9.1  Note the terrace level (West Chicago) on the left side of the road. Also note the large number of glacial erratics scattered over the ground.

0.4  9.5  Crossing concrete culvert. Note on the left an abandoned gravel pit in the West Chicago Terrace.

0.6  10.1  On the left in the corner of the field note the glacial erratics.

0.7  10.8  T-road intersection from the right (Brodie Road). Continue straight ahead.

0.1  10.9  CAUTION. NARROW CULVERT.

0.1  11.0  Stop. Abandoned Brodie quarry in Shakopee Dolomite. West Chicago Terrace gravel.

Note the soil profile developed in the terrace gravel. The gravel consists of a great variety of rock types, including locally derived chert, dolomite, and limestone, Silurian chert and fossiliferous dolomite from the Lake Michigan basin, and igneous and metamorphic rocks which the glacier carried into Illinois from the Canadian Shield. One can make an interesting collection in a short time.

The rock that was quarried here is the Ordovician Shakopee Dolomite. The rock is a gray brown to buff to green, fine to coarse crystalline dolomite, with sandy zones and zones of oolitic chert. Fossils are rare because they were destroyed by dolomitization. Some zones have vugs (small cavities) containing calcite and pyrite. Small algal mounds or reefs can be seen as thickenings in some of the beds. The algal mounds and the oolites preserved in the chert indicate that the sea was very shallow here when the Shakopee was being deposited. In the floor of the quarry there are mud cracks filled with sandy dolomite on the bedding planes. These mudcracks indicate that the lime muds were exposed to drying before deposition of the next layer.
0.0 13.1 Turn left at T-street intersection. Continue ahead (south).
0.1 13.2 Turn left at street intersection.
0.1 13.3 STOP. Street intersection. Turn right.
0.8 14.1 T-road intersection from right (Sand Hill Road). Continue straight ahead (south). T-road intersection from left (Crummin Road). Continue straight ahead (south) toward Newark.
1.0 15.1 CAUTION: Railroad crossing. Continue straight ahead. Village of Newark.
0.3 15.4 Crossing Main Street. Continue straight ahead (south) on Johnson Street.
0.1 15.5 T-street intersection. Turn right onto Taylor Street.
0.1 15.6 Intersection with Ottawa Road. Turn left. Continue ahead (south).
0.2 15.8 STOP. CAUTION. Intersection with Illinois Route 71. Continue straight ahead on Fennell Road.
0.8 16.6 T-road intersection from right (Lisbon Center Road). Continue ahead.
0.1 16.7 T-road intersection from left (Lisbon Center Road). Turn left (east). Ascend front of Inner Marseilles Moraine.
0.7 17.4 Approaching top of the Marseilles Moraine. Back toward the right (southwest) is an excellent view of the sloping Marseilles outwash plain.
0.2 17.6 Stop 5. Inner Marseilles Moraine.

Northeastern Illinois, including the Yorkville area, was glaciated during Kansan, Illinoian, and Wisconsinan times by glaciers which advanced into Illinois from the northeast (fig. 1). The Kansan and Illinoian drifts are locally preserved beneath the younger Wisconsinan glacial deposits, which make up the bulk of the surface materials throughout the region. The Woodfordian glacier of the Wisconsinan was the last to invade northeastern Illinois, and the ice melted from the Yorkville area only about 15,000 years ago. The glacier advanced as far south as Shelbyville, where it deposited a prominent ridge of till called the Shelbyville Moraine (see glacial map). Many similar ridges, or end moraines, that were formed during later pulsations of the glacier occur in the region and make up the most prominent topographic features of an otherwise relatively flat terrain.

There are 30 named Woodfordian moraines and several unnamed minor ones. This stop is near the crest of the Inner Marseilles Moraine, the most prominent topographic feature in the Yorkville area. The Marseilles Moraine is one of the largest end moraines in Illinois. It attains a maximum width of about ten miles and is traceable for approximately one hundred miles from east central Kendall County, through La Salle, Grundy, Livingston, Ford, and Iroquois Counties to south central Kankakee County.
As the Marseilles glacier melted, meltwater ponded and formed glacial Lake Lisbon between the moraine and the ice front. As melting increased, the lake level was raised until water spilled over the lower parts of the moraine cutting several outlets or spillways. The channel that was eroded here drained toward the north into Fox Valley. The itinerary map shows several of these old spillways. This channel and one south of Oswego are prominent topographic features. Long after the Marseilles ice melted from the area, drainage from the Valparaiso glacier became so great that all of the water could not escape through Illinois Valley, which then was much narrower and not as deep as it is now. The water backed up into the Morris lowland, and glacial Lake Wauponsee was formed between the Marseilles and Minooka Moraines. At its highest level Lake Wauponsee also drained through this spillway for a short time.

Intersection of County Line Road and U. S. Route 52. Turn right and head north. Proceeding along the west side of the glacial spillway.

Descending onto the outwash plain of the Inner Marseilles Moraine.

Note the profile of the channel toward the southeast.

Here the glacial spillway fans out onto the top of the outwash plain.

T-road intersection (Lisbon Center Road & County Line). Turn right onto Lisbon Center Road.

Small bridge. CAUTION.

Stop 7. Abandoned gravel pit in outwash.

The gravel exposed here is at the front edge of the Marseilles Moraine. The gravel is very coarse and poorly-sorted. The exact origin of the deposit is questionable, and two possibilities exist. The coarseness, poor sorting, and proximity to the end moraine strongly suggest that it is Marseilles outwash deposited immediately in front of the melting Marseilles glacier. However, the gravel is also located near the north end of the glacial channel seen at Stop 6. Therefore, it is possible that the deposit was formed by washing of Marseilles drift by overflow from glacial Lakes Lisbon and Wauponsee.

T-road intersection (Lisbon Center Road & Fennell Road). Turn left (north) onto Fennell Road and continue ahead toward Newark.

STOP. Intersection with Illinois Route 41. CAUTION. Continue ahead on Ottawa Road and enter village of Newark.

T-street intersection. Turn right (east) onto Taylor Street.

T-street intersection. Turn left (north) onto Johnson Street.

Cross Main Street. Continue ahead.
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<th>SERIES</th>
<th>GROUP</th>
<th>FORMATION</th>
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## Time Table of Pleistocene Glaciation

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<th>Substage</th>
<th>Nature of Deposits</th>
<th>Special Features</th>
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<td>Holocene</td>
<td>Years</td>
<td>Soil, youthful profile of weathering, lake and river deposits, dunes, peat</td>
<td>Outwash along Mississippi Valley</td>
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<td>Before Present 7,000</td>
<td>Valderan, Outwash, lake deposits</td>
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<td>11,000 Twoocreekan, Peat and alluvium</td>
<td>Ice withdrawal, erosion</td>
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<td>Wisconsinan</td>
<td>Woodfordian</td>
<td>22,000, Drift, loess, dunes, lake deposits</td>
<td>Glaciation; building of many moraines as far south as Shelbyville; extensive valley trains, outwash plains, and lakes</td>
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<td>Farmdalian</td>
<td>28,000 Soil, silt, and peat</td>
<td>Ice withdrawal, weathering, and erosion</td>
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<td>Altonian</td>
<td>75,000 Drift, loess</td>
<td>Glaciation in northern Illinois, valley trains along major rivers</td>
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<td>Sangamonian</td>
<td>175,000</td>
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<td>Jubileean</td>
<td>Drift, loess</td>
<td>Glaciers from northeast at maximum reached Mississippi River and nearly to southern tip of Illinois</td>
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<td>Illinoisian</td>
<td>Monican</td>
<td>Drift, loess</td>
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<tr>
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<td>Liman</td>
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<td>Yarmouthian</td>
<td>300,000</td>
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<td>Kansan</td>
<td>600,000</td>
<td>Drift, loess</td>
<td>Glaciers from northeast and northwest covered much of state</td>
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<td>700,000</td>
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<td>Aftonian</td>
<td>900,000</td>
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<td>Glaciers from northwest invaded western Illinois</td>
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<tr>
<td>Nebraskan</td>
<td>1,200,000 or more</td>
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<td>(1st glacial)</td>
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GEOLOGIC MAP OF ILLINOIS showing BEDROCK BELOW THE GLACIAL DRIFT 1970 (From Willman and Frye, 1970.)

0 20 40 60 MILES
0 20 40 80 KILOMETERS

Pleistocene and Pliocene not shown

TERTIARY

CRETACEOUS

PENNSYLVANIAN

P3 Bond and Mattoon Formations Includes narrow belts of older formations along La Salle Anticline

P2 PENNSYLVANIAN Carbondale and Modesto Formations

P1 PENNSYLVANIAN Caseyville, Abbott, and Spoon Formations

MISSISSIPPIAN Includes Devonian in Hardin County

DEVONIAN Includes Silurian in Douglas, Champaign, and western Rock Island Counties

SILURIAN Includes Ordovician and Devonian in Calhoun, Greene, and Jersey Counties

ORDOVICIAN

CAMBRIAN

Des Plaines Complex - Ordovician to Pennsylvanian Fault

ILLINOIS STATE GEOLOGICAL SURVEY