State of Illinois
Department of Registration and Education
STATE GEOLOGICAL SURVEY DIVISION
John C. Frye, Chief

GUIDE LEAFLET

GEOLOGICAL SCIENCE FIELD TRIP

Sponsored by
ILLINOIS STATE GEOLOGICAL SURVEY

GREENVILLE AREA

Bond and Montgomery Counties

Greenville, Hillsboro, Mt. Olive, and New Douglas Quadrangles

Leaders
Ed Odom, Guy Dow, George Wilson, Curt Larsen
Urbana, Illinois
October 20, 1962

GUIDE LEAFLET 1962F

HOST: Bond County
Consolidated High School

To the Participants:

It has been said that the landscape is truly beautiful only when we understand the varied forces that have worked through the ages to develop it. The result of this understanding is increasing enjoyment and appreciation of the natural features about us.

The Geological Science Field Trip program is designed to acquaint you with the landscape, rock and mineral resources, and the geological processes that have led to their origin. With this program, we hope to stimulate a general interest in the geology of Illinois and a greater appreciation of the state's vast mineral resources and their importance to the over-all economy.

We encourage you to ask the tour leaders any questions that may occur to you during the trip. Discussion often clarifies points that otherwise would remain confused to many of the participants. We also invite your written comments upon the conduct of the trip so that we might improve them as much as possible.

Additional copies of this guide leaflet, as well as itineraries for trips that have been held in the past, may be obtained free of charge by writing to the Illinois State Geological Survey. Maps are available for 30 cents each.

We hope you enjoy today's trip and will come again.

GREENVILLE GEOLOGICAL SCIENCE FIELD TRIP

Abstract

Greenville lies within the controversial "Ridged Drift" area of the Kaskaskia Basin. A belt 90 miles long and 32 miles wide is characterized by elongate ridges and kame-like hills which rise abruptly from the Illinoian Till Plain. Although several theories have been advanced to explain these features, none is entirely satisfactory and their origin remains an enigma.

Illinois' first coal mine-power plant combination is under development in the area. The No. 6 Coal will be mined at a depth of approximately 500 feet to supply fuel for the plant. Water to generate steam for the turbines will be acquired from a lake of 1,096 acres on the McDavid Branch of Shoal Creek Valley.

The Sorrento Oil Field, which has been producing since 1938, is one of the oldest in Illinois. Production is from two Middle Devonian sand bars draped over an anticlinal structure to form the trap.

The Illinoian Till Plain is highly dissected in the region and is overlain by Roxana and Peoria Loesses of Wisconsinan Age. The Sangamonian Interglacial Stage is represented by a partially developed soil profile.

Rocks of the Upper Pennsylvanian System underlie the Pleistocene deposits. The Shoal Creek Limestone is quarried locally. The Shoal Creek and some overlying beds are quite fossiliferous.

Suggested References for Further Study of the Geology of the Field Trip Area

1. Frye, John C. and Willman, H. B., "Classification of the Wisconsinan Stage in the Lake Michigan Glacial Lobe," Illinois State Geological Survey, Circular 285, 1960.

2. Leighton, Morris M., "Stagnancy of the Illinoian Glacial Lobe East of the Illinois and Mississippi Rivers," Journal of Geology, Vol. 67, No. 3, May 1959.

3. Leverett, Frank, "The Illinois Glacial Lobe," United States Geological Survey, Monograph 38, 1899.

GREENVILLE GEOLOGICAL SCIENCE FIELD TRIP

Suggestion: Have someone read the guide as we travel through the countryside so that the driver will be able to learn the geology of the area, also.

Itinerary

0.0 0.0 Turn right (east) on U. S. Alternate 40.

0.3 0.3 Note high hill ahead to right. This hill is 55 to 60 feet higher than the surrounding territory.

0.8 1.1 Slow. Turn left (north) at south edge of Greenville Country Club.

0.3 1.4 Stop 1. Discussion of Kame-Like Hills and Elongate Ridges and the Pleistocene History of the Region.

A. The Pleistocene Epoch

Tens and hundreds of thousands of years ago most of Illinois, together with most of northern North America, was covered by huge glaciers. These glaciers expanded from centers in central and eastern Canada. They developed when the mean annual temperatures were somewhat lower than now, so that not all of the snow that fell during the winters melted during the summers. The snow residues accumulated year after year until a sheet of ice was formed so thick that, as a result of its weight, it 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 Missouri and Ohio Rivers.

Moderation of temperatures halted the glacier. For a while the melting of the ice 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.

It is now commonly known that there were four major periods of glaciation during the Pleistocene or Great Ice Age, and that between each there was a long interglacial period in which conditions were much as they are today. 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.

A complete discussion of Pleistocene (Ice Age) history would require a sizable volume; in fact, the story is still not fully known. Present facts indicate that this era of geologic history began about one million years ago when the Nebraskan Glacier advanced over the area. This oldest glacier is named Nebraskan because the typical Nebraskan glacial deposits are best developed in the state of Nebraska. Nebraskan deposits are not abundant in Illinois, probably because weathering during the Aftonian Interglacial Stage after the retreat of the Nebraskan Glacier destroyed them.

The next glacial episode produced the Kansan Glacier which again advanced from the west. Thick deposits of till and outwash sand and gravel were deposited in Illinois when the Kansan Glacier withered away.

The Kansan Stage was followed by the Yarmouthian Interglacial Stage during which erosion carved valley and hills in the Kansan deposits.

The third glacial stage, the Illinoian, is important to the residents of Illinois. It covered 80 percent of Illinois, reaching southward to Carbondale and Harrisburg. In contrast to the preceding glacial advances, the Illinoian came from the east rather than the west.

After several thousands of years, climatic conditions caused the melting away of the Illinoian ice sheet. During this warm stage, the upper part of the Illinoian till was weathered and soil developed, just as in the case of the preceding Yarmouthian interval. However, this action did not take place to the degree it did during the Yarmouthian, so that the post-Illinoian (Sangamonian) interval is estimated to have lasted only about 150,000 years. The Sangamon soil resembles present day soils in color, texture, and depth of development. This fact lends support to theory that the climate existing during interglacial times was similar to the present climate. The theory that we are living in an interglacial interval has been advocated by numerous glacial geologists. We should not brush this thought aside for it is estimated that a drop of only five degrees in the average annual temperature would bring another glacier down upon us.

The last and most recent glacial stage was the Wisconsinan. This glacier advanced southward from the Lake Michigan Basin to the present sites of Shelbyville, Charleston, and Peoria where it formed a terminal moraine that geologists call the Shelbyville Moraine. The Shelbyville Moraine was built by the Wisconsinan Glacier approximately 20,000 years ago.

As the Wisconsinan Glacier retreated, withdrawals and readvances created a complex sequence of deposits in northeastern Illinois, the most outstanding of which are the moraines. More than fifty separate moraines were formed by this glacier in Illinois alone. The major ones are shown on the accompanying glacial map of northeastern Illinois.

To appreciate the significance of the Pleistocene Epoch, we need to consider only the rich soils formed from the glacial deposits and the abundant deposits of sand and gravel. We would not have these treasures had the glaciers missed Illinois.

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 <u>till</u>. Some of the glacial drift was washed out with the melt-waters. The coarsest <u>outwash</u> material was deposited nearest the ice-front and gradually 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 <u>outwash-plain</u>; where it was restricted to the river valleys it forms <u>valley-trains</u>.

A 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 of the advancing ice. With the exception of the Shelbyville Moraine which marks the maximum advance of the Wisconsinan Glacier, a moraine marks the position to which the ice-front readvanced after a recession.

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

As a glacier began to recede, melt-water gradually accumulated in local ponds or lakelets between the ice-front and the moraine last formed except where there were drainage channels through the moraine. Where such drainage channels are absent, it may be presumed that as the ice-front continued to recede the local ponds and lakelets gradually merged into one large lake which remained until a channel formed through which it could drain.

At times, especially in the winters, the out-wash 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 to 80 feet thick. Far from the valleys it may measure only inches, if it can be identified at all.

B. Discussion of the Illinoian in this Area with Particular Emphasis on the 'Ridged Drift' of the Kaskaskia Valley

We are standing on the western flank of a hill which is part of a conspicuous topographic belt running southwestward from the terminal moraine (Shelbyville) of the Wisconsinan Glacier to a point near Belleville. This belt is approximately 90 miles long and 32 miles wide in the main portion. Narrow, sub-parallel ridges and more or less conical shaped hills, both of which rise abruptly from the surrounding plain, characterize this portion of the Kaskaskia Basin. Some of these hills are composed of water-laid sand and gravel and some are till deposited directly by the ice.

The origin of these topographic features has been a source of controversy among geologists. At the present time, comparatively little is known about the Illinoian glaciation in this area and many theories have been advanced. It is quite obvious, from a survey of the literature available and from field observations, that these topographic features are not all the same, although many geologists have tried to explain their origin as though they were.

Some of the continuous ridges are definitely moraines, and the Kaskaskia Valley has been occupied concurrently by more than one glacial lobe. One such moraine defines a lobe on the east of the river, and there is at least one on the west side of the valley. Furthermore, there

is convincing stratigraphic evidence, here and elsewhere in Illinois, pointing to several consecutive advances and retreats of the Illinoian ice. At the present time, the evidence is overwhelmingly against any prolonged stagnation of a significant portion of the Illinoian ice and for this reason theories which require such stagnation to explain the origin of the ridged drift are not supported by the Illinois State Geological Survey. There must be considerably more work conducted with an open mind before the answers are known. Because the Illinoian glacial deposits are older and consequently less well defined than the Wisconsinan deposits, they are far more difficult to interpret and have been described only generally. Recently, geologists have intensified their study of the Illinoian and the results probably will reveal complexities in this stage rivaling those of the much better known Wisconsinan.

0.3 1.7 Slow. Turn hard left (west).

0.3 2.0 Turn right (north).

0.5 2.5 Slow. Turn left (west).

0.4 2.9 Slow. Narrow bridge. Note glacial till below black soil zone on right.

0.2 3.1 Turn left (south).

1.0 4.1 STOP. Turn right (west) on Alternate 40.

0.2 4.3 Entering city limits of Greenville.

0.2 4.5 Bond County High School on left.

0.1 4.6 Slow. Turn hard right (north).

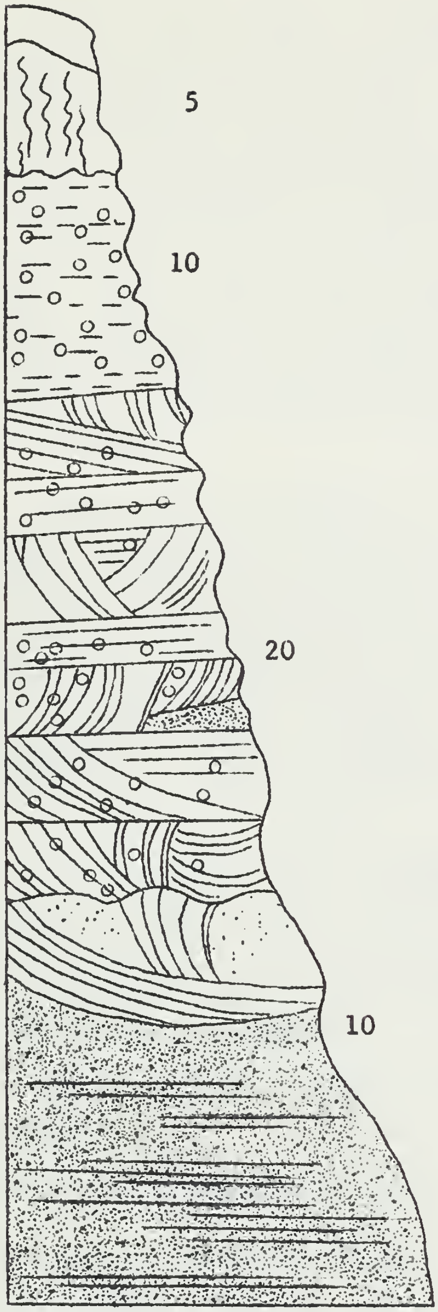
0.7 5.3 Stop 2. Gravel Pit in Illinoian Valley-Train Deposit. (DANGER! The material in this pit slumps badly. Stay away from the walls!)

This gravel pit is located in what appears to be a valley-train deposit. The nature of the materials, the location along a stream (east branch of Shoal Creek) which parallels a ridge system thought to be a moraine, and the extent of the deposit (the same sequence of material is found at least 12 miles to the north) all suggest that this is a valley fill derived from the front of the glacier which built the adjoining moraine. From a water well nearby, it is known that there is 90 feet of sand and gravel in this deposit.

This pit reveals a remarkable section which illustrates several principles of sedimentation as well as providing an opportunity to study several events that occurred during the Pleistocene. Let us start from the bottom and work our way through the section, describing as we go the principles and events associated with each member.

The lower portion of the pit contains up to 10 feet of fine to medium sand which is thinly bedded and very clean. By clean, we mean that the grains are nearly the same size and composition due to sorting action of running water. There are no silts or clays mixed with the sand, and it will flow freely through the fingers without sticking even when compressed. The good sorting indicates that the material must have been

STRATIGRAPHIC SECTION AT STOP 2



Upper loess is Peoria, lower is Roxana, but the boundary between them is difficult to see. This loess is the only record of the Wisconsinan.

Highly weathered gravel represents the Sangamonian Interglacial Stage. The gravel was deposited during the Illinoian Stage of glaciation, as part of the valley fill.

This is unweathered Illinoian gravel. Three to 20 feet of this gravel has been tightly cemented by calcium carbonate. The more permeable zones were cemented, the maximum upper and lower limits of cementation being controlled by the ground-water table. The well-developed cross bedding gives us clues to the type of deposit and the direction of flow of the melt water.

Very clean, thinly bedded sand (some cross bedding). Like the overlying gravel, this material was carried from the front of the ice by melt water. The finer grain and better sorting indicate that the ice may have been farther away than when the gravel was deposited.

carried for some distance before being deposited, and the excellent bedding proves that it was deposited in water. The material was derived from the front of the Illinoian Glacier and carried by melt water as it rushed down the valley of Shoal Creek. At that time, the stream was much larger, as shown by the large size of the valley compared to the small stream which now occupies it.

Next is 3-20 feet of conglomerate, very cross-bedded and interbedded with sand. This type of cross-bedding is known as cut and fill structure and occurs when the stream is so choked with sediment that the channels become filled rapidly, forcing the stream to alter its course time after time. Often an old channel will be re-cut and again refilled, causing the bedding to be disposed at many different angles. Notice that the tops of the beds are sharply terminated, or truncated, by the overlying bed but that the bottoms curve along the base of the channel. The concave face of the cross-bedding points in the direction of flow of the water. This material was also derived from the front of the melting Illinoian Glacier. The cementation was caused by ground water percolating through the more porous zones where it deposited calcium carbonate. Portions that were impermeable--generally poorly sorted, silty zones--were not cemented.

Above the conglomerate is up to 10 feet of oxidized, deeply weathered red gravel. Much of the clay and silt in this zone was derived from the breaking down of the mineral constituents in the original gravel. The red gravel was deposited during Illinoian time and is nothing but the weathered portion of the underlying gravel. The significance of this zone is that it represents a time of weathering between the retreat of the Illinoian and the advance of the last, or Wisconsinan, glacier. The inter-glacial stage is called the Sangamonian. In other areas, the Sangamonian Interval is frequently represented by a fossil soil with well developed humic zones.

Resting on top of the weathered gravel is 4-5 feet of Roxana Silt and Peoria Loess. These wind-blown silts were formed during the Wisconsinan Stage and are the only record we have of this glaciation in the Greenville area since the Wisconsinan ice sheet did not reach this far. (Please refer to the Pleistocene history included in Stop 1-A for an explanation of loess.)

The events described above are summarized in the accompanying diagram.

0.6 5.9 Bridge over Kingsbury Branch of Shoal Creek. Rough road.

2.0 7.9 Note rolling nature of Illinoian Till Plain through this region.

0.3 8.2 Glacial till exposed in ditch on right.

0.1 8.3 Narrow bridge over Burlington and Quincy Railroad.

0.7 9.0 Note the color variations in the soil in field on right.

0.2 9.2 T-road east. Continue ahead.

0.1 9.3 Terrace work in field on right a soil conservation practice.

1.6 10.9 Crossroad.

0.1 11.0 Note the large flat areas with occasional hills. This is the Illinoian Till Plain.

1.0 12.0 Road turns right, then left. Continue ahead (north) on blacktop road.

1.2 13.2 Note hill ahead surrounded by very flat plain.

1.1 14.3 Caution. T-road. Turn left (west).

0.2 14.5 Abandoned gravel pit located behind farm house on right. This pit has essentially the same type of gravel and stratigraphic sequence as seen at Stop 2.

0.2 14.7 Another abandoned gravel pit on right.

0.3 15.0 Slow. Narrow bridge over East Fork of Shoal Creek. Note 15 feet of sand and silt in stream banks.

0.3 15.3 Loess exposed in roadcut on right.

0.1 15.4 Loess in roadcut on right.

0.2 15.6 Slow. Turn right (north).

0.1 15.7 Gray color of the soil in this area indicates it was formed under a forest vegetation.

0.4 16.1 Loess and till exposed on right.

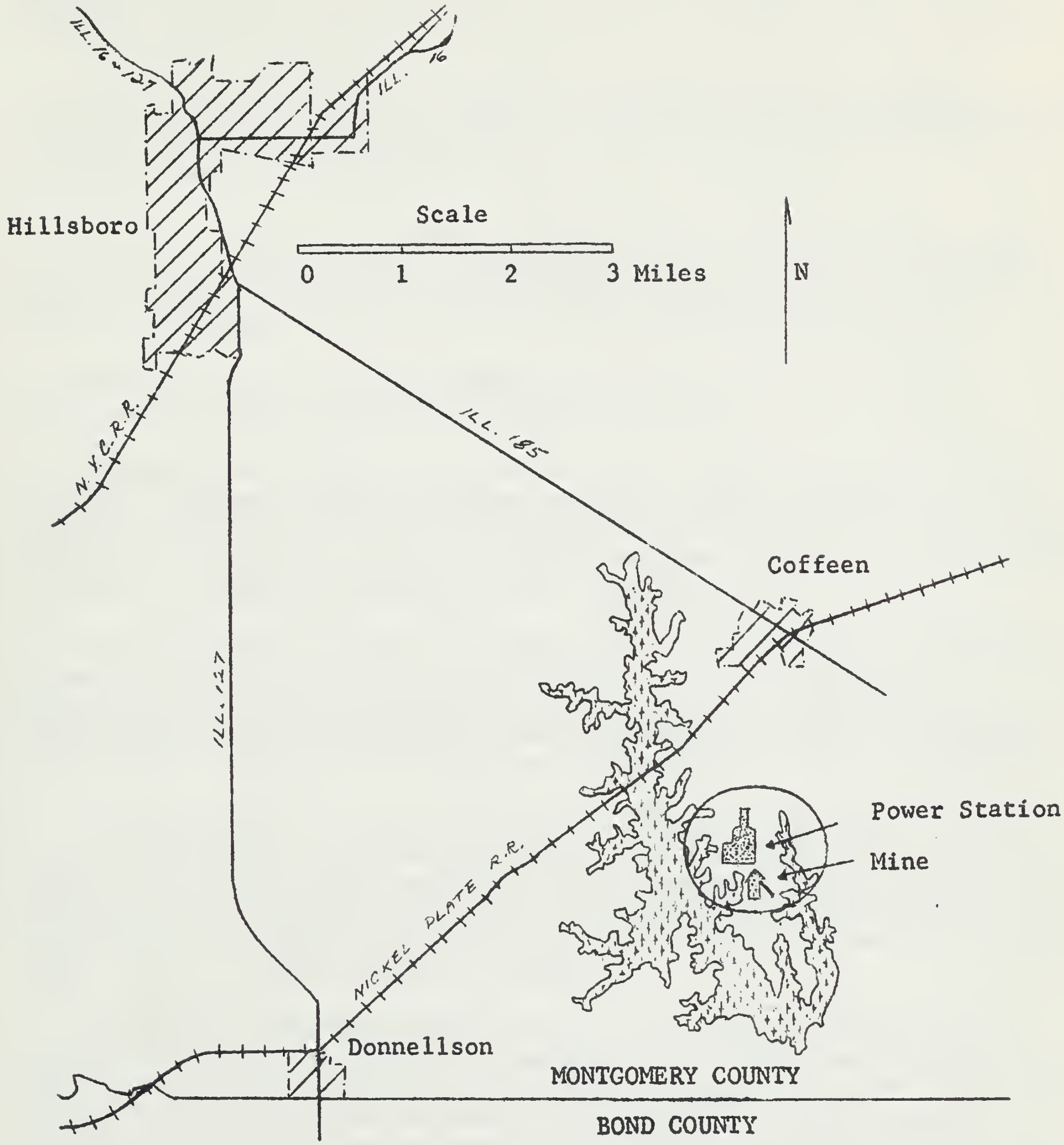
0.1 16.2 T-road west. Continue ahead.

0.3 16.5 Four to six feet of pinkish-buff loess overlying up to 10 feet of gray till. A well-developed soil profile is also evident.

0.2 16.7 Stop 3. Discussion of Coal Mine, Power Plant, and Lake to Be Constructed in This Area.

The Truax-Traer Coal Company Division of Consolidation Coal Company and Central Illinois Public Service Company are cooperating on a project to convert coal into electric power. The multi-million dollar development will tap the three billion-ton coal reserve of the area and will change BTU's into kilowatts. This will be the first of several proposed mine-mouth site electric generating plants in Illinois.

Completion of the first generating unit is scheduled for mid-1965. The supplying coal mine will be under development at the same time, and is expected to be completed early in 1965. From 300-500 workers will be employed by contractors during peaks of construction over the the three-year building period. About 50 permanent employees will be needed to operate the first unit of the station. Approximately 150 coal miners will be needed when the station goes into operation, with an annual coal output of more than 1,000,000 tons per year. Present plans call for eventual expansion of the output to 3,700,000 tons a year as additional generating units are added.



NEW POWER STATION - COAL MINE PLANNED NEAR COFFEEN

Location of the new Central Illinois Public Service Company power station and Consolidation Coal Company mine is shown in relation to nearby Montgomery County communities. The site is about eight miles southeast of Hillsboro, two miles from Coffeen, and four and one-half miles from Donnellson. As indicated, the power station and mine will be located in the "V" formed by the lake.

The lake is well under construction as can be seen by the vegetation that has been cleared at least up to the lake level. An earthen dam 70 feet high and 1,320 feet long will be constructed across McDavid Branch, a tributary of the East Fork of Shoal Creek, some 3½ miles south of Coffeen. The lake will flood approximately 1,096 acres with water derived from a 12,064-acre watershed. Lake will have a maximum depth of 60 feet and 60 miles of shore line. According to engineers, the new reservoir will have the capacity to sustain a continuous water supply of 8 million gallons per day.

The steam turbine power plant will initially install a 350,000 kilowatt generator which will require 3 million gallons of water per day. The heat necessary to convert this water into steam will be derived from the coal mined near the plant.

The mine shaft will descend some 500 feet to the No. 6 Coal. The No. 6 Coal is approximately 5-7 feet thick and is the most economically important coal in Illinois. The cyclothem to which the No. 6 belongs is called the Brereton Cyclothem and is Middle Pennsylvanian in age.

The following discussion summarizes important features of the Pennsylvanian Period and of the formation of coal.

Pennsylvanian sediments are unlike older sediments in Illinois in that they consist of many different rock types, with coal the most outstanding. In Illinois, coals are commonly overlain by black sheety shale ("roof slate") followed by limestone with marine fossils. The limestone is usually overlain by gray shale also containing marine fossils.

Beneath the coal there is an underclay, in turn sometimes underlain by an underclay limestone or shale, then sandstone. This type of rhythmic succession of different kinds of strata is repeated in much the same sequence some 50 times where the Pennsylvanian rocks are thickest. Each rhythmic succession of Pennsylvanian rocks is called a cyclothem.

The many different rock types in the Pennsylvanian System indicate many rapid changes of environment which took place repeatedly. At that time rivers were bringing sediments from the north and east, possibly as far away as the present Atlantic coast and the region south of Hudson Bay. The Mid-West was subject to frequent marine invasions as the land rose or sank, or the sea level raised or lowered.

That these conditions existed is evident from the nature of the sediments. Many of the shales, limestones, and ironstones above the coals contain marine fossils. The coals are believed to have formed in broad fresh-water marshes somewhat like the present Dismal Swamp of Virginia. Most of the sandstones, conglomerates, underclays, underclay limestones, and some shales probably accumulated in fresh-water environments such as river valleys, lagoons, lakes or lowland plains. There is no area in the world today that has conditions exactly like those that existed during "Coal Measures" time.

The plants and trees that grew in "Coal Measures" time were luxuriant. In the jungle-like growths the plants most common were huge tree ferns that had fronds five or six feet long and grew to a height of more than 50 feet. Along with them were seed ferns, now extinct; giant scouring rushes; and large scale trees, which grew to heights of 100 feet or more.

The large scale trees we find preserved in the coals do not have growth rings. The luxuriant growth and lack of growth rings probably indicate that the climate that prevailed at this time was warm and without seasonal change. As the plants fell into the swampy waters they were partially preserved, buried by later sediments, and converted into coal.

0.2 16.9 Turn left.

0.6 17.5 The coal mine and power plant are to be located in this immediate area, probably on the west side of the road.

0.3 17.8 The air shaft, which will have to be separate from the hoisting shaft, will be located on the left side of the road.

0.2 18.0 Turn left (west).

0.2 18.2 Turn right (north).

0.5 18.7 Turn left (west). Note the very flat till plain in this area.

0.2 18.9 T-road north. Continue ahead.

0.2 19.1 Turn left (southwest).

0.6 19.7 Crossing McDavid Branch of Shoal Creek. This valley will be entirely flooded.

1.0 20.7 T-road south. Continue ahead.

0.5 21.2 T-road north. Continue ahead.

0.2 21.4 Caution. Nickel Plate Railroad.

0.5 21.9 Note the very flat plain. This region slopes to the south at the rate of only a few feet to the mile.

0.6 22.5 Slow. Turn left (south) on blacktop road.

1.1 23.6 Slow. T-road. Turn right (west).

0.1 23.7 Small knoll on left.

0.8 24.5 STOP. Turn left (south) on Highway 127. Illinois Power Company Transformer Station on left.

0.6 25.1 Entering city limits of Donnellson.

0.1 25.2 Caution. Nickel Plate Railroad. Three tracks.

1.7 26.9 Soils in this region are relatively fertile, as can be seen by the crops produced here.

2.0 28.9 Sorrento Road to right. Continue ahead.

1.1 30.0 Caution. Chicago, Burlington, and Quincy Railroad.

3.4	35.4	Crossing kame-like ridge.
2.2	35.6	Slow. Turn right (south) on Illinois Highway 140.
0.1	35.7	STOP. Continue ahead on Illinois 140.
0.1	35.8	Slow. Turn left into Greenville City Park. Stop 4. Lunch. (Make a loop through park.)
0.3	36.1	Turn left (west) on Illinois 140.
0.3	36.4	Glacial till exposed in roadcuts on right and left.
1.4	37.8	Note numerous small knolls which appear here and there over the Illinois Till Plain.
2.3	40.1	Note the wide valley occupied by Shoal Creek. The creek is far too small to have created the valley it now occupies. The stream meanders a great deal through this valley. Drainage in the area is poor.
1.0	41.1	Crossing Shoal Creek. The valley is approximately 1½-miles wide at this point. Obviously at one time in its history, the stream carried much more water than at present.
1.3	42.4	Note the good soil profile exposed in the trench silo on the right.
0.4	42.8	Pocahontas Road. Continue ahead.
0.5	43.3	Oil storage tank on right. Oil is piped to this tank from the Sorrento Oil Field. It is picked up by truck here and taken to refineries.
0.6	43.9	Slow. Turn right on Old Ripley Road.
0.1	44.0	Note knoll ahead approximately 30 feet high.
0.1	44.1	Entering Old Ripley.
0.2	44.3	Note the very flat till plain on the left (west).
0.7	45.0	Crossroad. Continue ahead.
0.5	45.5	The road follows an extremely narrow ridge between Shoal Creek Valley on right and the Dry Fork tributary on left. For some reason, Dry Fork turns abruptly to the north when it reaches this ridge. The ridge is underlain by bedrock and capped by glacial till.
0.9	46.4	Excellent soil profile developed in loess on right, underlain by drift.
0.2	46.6	Approximately 40 feet of glacial till exposed in cut on left. Note the extreme amount of slumping of this till down the cut. Bedrock occurs at approximately road level. The bedrock in this area is a shale. It is possible that the slumping is caused by slipping occurring at the interface between the shale and the till.
0.3	46.9	Crossing Dry Fork Creek.

0.5 47.4 Stop 5. Exposure Illustrating the Effects of Multiple Glaciation During the Pleistocene.

The section here is as follows:

Material	Feet
Buff loess (Peoria)	2-3
Pink Silt (Roxana)	3-4
Brown, oxidized till representing the Sangamon Soil. The upper 1 foot is highly oxidized with limonite concretions.	4
Gray, pebbly till with large gneiss boulder embedded	6-7

From this exposure we can derive the following sequence of events:

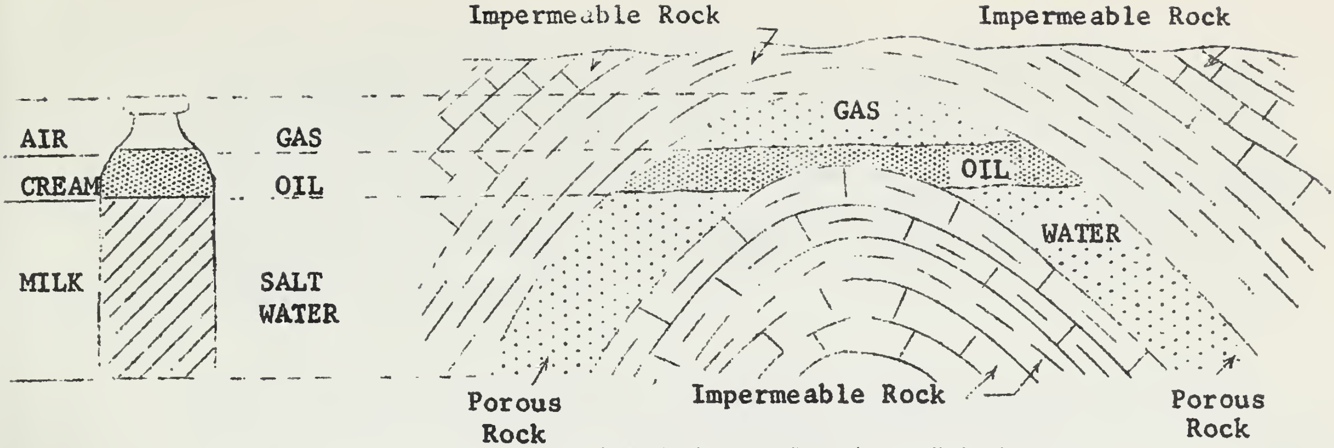
All of the till was laid down by the Illinoian Glacier. Upon retreat of the glacier, the newly deposited till was exposed to weathering and the top 4 feet was oxidized and leached of carbonates, the upper foot most severely oxidized. This weathering took place during the Sangamonian Interglacial Stage, and, where good soil profiles are developed, the soil is called the Sangamon Soil. Following this came the last of the four glaciers, the Wisconsinan. The ice sheet never reached the Greenville area, but the Roxana Loess deposited by winds during the earliest stage of the Wisconsinan (Altonian) and the later Peoria Loess record its influence.

Let us consider in more detail the weathered till which represents the Sangamon Soil.

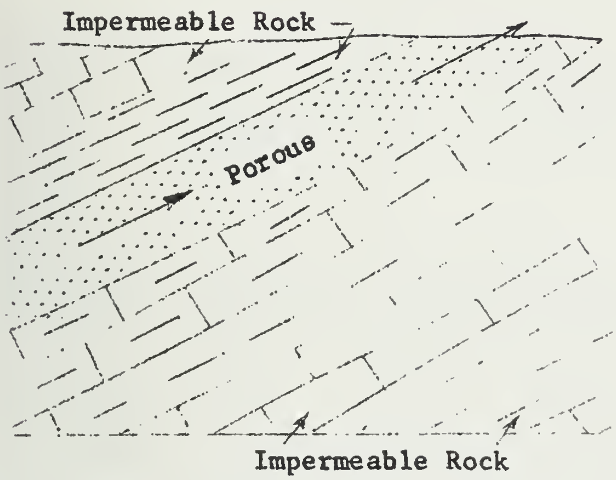
Rocks and minerals suffer changes when they are exposed to the weather. These physical and mineralogical changes, though slow, become evident when earth deposits remain undisturbed for long periods of time. This happens in the development of a soil profile.

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 the 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.

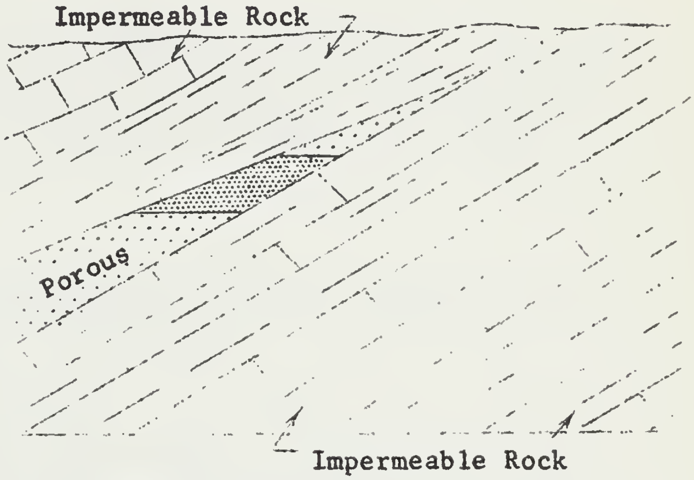
The zonal effect results from the fact that the four principal processes which effect soil weathering all progress with the downward movement of ground water but at different rates. These processes, listed in order according to their rate of progress, beginning with the most rapid are: (1) oxidation,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



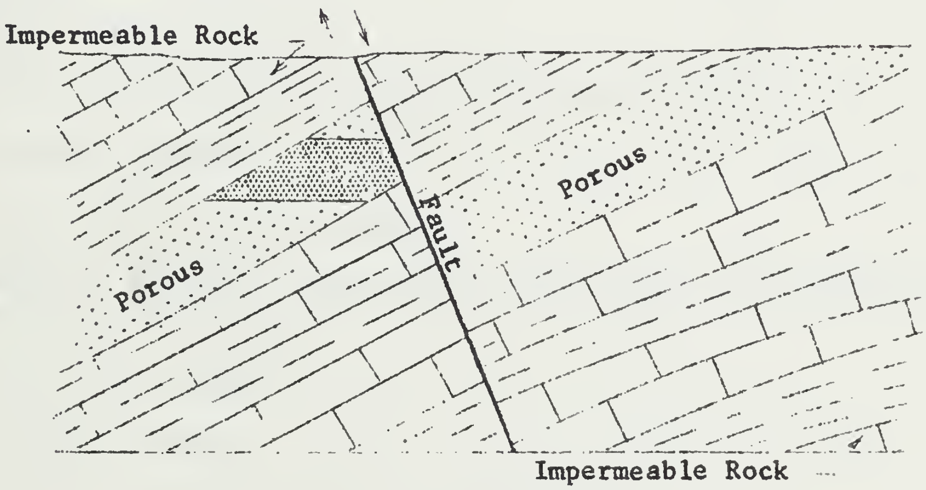
A N T I C L I N A L   T R A P



N O   T R A P
(Oil and Gas escape to surface)



S T R A T I G R A P H I C   T R A P
(Pinch-out)



F A U L T   T R A P

CRUSTAL STRUCTURES INFLUENCING OIL ACCUMULATION

As a result, in the A Zone, in which the humus material derived from decaying plants has accumulated, the rocks are oxidized, leached, and decomposed. In the upper part of the B Zone, they are oxidized and leached, while 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. This profile lacks a prominent A Zone but has well developed B and C horizons.

This stop is also situated in the producing area of the Sorento Consolidated Oil Field. This is one of the oldest pools in Illinois. Some production has been from the Pennsylvanian but most of it is confined to Middle Devonian rocks. The producing rocks are two sand bars draped across an anticlinal structure.

The deepest well is 1,875 feet. Since its discovery in 1938, the pool has produced 1,582,000 barrels of oil, 88,000 of which were produced in 1960. There have been 54 wells completed, and 29 are still producing. Only one new well was completed in 1960, and 4 were abandoned.

0.1 47.5 Note tank battery on left.

1.1 48.6 The relative relief in this area is due to erosion. The streams are rapidly dissecting the Illinoian Till Plain.

0.3 48.9 Caution. Crossroad. Continue ahead.

1.3 50.2 Note the flatness of the Illinoian Till Plain.

0.2 50.4 Caution. Junction with New Douglas Road. Caution. No stop signs on either road.

1.2 51.6 Slow. Entering Sorento.

0.4 52.0 STOP. Turn left. Entering Sorento Business District.

0.1 52.1 Turn right (north).

0.1 52.2 Sorento Post Office on right.

0.1 52.3 Caution. Railroad. Junction of Nickel Plate and Chicago, Burlington, and Quincy Railroads.

0.4 52.7 T-road. Turn right.

0.3 53.0 Turn left (north).

0.5 53.5 Crossroad. Continue ahead on gravel road.

0.1 53.6 Note high knoll on left.

0.4 54.0 Turn right (east).

0.3 54.3 Stop 6. Quarry in Shoal Creek Limestone.

The great thickness of overburden is a major problem in the operation of this quarry. Most of the limestone produced here is used for agricultural lime. Limestone is one of the major sources of Illinois' mineral wealth. About 37 million tons were produced in the state in 1960, valued at nearly $51 million.

Section at the quarry is as follows, from top to bottom:

Pleistocene

5-6 feet loess
20 feet Illinoian Till

Pennsylvanian

9 feet gray fossiliferous shale

1 foot limestone coquina
4 inches gray shale
5 inches fossiliferous limestone
} --- This is known as the cap rock and is the best source of fossils.

1 foot gray shale
1½ foot dark gray to black shale
10 feet Shoal Creek Limestone
1-2 feet black fissile shale exposed in sump area at north end of quarry.

The best collecting is at the top of the quarry, and there is no need to enter into the pit area. The bedrock is Upper Pennsylvanian in age. Fossils which may be found here include:

Pelecypods

Aviculopina
Myalina
} --- clams

Pecten --- scallop

Brachiopods

Composita
Productids
Marginifera
Hustedia
Neospirifera
Punctospirifera

Gastropods --- not abundant

Crinoids --- numerous fragments

Trilobites --- rare

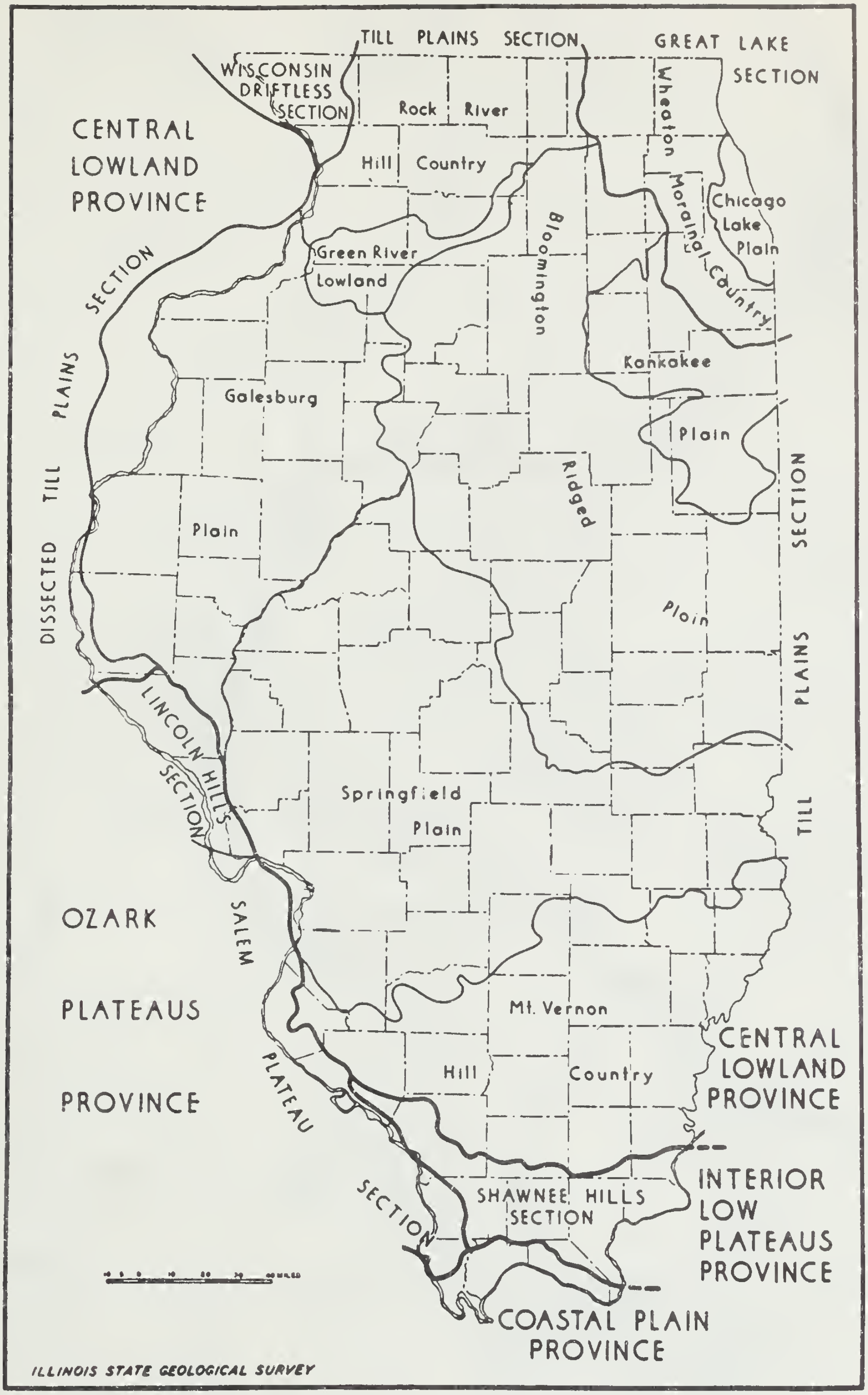
End of Field Trip
See you in the Spring. Happy New Year!

GEOLOGICAL COLUMN - Greenville Area

ERAS		PERIODS		EPOCHS	REMARKS
Cenozoic "Recent Life"	Age of Mammals	Quaternary		Pleistocene	Recent post-glacial stage Wisconsinan Loess Illinoian glacial drift Kansan glacial drift Nebraskan glacial drift
		Tertiary		Pliocene Miocene Oligocene Eocene Paleocene	Not present in Greenville area
Mesozoic "Middle Life"	Age of Reptiles	Cretaceous			Not present in Greenville area
		Jurassic			Not present in Illinois
		Triassic			Not present in Illinois
Paleozoic "Ancient Life"	Age of Amphibians	Permian			Not present in Illinois
		Pennsylvanian	Group	McLeansboro	Shoal Creek Limestone
				Kewanee	Herrin Limestone and No. 6 Coal at depth
				McCormick	Present at depth sandstone and shale
		Mississippian		Chesterian (Upper Mississippian)	Sandstone, limestone, and shale in deep wells
				Valmeyrian (Middle Mississippian)	Limestone, shale, and sandstone at depths
				Kinderhookian (Lower Mississippian)	Limestone, shale, and sandstone at depths
	Age of Fishes	Devonian			Black shale and limestone in deep wells. Some small sand bodies.
	Age of Invertebrates	Silurian			Limestone at depth
		Ordovician			Shale, limestone, and sandstone at depth
		Cambrian			No data available
Proterozoic Archeozoic		Referred to as "Precambrian" Time			No data available

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

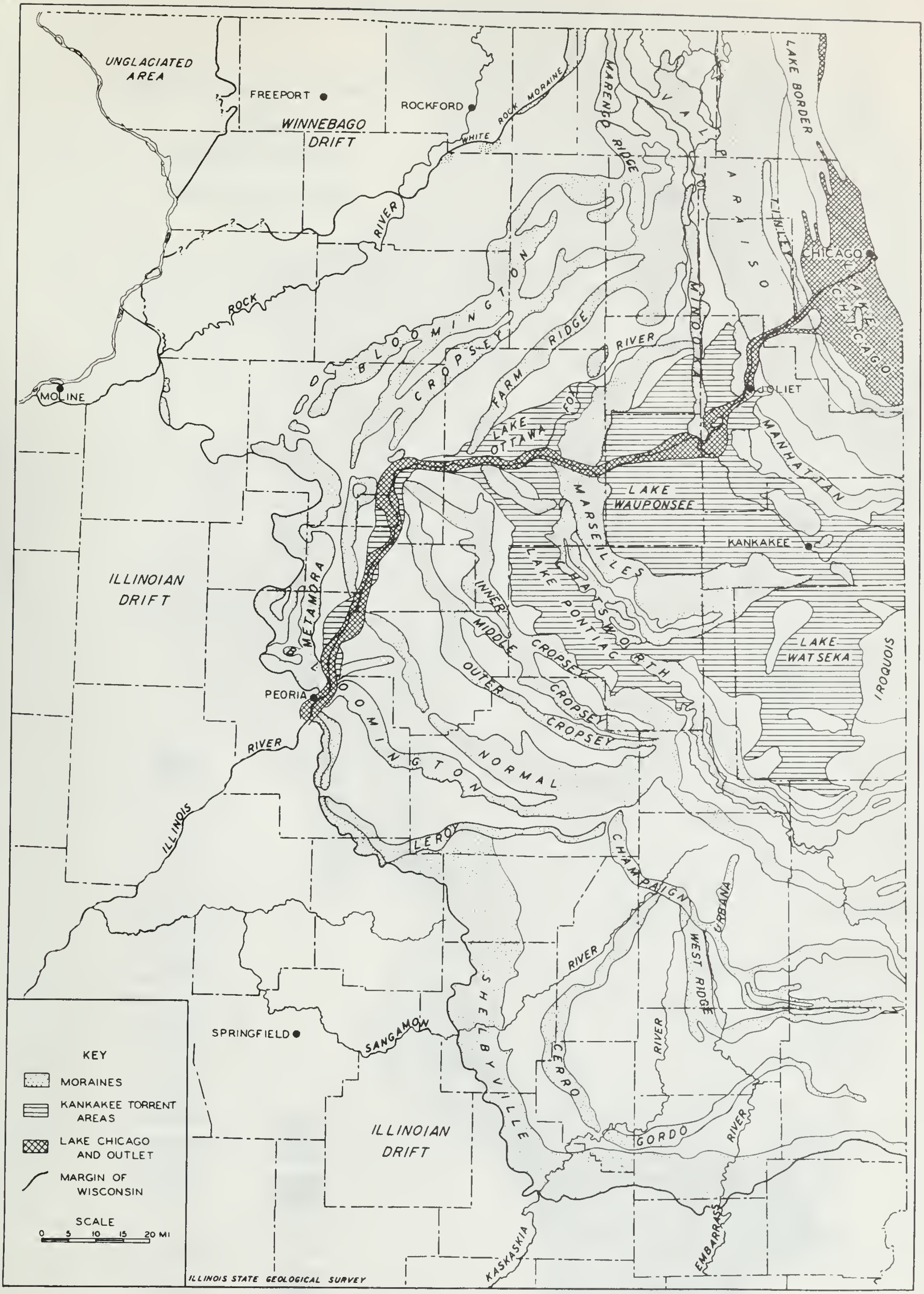
Stage	Substage	Nature of Deposits	Special features
Recent		Soil, youthful profile of weathering, lake and river deposits, dunes, peat	
Wisconsinan	5,000 yrs. Valderan 11,000 yrs.	Outwash	Glaciation in northern Illinois
Wisconsinan	Twocreekan 12,500 yrs.	Peat, alluvium	Ice withdrawal, erosion
Wisconsinan	Woodfordian 22,000 yrs.	Drift, loess, dunes lake deposits	Glaciation, building of many moraines as far south as Shelbyville, extensive valley trains, outwash plains, and lakes
Wisconsinan	Farmdalian 28,000 yrs.	Soil, silt and peat	Ice withdrawal, weathering, and erosion
Wisconsinan	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	
	Lovelandian (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	



PHYSIOGRAPHIC DIVISIONS OF ILLINOIS

(Reprinted from Illinois State Geological Survey Report of Investigations 129, "Physiographic Divisions of Illinois," by M. M. Leighton, George E. Ekblaw, and Leland Horberg)

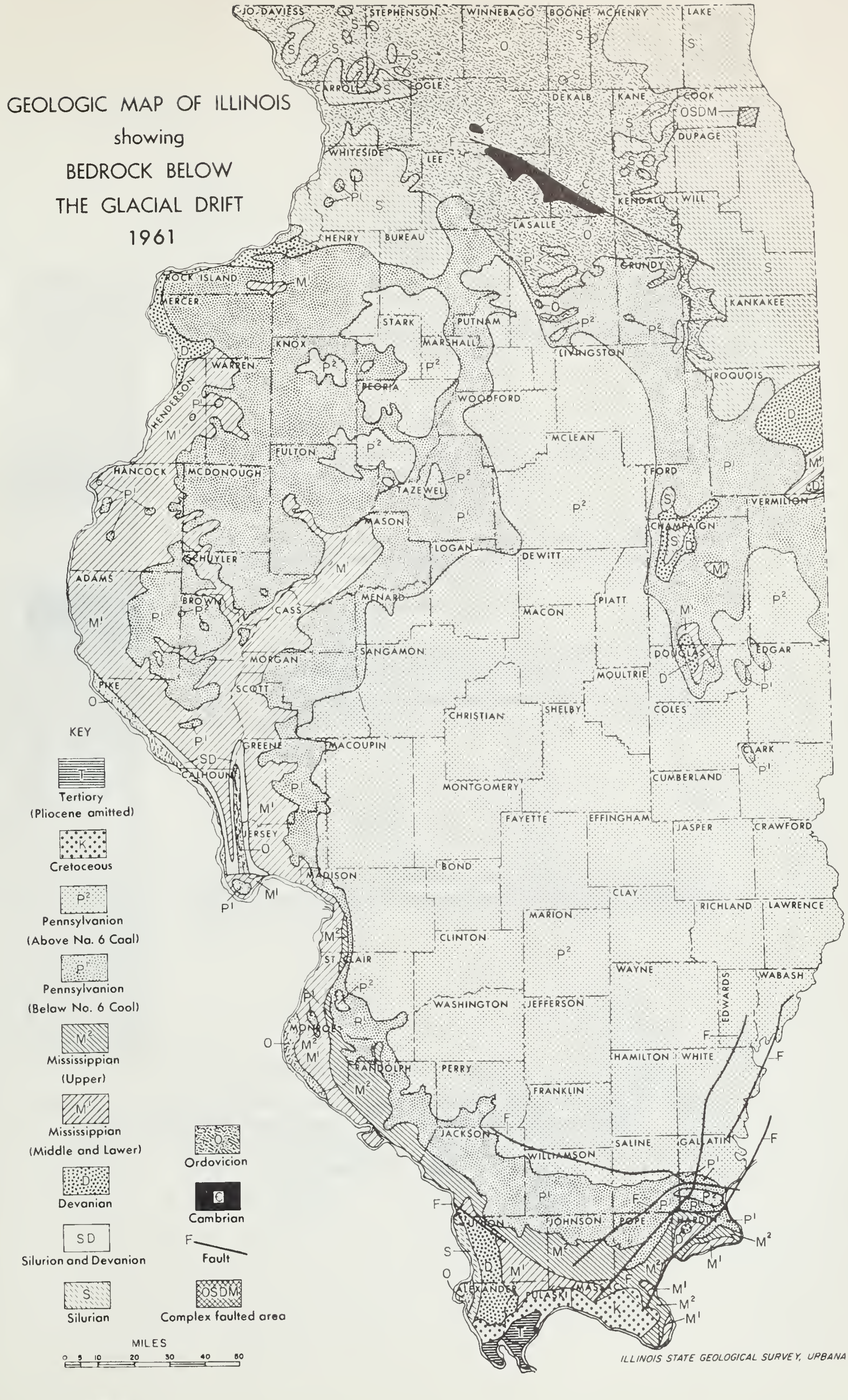
(47669—15M—11-61)



GLACIAL MAP OF NORTHEASTERN ILLINOIS

GEORGE E. EKBLAW
Revised 1960

(47669—15M—11-61)



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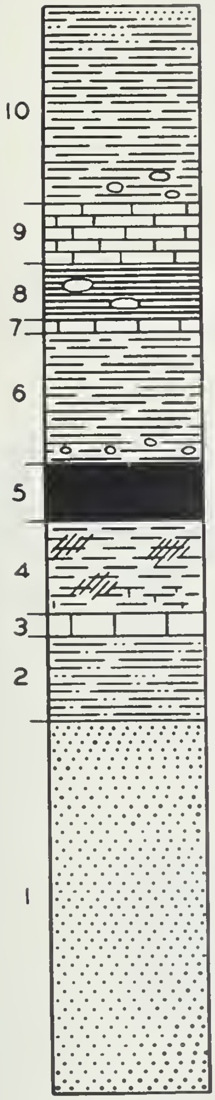


Shale, gray, sandy at top; contains marine fossils and ironstone concretions especially in lower part.

Limestone; contains marine fossils.

Shale, black, hard, laminated; contains large spheroidal concretions ("Niggerheads") and marine fossils.

Limestone; contains marine fossils.

Shale, gray; pyritic nodules and ironstone concretions common at base; plant fossils locally common at base; marine fossils rare.

Coal; locally contains clay or shale partings.

Underclay, mostly medium to light gray except dark gray at top; upper part noncalcareous, lower part calcareous.

Limestone, argillaceous; occurs in nodules or discontinuous beds; usually nonfossiliferous.

Shale, gray, sandy.

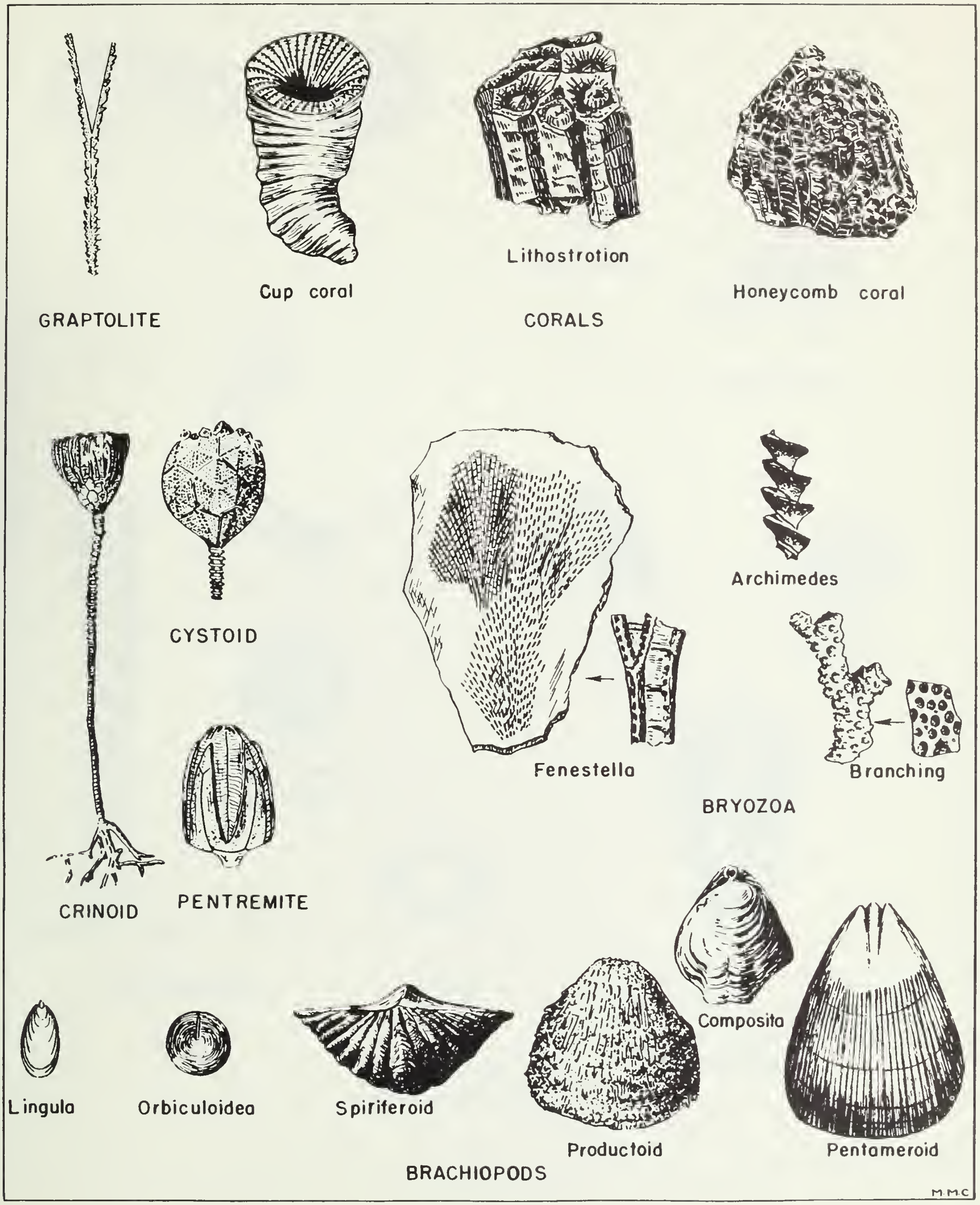
Sandstone, fine-grained, micaceous, and siltstone, argillaceous; variable from massive to thin-bedded; usually with an uneven lower surface.

AN IDEALLY COMPLETE CYCLOTHEM

(Reprinted from Fig. 42, Bulletin No. 66, Geology and Mineral Resources of the Marseilles, Ottawa, and Streator Quadrangles, by H. B. Willman and J. Norman Payne)

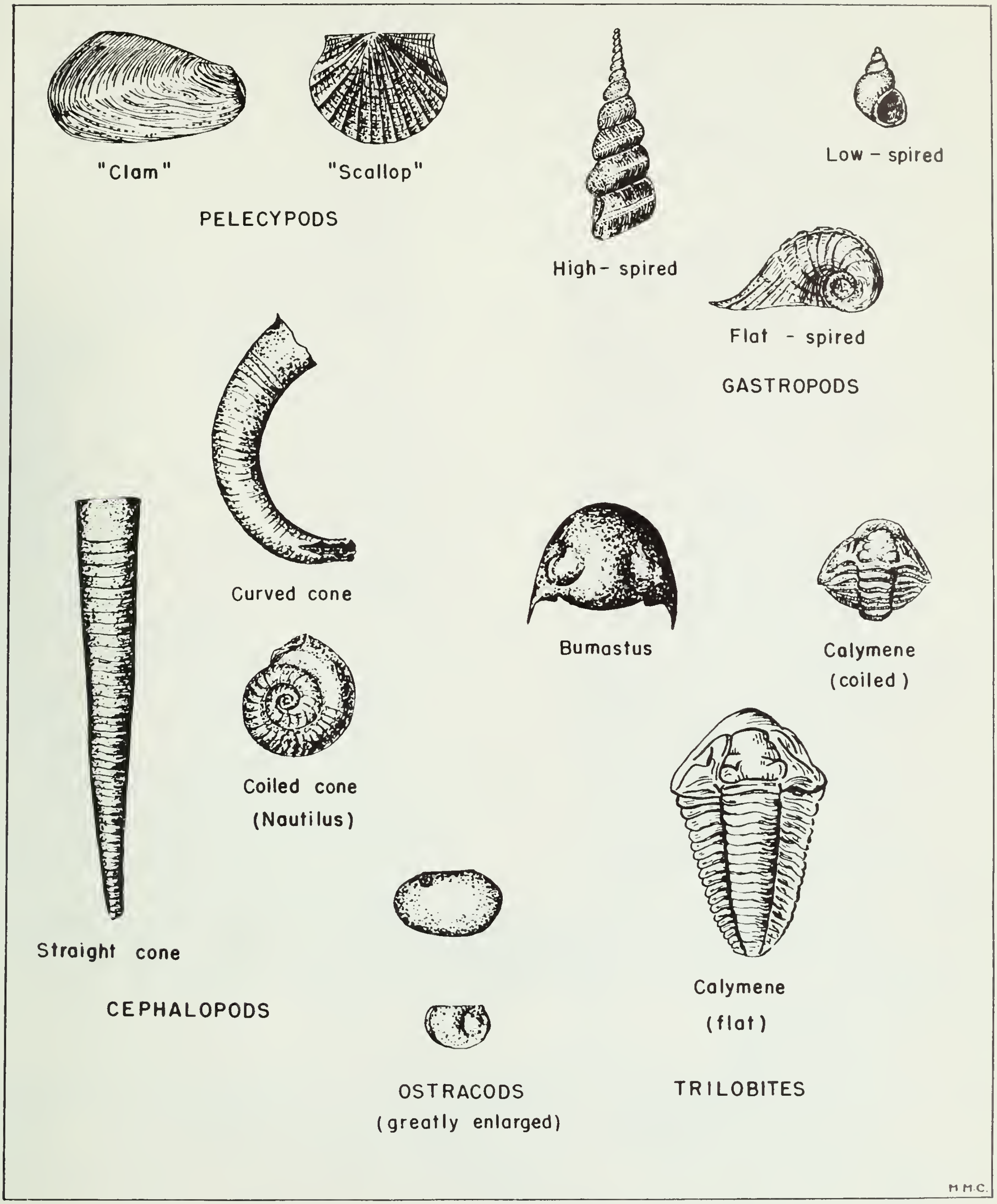
(47669—15M—11-61)

COMMON TYPES of ILLINOIS FOSSILS



(55757—25M—5-62)

COMMON TYPES of ILLINOIS FOSSILS



(55757—25M—5-62)