STATE OF ILLINOIS
DEPARTMENT OF REGISTRATION AND EDUCATION
STATE GEOLOGICAL SURVEY DIVISION

Morris M. Leighton, Chief

PARIS AREA

Paris Quadrangle

Guide Leaflet 51-B

by
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Urbana, Illinois
April 21, 1951

PART I. ITINERARY

0.0 0.0 Caravan assembles facing south on west side of Paris High School.

0.3 0.3 Stop Sign. Cross Routes 16 and 133.

0.2 0.5 R.R. Crossing.

0.2 0.7 Turn left (E) at Paris Bible Church.

0.1 0.8 Stop Sign. Turn right (S) on Route 1.

0.4 1.2 Leave Paris. For next $2\frac{1}{2}$ miles route is over very gently rolling Wisconsin Till Plain.

2.4 3.6 Country becomes rougher as Shelbyville Moraine belt is entered.

1.0 4.6 Turn left (E) on gravel road on summit of Shelbyville Moraine.

0.2 4.8 STOP NO. 1. On Shelbyville Moraine. View south over flat Illinoian Till Plain, entrenched by stream valleys.

During the Ice Age (Pleistocene Period), continental glaciers advanced into Illinois at four distinct times, each invasion being separated by a mild climate interval measurable in hundreds of thousands of years.

The last three of the four glacial advances passed over the site of Paris. Each of these glaciations, when the ice melted away, left a thick accumulation of clay, sand, pebbles, cobbles and boulders over the landscape. The earliest of these "glacial drift" accumulations, left by the Kansan glacier, has been removed or buried by later glaciations. The middle of the three invasions, the Illinoian, extended over almost the entire state, and the surface of this old glacial drift plain can be seen stretching to the southern horizon.

The last or Wisconsin glaciation covered roughly the northeastern quarter of Illinois. We stand here on the terminal moraine, a high and irregular-surfaced ridge that marks the limit of the ice advance. Thus the country to the north was once covered by the Wisconsin glacier, the area to the south was not, and a wall of ice hundreds, possible thousands, of feet thick, stood along the line of the ridge called the "Shelbyville Moraine."

Although the ice front here remained stationary for a long time, the ice mass itself was constantly moving forward. The line was stabilized because the rate of ice-melting was balanced by the rate of forward motion of the ice. Thus great quantities of mud, sand, and rock, carried or shoved by the glacier, were liberated here over a long period of time. At the end of this long period of stalemate, the glacier finally melted away and the high ridge of glacial drift, or "till," was left behind.

Today the moraine exists as a belt of wooded hills between great plain areas to north and south. These Wisconsin and Illinoian till plains, respectively, are much alike but have certain differences.

The Illinoian plain is extremely flat, the Wisconsin very gently rolling. The Illinoian plain is more dissected, by deeper stream valleys, because, being older, it has been longer subjected to stream erosion. The soils under the Illinoian plain are on the average less fertile because, being older, they have suffered more leaching action by rain waters descending into the soil. This has greatly reduced the lime content of the soils, which the wise agriculturalist is restoring by adding agricultural lime to his fields.

0.0 4.8 Continue ahead (SE).

1.9 6.7 Ford over Clear Creek.

0.1 6.8 STOP NO. 2. Glacial Drainage in Valley of Clear Creek.

When a continental glacier melts, it liberates two things in great quantity, water and debris, ranging from clay to large boulders. When running water comes in contact with rock debris, it sets about to sort and stratify this debris, separating clay from sand and gravel, and commonly leaving the boulders behind as too heavy to carry.

Clear Creek lies on the site of an old valley, carved deep in the bedrock long before the Glacial Period. Although this valley had been filled by glacial debris after the coming of the ice, it persisted as a shallow depression in the till sheet.

When the glacier, beginning its retreat, released great volumes of water, this water broke through a low place where the moraine crossed the old valley. Because it was carrying a great load of sediment, the torrent dropped sand and gravel over its valley floor to a considerable thickness.

Toward the end of the Glacial Period, when the ice front lay in the Great Lakes Region, the Wabash River carried a great flood of water from the north and deepened its valley. This caused the tributaries, including Clear Creek, to begin deepening their valleys also. Thus today the creek is flowing 20 to 30 feet below its glacial level and has cut a narrow channel down through the "outwash" gravel into the old Illinoian till below. A few hundred yards down the creek, a steep cut bank shows, below gravel, a steep till face that is leached and oxidized to buffy above but retains the gray of the fresh till below.

In the bars of the creek, cobbles that have been washed out of the glacial till tell us much of the history of the glacier's travels from the far north. A large proportion among the cobbles are crystalline rocks, of Pre-Cambrian age, whose outcrops are in the far north around the upper Great Lakes and Canada. The cobbles afford an excellent opportunity for study of igneous and metamorphic rocks, in a region where only sedimentary strata now come to the surface.

0.0 6.8 Continue ahead (E).

0.6 7.4 STOP NO. 4. To note V-shaped valleys of ravines cut in moraine flanks. Such valleys are typical of youthful erosion, in this case where dissection of the moraine by present erosive agencies is active.

0.5 7.9 Caution. Blind overpass over R.R.

0.1 8.0 Junction-blacktop road. Turn right (SE).

0.2 8.2 Junction; fork left (E) and continue on ridgetop.

1.1 9.3 Junction; fork left (E) and continue on ridgetop.

1.3 10.6 STOP NO. 4. El Bridge Oil Field.

Deepest wells here go down nearly 2000 feet into Devonian Limestone. However, most of the oil is coming from higher and younger, porous Mississippian limestone (McCloskey) at around 950 feet below the surface. A sand low in the Pennsylvanian strate produces some oil at 760 feet.

The field was discovered in 1949 and since then has produced a half million barrells of oil from 37 wells. At present the pool produces about 1000 barrels of oil per day. Nearly all of the wells were drilled by National Associated Petroleum Company. The field now yields large quantities of salt water along with the oil, which liquids are separated in the high vertical separating cylinders ("gun-barrels"). The salt water is returned under ground through special "disposal wells" or run out into ponds to evaporate or filter into non-agricultural soil, and the oil run into the small tank batteries.

The rock structure responsible for the accumulation of the oil here is a dome in the strata, possibly over the core of an ancient coral reef. Oil, when it slowly separates from the salt water with which it is originally mixed, being lighter, rises into high places in the porous layer, such as the present dome. The hill on which the wells are located, being of glacial origin, has nothing to do with this dome, which term expresses merely the attitude of the bedrock layers, not their topography.

0.0 10.6 Continue ahead (SE).

0.3 10.9 Turn left (N) and descend moraine crest.

1.5 12.4 Cross Sugar Creek.

0.4 12.8 4-Way corners; turn left (W).

0.5 13.3 Cross Sugar Creek.

0.9 14.2 Note cut banks along McCalls Branch to left. These are in Wisconsin (Tazewell) Glacial Till. Recent landslides, including mature trees, is evidence of present rapid cutting by stream.

1.7 15.9 NEVINS. Turn right (NW) on old blacktop.

0.9 16.8 R.R. Crossing.

1.5 18.3 R.R. Crossing.

3.3 21.6 Stop Sign. Cross Route 150 and continue ahead (N) on High Street in PARIS.

4 22.0 Double Stop Signs. Continue ahead (N).

2 22.2 Stop Sign. Continue ahead (N).

3 22.5 R. R. Crossing.

4 22.9 EDGAR CEMETARY. Continue ahead (N).

8 23.7 4-Way Corners; turn left (W) following high tension line.

4 24.1 Stop Sign. Cross Routes 1 and 150, and continue ahead (W), past cemetary.

2 24.3 Turn right (N) on east side of ball park.

3 24.6 Enter TWIN LAKES PARK - LUNCH STOP.

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0 24.6 Reverse route and return to Highway 1 and 150, cross same and continue ahead (E).

4 25.0 4 Corners; continue ahead (E).

4 25.4 Cross Sugar Creek.

1 26.5 3-Way corners; turn right (S).

9 27.4 Turn left (NE) on narrow brick pavement.

9 28.3 Turn half right onto red road.

9 29.2 Lanes Branch School; continue ahead 2 miles.

9 31.1 Cross Coal Creek.

2 31.3 Turn right (S) at Little Grove Church.

2 31.5 Cross Coal Creek.

1 31.6 STOP NO. 5. Roadcut south of Coal Creek.

Principal exposure in the roadcut is of Wisconsin glacial till consisting of cobbles, pebbles, and sand in gray to buffy clay.

The basal few feet of the cut, however, exposed brown to greenish black gumbotil of Illinois age. The gumbotil developed from till through the chemical action of descending groundwater during the more than 100,000 years interval between Illinoian and Wisconsin glaciations. In this process pebbles of nearly all types of rock have been dissolved away and much colloidal material has been redeposited to give the clay its waxy appearance.

Between the till above and the gumbotil below is a one foot band of dark mucky soil with streaks of waterlaid sand. Near the top of this "Sangamon" soil zone and immediately below the Wisconsin till are embedded numerous small tree trunks from a forest that evidently was overwhelmed by the advancing Wisconsin (Tazewell) glacier.

Note that many of the pebbles in the glacial till are striated as a result of grinding action when they were embedded in the ice.

)0 31.6 Continue ahead (S).

)3 31.9 Junction, 3-Way. Turn left (E).

10 32.9 Jog; continue ahead (E).

10 33.9 Junction, 4-Way; turn left (N).

:4 34.3 STOP NO. 6. Pennsylvanian bedrock exposures along Coal Creek.

The strata which include Illinois valuable coal seams were deposited in Pennsylvanian Time, well over 200 million years ago. At a time when very high mountains were rising along the present Atlantic Coast, Illinois was part of a great swampy lowland, sometimes a flood plain or delta area of great streams flowing from the mountains westward to the sea, sometimes inundated by the waters of the western sea, sometimes everglade-like swamps covered with dank vegetation where our coal bed generated.

Because of this shift in environments as the land sank with extreme and irregular slowness, we find an alternation of layers of different kinds of rocks: sandstones from river channels and delta fans, shales and clays from alluvial mud flats, black slatelike shales from stagnant brackish coastal lagoons, coal beds from great freshwater swamps, and limestones full of the fossil remains of animals that lived in the shallow arms of the sea. These different environments commonly succeeded each other in regular cycles.

Prominent in the road ditch is a thick limestone bed (Shoal Creek Limestone), containing black pebbles of phosphatic matter and occasional large scallop-like sea shells. Below this is some 20 feet of green shale with harder silty bands.

Farther down the Creek (and not being visited at this time), a lower limestone (Trivoli Limestone) outcrops. This thin and varied limestone band is made up largely of fragments of shells and corals, including brachiopods (especially Marginifera), cup corals, crinoid joints and plates, small gastropods (snails), and parts of trilobites. The limestone is cross-bedded, showing it to have been deposited as a lime-sand in shallow water.

Below the limestone is about a foot of dark shale, then about a foot of black slaty shale ("roof slate"), then about 14 inches of coal, on an underclay that grades downward into green shale. The green shales, both above and below the Trivoli limestone have limey concretions and nodules which wash out of the clay-shale and show a shining brown surface.

.0 34.3 Continue ahead (N).

.6 35.9 Stop Sign. Turn half right on narrow pavement.

.2 36.1 Hunter School. Valley on left has outcrops of Pennsylvanian shale, lying between Shoal Creek and Trivoli limestones.

.5 37.6 Indiana State Line; road curves to due east.

.4 38.0 R. R. Crossing. Enter BLANDFORD.

.3 38.3 Stop. Turn left (N) on Indiana Route 71.

.0 39.3 Coal Mine on right. This is shaft mine in No. 5 Coal Bed, which is also mined on Illinois side of state line.

.2 39.5 Cross Brouillett Creek.

.9 40.4 WEST CLINTON (R.R. yards) turn right (E).

.7 41.1 Stop No. 7, Strip Mine in Coal No. 7.

When coal is mined underground, it is generally necessary to leave at least 50% of the coal behind as pillars. When the coal seam comes reasonably close to the surface, it is possible to recover all of the seam by strip-mining. In this process giant shovels strip away the earth and rock (glacial drift and Pennsylvanian strata) from above the coal, and a smaller shovel loads the coal onto motor trucks. It is a rule of thumb (not completely accurate) that the miners can afford to strip ten feet of earth for every foot of coal in the seam. Thus if the coal bed were 6 feet thick it could profitably be strip mined when it comes within 60 feet of the surface.

In the present pit, water covers most of the coal measures strata including the coal bed itself, and only a limited thickness of Pennsylvanian shale shows beneath a heavy cover of leached and oxidized glacial till.

Note that pine seedlings have been planted on the strip piles, in the interest of forestation and the development of timber resources on the mined-out land. In many areas when the piles are leveled off, the land proves to be suitable for crops of many kinds, because the mixture of several rock formations, from below the leached zone in the soil profile, provides a variety of fresh minerals.

0.1 41.2 Make U-turn and return to W. Clinton.

0.8 42.0 Stop Sign. Turn left (S) on Indiana Route 71.

1.5 43.5 Turn right (W) on blacktop road.

0.3 43.8 R. R. Crossing.

0.3 44.1 Curve; enter Illinois.

1.7 45.8 3-way corners; turn left (S).

0.1 45.9 3-way corner; turn right (W).

3.1 49.0 STOP NO. 8. West of St. Aloysius Church.

Quarry here is in a marine limestone (Livingston Limestone) that lies some scores of feet higher than the Shoal Creek limestone of Stop No. 6 (at that place, the Livingston limestone had been removed by erosion).

The limestone here is thick enough to quarry (13 feet) for aglime and road stone. Most of the rock is highly fossiliferous, especially in the vicinity of the shale band, three and one half feet below the top.

In the Creek bank, below the quarry, may be seen 7 inches of soft greenish gray clay shale below the limestone, under which is $2\frac{1}{2}$ feet of black slaty shale (roof slate). Below the roof slate is a 4 inch coal band on typical underclay (fire clay). Farther down stream a considerable thickness of gray green shale appears below the underclay.

Thus, although the coal seam is not of commercial value, it has the same associated strata as most of the commercial seams, namely an underclay below and a roof slate, shale, and marine limestone above.

The fossils in the limestone include crinoid stems and brachiopods (especially Marginifera and Composita) in greatest abundance, but also corals, bryozoa (moss animals), gastropods (snails), trilobites, and fish bones.

End of Conference - Bon Voyage!

(To return to Route 1/150, go due west 2 miles, jog right 0.2 miles, and go west two more miles. To go to Paris, turn south (left) next corner, go south $2\frac{1}{2}$ miles, and follow narrow pavement SW into Paris.)

PART II. GEOLOGICAL HISTORY OF PARIS AREA.

ORIGIN OF THE BEDROCK

Although all of the bedrock strata which crop out in Edgar County are of Pennsylvanian age, wells drilled to a depth of over 2,000 feet pass through older rock layers of Mississippian, Devonian, Silurian, and Ordovician age (see Geological Column). Wells in other parts of Illinois pass below the Ordovician through many hundreds of feet of limestone, shale, and sandstone of Cambrian age, and a few have reached the "granite basement."

This "granite basement" of pre-Cambrian age is made up of very old and very hard crystalline rocks such as granite, gabbro, basalt, porphyry, gneiss, schist, and quartzite Some of these rocks were originally sediments that were twisted and exposed to great heat and pressure during mountain building movements. Others, originally molten, cooled and crystallized deep in the crust, or flowed out onto the surface as lava.

When the last mountain building period was over, erosion working through an immense period of time, beveled the hard rocks to a nearly plane surface, close to the level of the sea. For the next two hundred million years, shallow seas much of the time covered what is now Illinois. In them were deposited layer upon layer of lime mud with lesser proportions of sand and mud. The ancient sea animals left their hard parts behind in the limestone, sandstone, and shale strata that resulted.

COAL PERIOD HISTORY

By Pennsylvanian time, conditions had changed to the extent that the bulk of the strata were laid down inside the coast line as fresh water deposits, with only occasional incursion of the sea. The conditions which brought this about are described under STOP NO. 6.

The life in the ancient coal swamps represented the first period in earth history when animals conquered the land and learned to live in air rather than in sea water. (Plants had begun this movement earlier, in the Devonian Period.)

In the dense forests of fern, rush, and club moss trees, the most spectacular animals were the giant amphibians (rather like immense salamanders) and the earliest of reptiles, of lizard shape. The air was dominated by dragon flies with a wing spread of over two feet, and on the ground crawled cockroaches, spiders and centipedes. Various crustacea, rather shrimplike, and horseshoe crabs lived in the fresh water pools and swamps. The nature of the sea life is suggested by the fossils found in the marine limestones described under Stops 6 and 8.

LONG INTERVAL OF EROSION.

After the Coal Period, no sea returned to this part of Illinois and the land lay at a moderate elevation above sea level, probably about as it does today. Erosion carved the region into broad valleys with subdued uplands between. The Paris Area in those days lay in an upland area between large valleys to north, west, and south. It is only logical to assume that the dinosaurs of the Mesozoic and the Mammalian herds of the Tertiary once roamed over the uplands of Edgar County. But

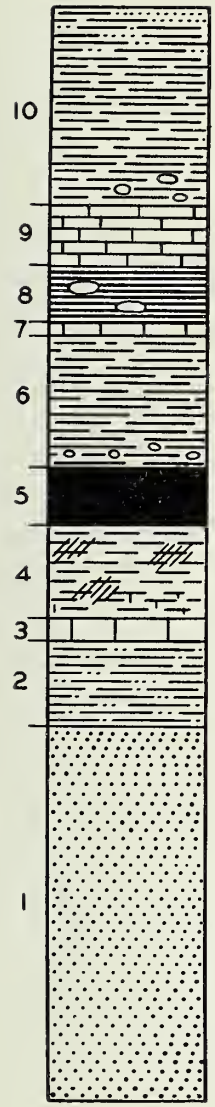
because the region was being eroded and no permanent rockforming sediments were being laid down, these creatures left their bones to moulder away in the sun and the rain of that dryland surface.

ICE AGE HISTORY.

The next great event that left deposits behind whereby we may read the story of past events was the glaciation of Pleistocene Times. As was discussed at STOP NO. 1, this advance of the glaciers from the far north was not a single incident but a series of four glacial invasions separated by very long intervals of milder climate like that of the present. In fact, we have no assurance that the present period is not just one more interglacial stage. But since the last of the glaciers melted away considerably less than 20,000 years ago, and since the shortest of the interglacial periods endured for over 100,000 years, there is no immediate cause for concern.

PART IV. GEOLOGICAL COLUMN - PARIS AREA

ERAS		PERIODS	EPOCHS	REMARKS
Cenozoic "Recent Life"	(Age of Mammals)	Quaternary	Pleistocene	Exposed in Paris Area: Recent post-glacial stage Wisconsin glacial stage Illinoian glacial stage.
		Tertiary	Pliocene Miocene Oligocene Eocene Paleocene	Not present in Paris area.
Mesozoic (Middle Life"	(Age of Reptiles)	Cretaceous		Not present in Paris area.
		Jurassic		Not present in Illinois.
		Triassic		Not present in Illinois.
Paleozoic "Ancient Life"	Age of Amphibians and Larly Plants	Permian		Not present in Illinois.
		Pennsylvanian	McLeansboro	Livingston, Shoal Creek, and Trivoli limestones, Coal #7 etc.
			Carbondale	Coal No. V in shaft mines.
			Tradewater	In deep wells only.
		Mississippian	Iowa (Lower Mississippian)	Limestones and shales in deep wells.
	Age of Fishes	Devonian		Dark shales and limestones in deep wells.
	Age of Invertebrates	Silurian		Magnesian limestones in deep wells.
		Ordovician		Maquoketa Shale, and Middle Ordovician Limestones, in deep wells.
		Cambrian		No data available.
Proterozoic Archeozoic		Referred to as "Pre-Cambrian" time		No data available.



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

9. Limestone; contains marine fossils.

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

7. Limestone; contains marine fossils.

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

5. Coal; locally contains clay or shale partings.

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

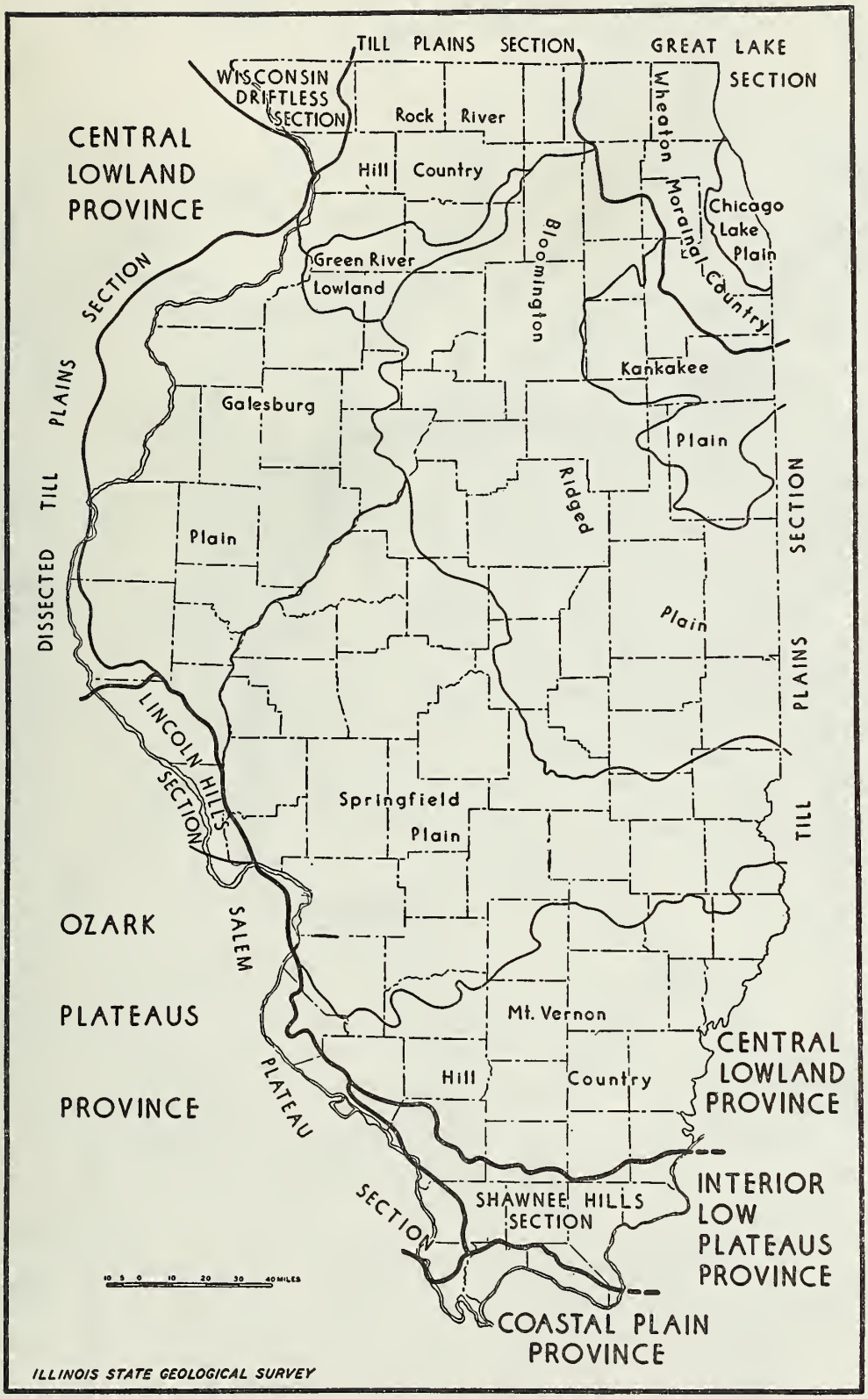
3. Limestone, argillaceous; occurs in nodules or discontinuous beds; usually nonfossiliferous.

2. Shale, gray, sandy.

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

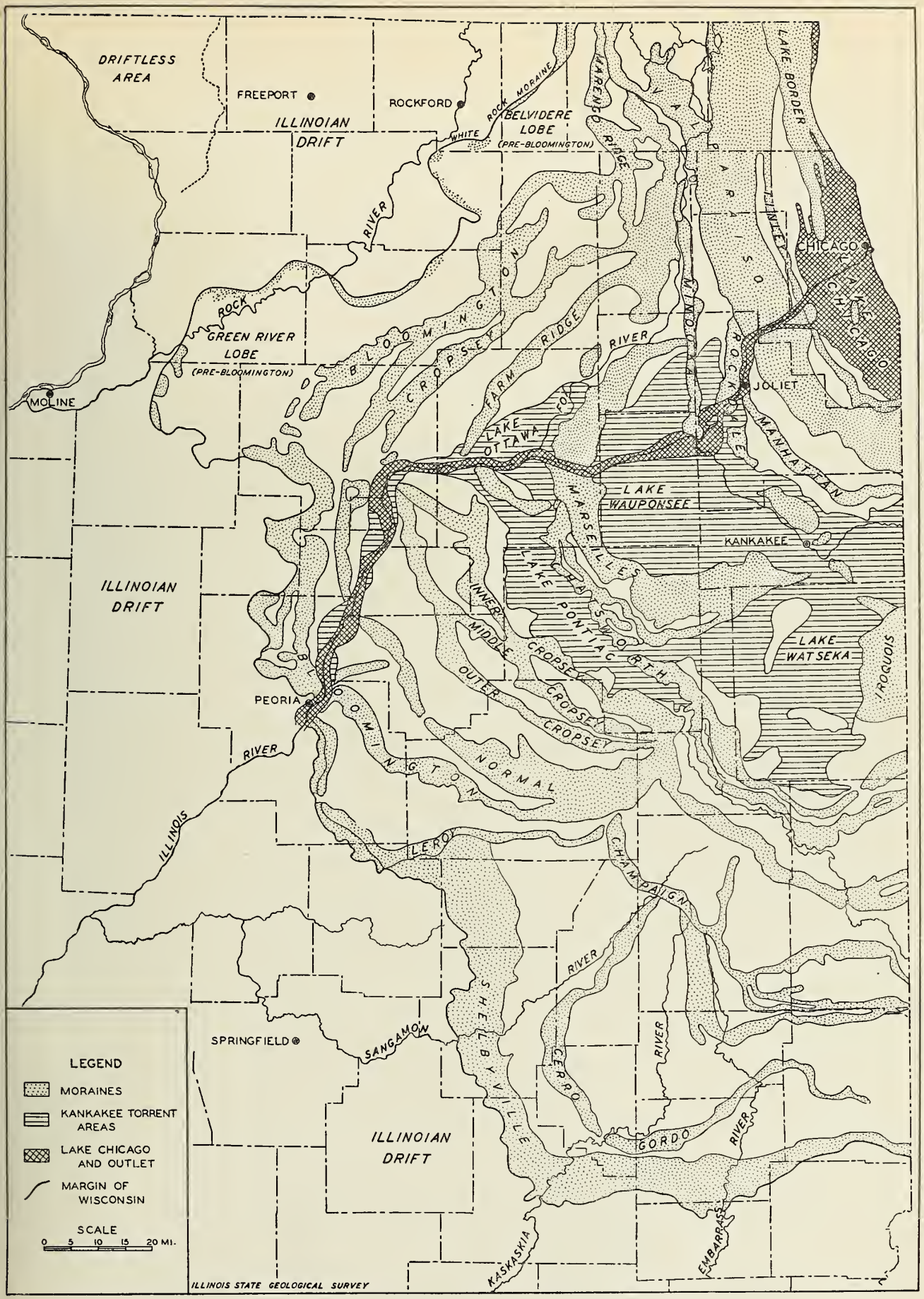
AN IDEALLY COMPLETE CYCLOTHEM

(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)



PHYSIOGRAPHIC DIVISIONS OF ILLINOIS

(Reprinted from Report of Investigations No. 129, Physiographic Divisions of Illinois, by M. M. Leighton, George E. Ekblaw, and Leland Horberg)



GLACIAL GEOLOGY IN NORTHEASTERN ILLINOIS
Compiled by George E. Ekblaw from data furnished by the Survey
January 1, 1942

(58691—5M—5-48)

BARKLEY

HEAVY WEIGHT

STOCK NO. 5412 1/3