PHYSIOGRAPHIC DIVISIONS OF ILLINOIS

by

M. M. LEIGHTON, GEORGE E. EKBLAW, and IELAND HORBERG

Reprinted from The Journal of Geology,
Vol. 56, No. 1, January, 1948

PRINTED BY AUTHORITY OF THE STATE OF ILLINOIS

URBANA, ILLINOIS

1948
ORGANIZATION

STATE OF ILLINOIS
HON. DWIGHT H. GREEN, Governor
DEPARTMENT OF REGISTRATION AND EDUCATION
HON. FRANK G. THOMPSON, Director

BOARD OF NATURAL RESOURCES AND CONSERVATION
HON. FRANK G. THOMPSON, Chairman
W. H. NEWHOUSE, Ph.D., Geology
ROGER ADAMS, Ph.D., D.Sc., Chemistry
LOUIS R. HOWSON, C.E., Engineering
A. E. EMERSON, Ph.D., Biology
LEWIS H. TIFFANY, Ph.D., Forestry
GEORGE D. STODDARD, Ph.D., Litt.D., LL.D., L.I.I.D.
President of the University of Illinois

GEOLOGICAL SURVEY DIVISION
M. M. LEIGHTON, Chief
SCIENTIFIC AND TECHNICAL STAFF OF THE
STATE GEOLOGICAL SURVEY DIVISION

100 Natural Resources Building, Urbana
M. M. LEIGHTON, Ph.D., Chief

ENID TOWNLEY, M.S., Assistant to the Chief
Velda A. MILLARD, Junior Assi. to the Chief

GEOLOGICAL RESOURCES
Arthur BEVAN, Ph.D., D.Sc., Principal Geologist in Charge

Coal
G. H. Cadw, Ph.D., Senior Geologist and Head
R. J. Heflin, M.S., Mech. Engineer
Robert M. Kosanke, M.A., Assoc. Geologist
John A. Harrison, B.S., Asst. Geologist
Jack A. Simon, M.S., Asst. Geologist (on leave)
Raymond Siever, M.S., Asst. Geologist
Mary E. Barnes, B.S., Asst. Geologist
Margaret PARKER. B.S., Asst. Geologist
D. Robert Scharer, B.F.A., Technical Assistant
CLARE O. GORDY, B.A., Technical Assistant

Oil and Gas
A. H. Bell, Ph.D., Geologist and Head
Frederick Squires, B.S., Petroleum Engineer
David H. Swann, Ph.D., Assoc. Geologist
Virginia Kline, Ph.D., Assoc. Geologist
Paul G. Luckhardt, M.S., Asst. Geologist
Wayne F. Meents, Asst. Geologist
Richard J. Cassin, B.S., Research Assistant
Nancy McDermott, B.S., Research Assistant

Industrial Minerals
J. E. Lamar, B.S., Geologist and Head
Robert M. Grogan, Ph.D., Assoc. Geologist
Raymond S. Schreiber, B.S., Research Assistant

Clay Resources and Clay Mineral Technology
Ralph E. Grim, Ph.D., Petrographer and Head
William A. White, B.S., Asst. Geologist

Groundwater Geology and Geophysical Exploration
Carl A. Bays, Ph.D., Geologist and Engineer, and Head
Robert R. Storm, A.B., Asso. Geologist
Merlyn B. Buhler, M.S., Assoc. Geologist
M. W. Pullen, Jr., M.S., Asst. Geologist
Gordon W. Prescott, B.S., Asst. Geologist
Robert N. M. Urson, B.S., Asst. Geologist
Margaret J. Castile, Asst. Geologic Draftsman

Engineering Geology and Topographic Mapping
George E. Eklaw, Ph.D., Geologist and Head
Richard F. Fisher, M.S., Asst. Geologist

Areal Geology and Paleontology
H. B. Willman, Ph.D., Geologist and Head
Heinz A. Lowenstein, M.A., Assoc. Geologist
J. S. Templeton, Ph.D., Assoc. Geologist

Subsurface Geology
L. E. Workman, M.S., Geologist and Head
Elwood Atherton, Ph.D., Assoc. Geologist
Paul Herbert, Jr., B.S., Asst. Geologist
Marvin P. Meyer, M.S., Asst. Geologist
Donald Scharer, B.S., Asst. Geologist
Robert C. McDonald, B.S., Research Assistant

Physics
R. J. Pierpont, Ph.D., Physicist Emeritus

Mineral Resource Records
Vivian Gordon, Head
Ruth R. Ward, B.S., Research Assistant
Dorothy F. Spencer, B.S., Technical Assistant
Mary Burnett, Technical Assistant
Harriet C. Daniels, B.A., Technical Assistant

GEOCHEMISTRY
Frank H. Reed, Ph.D., Chief Chemist
Grace C. Johnson, B.S., Research Assistant

Coal
G. R. Yohe, Ph.D., Chemist and Head
Ruth C. Wildman, M.S., Research Assistant

Industrial Minerals
J. S. Machin, Ph.D., Chemist and Head
Tin Boo Yee, M.S., Assistant Chemist
Paulene Eakman, B.A., Research Assistant

Fluorspar
G. C. Finger, Ph.D., Chemist and Head
Horst G. Schneider, B.S., Special Research Assistant
Robert F. Osterling, B.A., Special Research Asst.
Richard Blough, B.A., Research Assistant

Chemical Engineering
H. W. Jackson, M.S.E., Chemical Engineer and Head
P. W. Henline, M.S., Assoc. Chemical Engineer
B. J. Greenwood, B.S., Mechanical Engineer
James C. McCullough, Research Associate

X-ray and Spectrography
W. F. Bradley, Ph.D., Chemist and Head

Analytical Chemistry
O. W. Roes, Ph.D., Chemist and Head
L. D. McVicker, B.S., Chemist
Howard S. Clark, A.B., Assoc. Chemist
Emile D. Pierson, B.S., Research Assistant
Elizabeth Bartz, A.B., Research Assistant
Gloria J. Gilkey, B.S., Research Assistant
Wm. F. Loranger, B.A., Research Assistant
Ruth E. Koki, B.S., Research Assistant
Anabelle G. Elliott, B.S., Technical Assistant

MINERAL ECONOMICS
W. H. Voskuil, Ph.D., Mineral Economist
W. L. Busch, Research Associate
Nina Hamrick, A.M., Research Assistant
Ethel M. King, Research Assistant

EDUCATIONAL EXTENSION
Gilbert O. Raasch, Ph.D., Assoc. Geologist
Dorothy Ranney, B.S., Technical Assistant

LIBRARY
Anne E. Kovanda, B.S., B.L.S., Librarian
Ruby D. Frison, Technical Assistant

PUBLICATIONS
Dorothy E. Rose, B.S., Technical Editor
M. Elizabeth Staake, B.S., Assistant Editor
Miriam C. Calkins, Geologic Draftsman
Ardis D. Pye, Assistant Geologic Draftsman
Wayne W. Noffz, Technical Assistant
Leslie D. Vaughn, Assoc. Photographer
Beulah M. Unser, Technical Assistant

Consultants: Ceramics, Ralph K. Hurst, B.S., University of Illinois; Mechanical Engineering, Seichi Konzo, M.S., University of Illinois

Topographic Mapping in cooperation with the United States Geological Survey.

January 15, 1948
PHYSIOGRAPHIC DIVISIONS OF ILLINOIS

M. M. LEIGHTON, GEORGE E. EKBLAW, AND LELAND HORBERG

ABSTRACT

The classification proposes minor modifications in Fenneman's divisions and recognizes subdivisions of the Till Plains and Great Lakes sections, based largely on glacial features. The boundaries and characteristic features of the subdivisions are described, and their origin and relations to glacial features and bedrock topography are discussed.

INTRODUCTION

During the last sixty years increasing attention has been given to physiographic classification; and the broad outlines first conceived by W. M. Davis, J. W. Powell, and others have crystallized into a widely accepted classification for the United States. The establishment of this classification was due largely to comprehensive studies by the late N. M. Fenneman (1914, pp. 84–134; 1928, pp. 261–353; 1931; 1938). In these studies it was recognized that, with the progress of topographic and geologic mapping and the advances in geomorphic knowledge, numerous refinements and revisions would be made. It is the purpose of the present report to make such adjustments of Fenneman's regional boundaries in Illinois as are warranted by present information and to delineate smaller subdivisions which distinguish physiographic differences that can be shown on large-scale maps and which can be used in regional studies within the state (table 1 and fig. 1). These subdivisions, in turn, may be broken down later into still smaller units which may be used as a basis for description in quadrangle reports and other local studies. Local physiographic areas of this type have been described by F. M. Fryxell (1927, pp. 1–53) and by H. B. Willman (1942, pp. 31–37). In the present paper only the distinctive characteristics of the larger subdivisions are summarized.

The report is the outgrowth of geomorphic and glacial investigations carried on by Leighton since 1919, by Ekblaw since 1923, and of recent studies of the bedrock topography and subsurface Pleistocene deposits by Horberg. Copies of a preliminary draft of the map of physiographic divisions of Illinois were prepared in 1944 and furnished to the Committee on Drainage Basins and Flood Control of the Illinois Post-war Planning Commission and to the Illinois Legislative Flood Investigating Commission.

GENERAL DESCRIPTION AND REGIONAL RELATIONS

Illinois is essentially a prairie plain, and, compared with many other states, it presents few striking physiographic contrasts. The relief over most of the state is moderate to slight and is not sufficient to exert a marked effect on climate. Situated in the south-central part of the great Central Lowland (fig. 2) and near the confluence of major lines of drainage, it is the lowest of the north-central states. The mean elevation is about 600 feet above sea-level, compared with 700 feet for Indiana, 1,050 feet for Wisconsin, 1,100 feet for Iowa, and 800 feet for Missouri (Gannett, 1892, p. 289). The total relief of the state is 973 feet, the highest point, 1,241 feet above sea-level, being Charles Mound in the northwest corner of the state, and the
lowest point, 268 feet above sea-level, the
junction of the Ohio and Mississippi
rivers. The greatest local relief is near the
major valleys, especially within the
driftless uplands of northwestern and
southern Illinois, and reaches a max-
imum of 775 feet between Williams Hill,
1,065 feet above sea-level, and the Ohio
River Valley, 290 feet above sea-level, in
Plateaus, and Coastal Plain—lie almost
entirely outside the glacial boundary in
southern and southwestern Illinois.

FACTORS DETERMINING PHYSIOGRAPHIC
CONTRASTS

The physiographic contrasts between
various parts of Illinois are due to the
following factors and conditions: topog-

TABLE 1

Physiographic Classifications of Illinois

<table>
<thead>
<tr>
<th>Classification by Fenneman</th>
<th>Classification by Leighton, Ekblaw and Horberg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central Lowland province</td>
<td>Central Lowland province</td>
</tr>
<tr>
<td>Great Lake section</td>
<td>Great Lake section</td>
</tr>
<tr>
<td>{Till Plains section}</td>
<td>{Till Plains section}</td>
</tr>
<tr>
<td>Wisconsin Driftless section</td>
<td>{Kankakee Plain</td>
</tr>
<tr>
<td></td>
<td>{Bloomington Ridged Plain</td>
</tr>
<tr>
<td></td>
<td>{Rock River Hill Country</td>
</tr>
<tr>
<td></td>
<td>{Green River Lowland</td>
</tr>
<tr>
<td></td>
<td>{Galesburg Plain</td>
</tr>
<tr>
<td></td>
<td>{Springfield Plain</td>
</tr>
<tr>
<td></td>
<td>{Mount Vernon Hill Country</td>
</tr>
<tr>
<td></td>
<td>Dissected Till Plains section</td>
</tr>
<tr>
<td></td>
<td>Wisconsin Driftless section</td>
</tr>
<tr>
<td>Ozark Plateaus province</td>
<td>Ozark Plateaus province</td>
</tr>
<tr>
<td>{Lincoln Hills section</td>
<td></td>
</tr>
<tr>
<td>Salem Plateau section</td>
<td>Salem Plateau section</td>
</tr>
<tr>
<td>Interior Low Plateaus province</td>
<td>Interior Low Plateaus province</td>
</tr>
<tr>
<td>Shawnee section</td>
<td>Shawnee Hills section</td>
</tr>
<tr>
<td>Coastal Plain province</td>
<td>Coastal Plain province</td>
</tr>
</tbody>
</table>

Pope County of southern Illinois. The
local relief in most counties in the state,
however, is less than 200 feet.

Although large-scale relief features are
absent, the physiographic divisions of
the state are readily apparent and as-
sume great local significance. More than
nine-tenths of the state lies within the
Central Lowland, all of which is glaci-
ated except the Wisconsin Driftless sec-
tion in northwestern Illinois. The other
provinces—Ozark Plateaus, Interior Low

TOPOGRAPHY OF THE BEDROCK SURFACE

Recently acquired knowledge of the
topography of the bedrock surface of
Illinois, so widely obscured by the glacial
Fig. 1.—Physiographic divisions of Illinois, by Leighton, Ekblaw, and Horberg
Fig. 2.—Major physiographic divisions in central United States (after Fenneman)
deposits, emphasizes the great importance of this factor in the shaping of the broad physiographic features of the state (Horberg, 1946, pp. 179–192). Prior to glaciation an extensive lowland, eroded on the weak Pennsylvanian rocks of the Illinois basin, covered most of central Illinois. Bordering it on the north, west, and south were uplands that had been developed, for the most part, on the more resistant older Paleozoic limestones and dolomites. This ancient pattern is reflected to an important degree in the present land surface. The extensive lowland of central Illinois provided conditions for the thickest accumulation of glacial deposits and the development of the prairie plains of this portion of the state. The higher uplands of northwestern Illinois and of southern Illinois (the Shawnee Hills) prevented the further movement of the potent Illinoian glacial lobe and caused striking physiographic juxtapositions.

**EXTENT OF THE SEVERAL GLACIATIONS**

The effect of the extent of several glaciations is most apparent in the physiographic contrasts between the glaciated and nonglaciated areas of the state—the Wisconsin Driftless section and the bordering Rock River Hill Country in the northwest and the Shawnee Hills section and the Mount Vernon Hill Country in the south. This emphasis upon glaciation, however, should be modified by that measure of difference which already existed in the preglacial landscape. Even so, there is no denying the fact that a topographic revolution resulted from glaciation.

The successive superposition of younger drift-sheets upon older in some parts of Illinois and the deposition of only one drift-sheet in other parts also produced physiographic contrasts in the present topography (fig. 3). The bedrock control that characterizes the Mount Vernon Hill Country and most of the Rock River Hill Country is due to the fact that these regions have but one glacial mantle (the Illinoian), whereas the remainder of the glaciated area of the state was buried beneath either two or three drift-sheets. Nebraskan, Kansan, and Illinoian drifts are present in western Illinois, the first two from the Keewatin field; Kansan, Illinoian, Wisconsin, and possibly Nebraskan drifts from the Labradorian field are present in north-eastern Illinois; and Kansan and Illinoian drifts (Labradorian) are present in west-central and south-central Illinois.

**Differences in Glacial Morphology**

Two contrasting types of topography—the Wheaton Morainal Country and the Bloomington Ridged Plain—impressively illustrate differences in glacial morphology. When the Wheaton Morainal Country was formed, the ice lobe was more confined to the deep Lake Michigan basin, and the moraines are closely huddled together. In molding the Bloomington Ridged Plain, the glacier was more extensive and more widely radiating, and during its receding and readvancing substages it formed moraines widely spaced, alternating with nearly featureless ground-moraine plains. The moraines are also generally smoother than the bold moraines of the Wheaton Morainal Country.

**Differences in Age of the Uppermost Drift**

Physiographic contrasts have also been produced by differences in age of the uppermost drift, as in the case of the Bloomington Ridged Plain compared with the Springfield Plain or the Gales-
Fig. 3.—Diagram representing and bedrock surfaces, and (4) succession and structure of bedrock formations.

- Om — Maquoketa formation
- Og — Galena and Platteville formations
- Os — St. Peter sandstone

...
Diagrammatic cross section from Cairo north to Bloomington and thence northeast to Chicago, showing (1) physiographic divisions, (2) glacial deposits, (3) profiles of present and bedrock surfaces, and (4) succession and structure of bedrock formations. Note that the ratio of the vertical scale to the horizontal scale, 462:1, exaggerates the dip of the bedrock formations.

**KEY TO BEDROCK FORMATIONS**

- **T** — Tertiary system
- **K** — Cretaceous system
- **Pm2** — McLeansboro group, lower part
- **Pm** — McLeansboro group, upper part
- **Pv** — Caseyville group
- **Pe** — Carbondale group
- **Mc2** — Chester group, upper part
- **Mc** — Chester group, lower part
- **Pi** — Tradewater group
- **Me** — Osage group
- **Mm** — Meramec group
- **Mo2** — Maquoketa formation
- **Mm** — Marmora formation
- **Mc** — Maquoketa formation
- **Mt** — Maquoketa formation
- **Os** — St. Peter sandstone
- **Og** — Galena and Pliocene formations
- **Om** — Maquoketa formation
- **Og** — East and Pliocene formations
- **Oo** — St. Peter sandstone

ELEVATION IN FEET

0 50 100 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 5500 6000 6500 7000 7500 8000

APPROXIMATE HORIZONTAL SCALE

0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360 380 400 420 440 460 480 500 520 540 560 580 600 620 640 660 680 700 720 740 760 780 800 820 840 860 880 900 920 940 960 980 1000

SEA LEVEL
burg Plain. The more youthful age of the Bloomington Rridged Plain is responsible for the preservation of its glacial landscape; the greater age of the other two is responsible for their erosional features.

**HEIGHT ABOVE MAIN LINES OF DRAINAGE**

The effect of height above main lines of drainage on physiographic contrasts is the basic factor in the differentiation of the Galesburg Plain from the Springfield Plain. The Galesburg Plain is sufficiently higher above the Illinois River so that its valleys are more sharply incised than were those of the Springfield Plain, and they have different stream regimens.

**GLACIOFLUVIAL AGGREGATION OF A BASIN AREA**

The Green River Lowland is an example of the glaciofluvial aggradation of a basin area.

**GLACIOLACUSTRINE ACTION**

The Chicago Lake Plain is an example of glaciolacustrine action.

**PHYSIOGRAPHIC DIVISIONS**

**GREAT LAKE SECTION**

The Great Lake section of the Central Lowland province is separated from the Till Plains section to the south because of the bold encircling moraines of Lake Michigan basin, the greater prominence of lakes, and the extent of lacustrine plains in this area. In Illinois a purely topographic boundary between the two sections was drawn by Fenneman along “the outer edge of certain late Wisconsin moraines,” which, south of the Kankakee River, form “the western rim of the ‘Kankakee swamp . . . .’” (1928, p. 315). In this report the boundary is drawn as follows: Along the west border of the Tazewell Marengo ridge (fig. 4) and the Hampshire ridge south from the Wisconsin-Illinois state line to a point in central Kane County where the Elburn moraine turns westward and southwestward, easterly along an arbitrary topographic boundary to the Cary Valparaiso moraine in western Du Page County, along the outer edge of the Valparaiso moraine southward to the Will County line, and along the outer edge of the closely related Rockdale-Manhattan moraine southward and southeastward to the Indiana-Illinois state line. This boundary coincides, in general, with Fenneman’s. The only significant difference is in eastern Kankakee County, where the “Kankakee swamp” is excluded from the section, because the area is an alluviated glacial drainageway and lacks the characteristics of the true lacustrine plains found elsewhere in the section (Ekblaw and Athy, 1925, pp. 417-428). A similar revision of the boundary in the adjoining part of Indiana is implied.

The section is subdivided into the Wheaton Morainal Country and the Chicago Lake Plain, the boundary being marked by the highest (Glenwood) shoreline of glacial Lake Chicago.

**Chicago Lake Plain.**—The Chicago Lake Plain is the well-known featureless “prairie” of early writers of the area. It is characterized by a flat surface, underlain largely by till, which slopes gently lakeward and is interrupted by low beach ridges, morainic headlands and islands, and by two large glacial drainageways along the Des Plaines River and Sag Channel (Bretz, 1939, pp. 43-59). The beach ridges include well-developed spits and bars, which parallel the lake shore or funnel southwestward toward the outlet channel along the Des Plaines River. Blue Island, a prominent morainic island, is situated just east of the outlet channel and rises about 50 feet above
Fig. 4.—Glacial map of northeastern Illinois
the plain. Dunes, which are so conspicuous along the lake shore farther east, are scarcely recognizable and are found in only a few scattered localities.

Originally much of the lake plain was swampy and poorly drained. Its three rivers—the Chicago, the Calumet, and the Des Plaines—are without true valleys and have courses determined largely by beach ridges.

Wheaton Morainal Country.—The Wheaton Morainal Country is characterized by glaciated morainic topography (mostly of the Cary substage), which is more complex in detail and has more lakes and swamps than do the open stretches of the adjoining Bloomington Ridged Plain. It includes a series of broad parallel morainic ridges, which encircle Lake Michigan. In detail the topography is complicated by a variety of elongated hills, mounds, basins, sags, and valleys. The area is dominated by the Valparaiso moraine, which has the highest elevation and, except where interrupted by valleys, is continuous from Wisconsin to Indiana. With the exception of the Tinley moraine, all other moraines are discontinuous geographic features—those in front of the Valparaiso moraine are overridden by it and those behind are either interrupted by the Chicago Lake Plain or merge with ground moraines. Kames, kame terraces, kettles, basins, and eskers, although not abundant, occur more commonly than elsewhere in the state. Fox Lake and associated lakes are conspicuous water bodies. Small basins of extinct lakes and ponds underlain by stratified silts and clays are found throughout the area.

The topography is determined essentially by thick Wisconsin drift of the Lake Michigan ice lobe, the deposits of which completely buried the underlying bedrock surface. Older Illinoian drift occurs below the Wisconsin deposits along the outer margin of the section in Kane and McHenry counties; but elsewhere this older drift appears to have been removed before the deposition of the Wisconsin drift (fig. 3).

Postglacial erosion has been slight and is restricted largely to youthful valleys along the Fox and Des Plaines rivers. Locally along the Des Plaines Valley near Lemont the Valparaiso drift-sheet is thin, and its major features are determined by a pre-Valparaiso valley system eroded into older underlying drift (Bretz, 1939, p. 52).

Geologic history.—The outer moraines in the Great Lake section, including the Marengo, Hampshire, and Cropsey, were formed during the Tazewell substage of the Wisconsin glaciation, whereas the Valparaiso, Tinley, and Lake Border moraines were deposited during the succeeding Cary substage. The Fox River Valley and the valleys of the east and west forks of Du Page River were trenched, apparently by torrential waters, before the advance of the Cary ice. During glacial recession, large blocks of stagnant ice became buried and, upon melting, left the large basins now occupied by Fox Lake and associated lakes.

As the Cary glacier withdrew into the basin of Lake Michigan, Lake Chicago was impounded behind the Tinley and Lake Border moraines, and its discharge waters eroded the outlet channel along the Des Plaines Valley. With retreat of the ice beyond the Straits of Mackinac, this lower eastward outlet into the Atlantic Ocean drained Lake Chicago, and the Chicago Lake Plain emerged with essentially its present aspect. Unlike the beaches north of Milwaukee, the beaches of the Chicago Lake Plain were not subsequently tilted by differential uplift of the region.
TILL PLAINS SECTION

The Till Plains section, which covers about four-fifths of Illinois, is by far the largest physiographic division in the state, and in it seven subdivisions are recognized: the Kankakee Plain, Bloomington Ridged Plain, Rock River Hill Country, Green River Lowland, Galesburg Plain, Springfield Plain, and the Mount Vernon Hill Country. The section is characterized by broad till plains, which are uneroded or in a youthful stage of erosion in contrast with the maturely eroded Dissected Till Plains on the older drift-sheets to the west. The outer boundary coincides closely with the margin of the Illinoian drift.

Kankakee Plain.—The Kankakee Plain is a level to gently undulatory plain, with low morainic islands, glacial terraces, torrent bars, and dunes. It is partially fluviolacustrine in origin, but it differs from the lake plains of the Great Lake section in that the lakes which covered it were temporary expansions of glacial floods and did not extensively alter its surface either by deposition or by erosion, except along the courses of strong currents. It could be considered a modified intermorainic basin, floored largely with ground moraine and bedrock.

The district is enclosed by the Iroquois, Manhattan, and Minooka moraines of Cary age on the east and northeast and by the Marseilles and Chatsworth moraines of Tazewell age on the west and south.

Most of the region is poorly drained by shallow low-gradient streams which follow constructional depressions. The two major streams—the Kankakee and the Des Plaines—occupy glacial sluiceways, which, near Kankakee and Joliet, are entrenched in Silurian dolomites. The drift is thick to thin and in the Kankakee region scarcely conceals the bedrock surface.

Bloomington Ridged Plain.—The Bloomington Ridged Plain includes most of the Wisconsin moraines of Tazewell age and is characterized by low, broad morainic ridges with intervening wide stretches of relatively flat or gently undulatory ground moraine. In many places the major moraines rise with gentle slopes, and, although they are conspicuous from a distance, they become less so near at hand, whereas the minor moraines are prominent locally. It was in this district more than in any other that the grass-covered stretches of rolling prairie and extensive swamps, described by early settlers, were most typically and extensively developed (Poggi, 1934, pp. 1-124). The outer boundary of the district follows the outer border of the Shelbyville moraine from the Indiana line westward and northward to the Green River Lowland, beyond which it follows the outer border of the Bloomington moraine to its intersection with Hampshire Ridge of the Great Lake section.

The moraines form a series of loops roughly concentric with the outer boundary of the district and from south to north include the following moraines: Shelbyville, Cerro Gordo, Champaign, Leroy, Bloomington, Normal, Outer Cropsey, Middle Cropsey, Inner Cropsey, Farm Ridge, Chatsworth, Marseilles, and Iroquois. The outer moraines are more widely spaced than the inner moraines, and a series of re-entrants in the south-central part of the district indicate an interlobe relationship of the Lake Michigan and Lake Erie lobes. A temporary lake, Lake Ancona (Willman and Payne, 1942, pp. 213-215), is known to have existed behind the Inner Cropsey moraine, but it did not modify the
Physiographic Divisions of Illinois

25

ground moraine to any important degree.

The glacial deposits are relatively thick throughout the district and completely conceal the bedrock topography, except locally. Illinoian and older drift are present below the Wisconsin in most places, so that the level aspect of present drift-plains is due largely to the presence of the older drift-sheets, which filled in and covered the irregularities of the bedrock surface (fig. 3).

Drainage development is generally in the initial stage, and most streams follow and are eroding in constructional depressions, many of which cross morainic ridges. Undrained basins are much less numerous than in the Wheaton Morainal Country and occur mainly along the morainic ridges. The valleys of principal streams are larger and more numerous than in the Great Lake section, owing in part to greater areal extent of this division and to somewhat greater age, and they have floodplains bordered by valley-train terraces. The Illinois River, the master-stream of the district, has a broad flat-bottomed valley with steep walls and is bordered by numerous narrow steep-walled valleys with steep gradients. Between the "Big Bend" and Peoria the valley coincides with the large pre-Wisconsin valley of the ancient Mississippi and is wider and has a lower gradient than the upstream part of the valley, which is much younger.

Green River Lowland.—The Green River Lowland is a low, poorly drained plain with prominent sand ridges and dunes. It is bounded on the north and south by the Shelbyville moraine of the Green River lobe and on the east by the abrupt front of the Bloomington moraine (Leighton, 1923, pp. 265-281). Most of the district is modified outwash plain related to the Bloomington moraine, and it is only in the western part of the area that it merges with the Cary valley-train of the Rock River. Some of the sand ridges are in part bars on the outwash plain, but many are true longitudinal dunes with a west-northwest orientation or crescentic parabola dunes. North of Genesee, remnants of the Shelbyville terminal moraine can be recognized. At the close of the Cary substage the lowland was a great swamp in which the two principal rivers, Rock River and Green River, flowed sluggishly along poorly defined valleys choked with outwash.

The present lowland coincides in large part with a broad bedrock lowland which was occupied by the Mississippi River up to the time of Wisconsin glaciation; and a remnant of the old southern valley-wall forms a prominent old bluff on the south side of the present lowland.

Rock River Hill Country.—The Rock River Hill Country is characterized by subdued rolling hill-lands in the stage of late youth to early maturity. It includes the eroded Illinoian drift-plain north of the Shelbyville moraine and Meredosia Valley and a fringe of early Wisconsin drift which lies west of Marengo Ridge.

The Illinoian drift is thin throughout most of the district and is not known to be underlain by older till. Thus the major uplands and valleys are determined primarily by the bedrock surface. The Illinoian drift is without marked ridging, and constructional forms are very localized. In the western part of the district, where it borders the Mississippi Valley, thick deposits of loess and fine sand occur as broad ridges, paha, and dunes on the Illinoian till plain.

The major streams flow radially from a central upland into the Mississippi River on the west and the Rock River on the east and south. Their valleys are relatively broad and steep walled and have
terrace remnants of alluvial fill. The Mississippi River and the upper part of the Rock River occupy large alluviated valleys. Below the mouth of Kishwaukee River, the Rock has cut a post-Illinoian rock gorge, which extends south to the Green River Lowland. Numerous smaller rock gorges are also present along tributaries which locally are superimposed on spurs of the bedrock upland (Hershey, 1893, pp. 314–325). Most of the minor streams are narrow and V-shaped.

_Galesburg Plain._—The Galesburg Plain in western Illinois includes the western segment of the Illinoian drift-sheet. The till plain is level to undulatory with a few morainic ridges and is in a late youthful stage of erosion. It is bounded by Meredosia Valley and the Wisconsin drift border on the northeast, by the Illinois Valley on the southeast, and by the Illinoian drift boundary on the southwest. On the northwest a continuation of the district across the Mississippi River into Iowa is implied. Four morainic ridges can be recognized in the district—two occur near the drift border, a third lies near and roughly parallel to the Illinois Valley, and the fourth—the Buffalo Hart moraine—extends northward through the central part of the region. Locally, the Buffalo Hart moraine is a prominent physiographic feature.

The district is drained by streams which flow from a central upland westward into the Mississippi River and eastward and southward into the Illinois River. The larger valleys are steep walled, alluviated, and terraced, except for local narrowing along postglacial gorges. Much of the district is relatively high above baselevel, so that the minor valleys are numerous, deep, and youthful.

The Illinoian drift is generally thick and is underlain by extensive Kansan and Nebraskan deposits, especially along buried preglacial valleys. Most of the irregularities of the preglacial surface were filled in with older drift, so that, in contrast with the Rock River Hill Country, only gross features of the bedrock topography are reflected in the present landscape.

_Springfield Plain._—The Springfield Plain includes the level portion of the Illinoian drift-sheet in central and south-central Illinois. It is distinguished mainly by its flatness and by shallow entrenchment of drainage as compared with the more sharply incised valleys of the Galesburg Plain. The southern boundary of the district, which coincides closely with a similar division made by Paul McClintock in 1929 (fig. 1, p. 28), is drawn along a line south of which the drift thins and bedrock topography becomes a controlling factor; the western boundary follows the edge of the Illinoian drift.

Although the greater part of the district is a flat till plain, the morainic features in the western part of the region are much more conspicuous than elsewhere on the Illinoian drift-sheet. They include the Jacksonville and Buffalo Hart moraines and an extensive area of ridged drift in the Kaskaskia drainage basin. The moraines are low and broad, but they are readily recognized because of their continuity and the associated kames and kame terraces. The Kaskaskia ridges lie just to the east of an interlobate area indicated by the moraines and include an irregular assemblage of gravelly ridges and hills with small intervening plains, some of which are old lake basins. A large proportion of the hills and ridges appear to be kames and crevasse-fillings related to stagnant ice conditions (Ball, 1940, pp. 951–970).

Drainage systems are well developed, and the district as a whole is in a late
youthful stage of dissection. The uplands are low with respect to the master streams, and the valleys are relatively shallow. Most of the principal streams have low gradients and occupy broad alluviated and terraced valleys; the secondary tributaries have wide V-shaped valleys; and the headwaters, flowing essentially on the till plain, have broad shallow valleys and low gradients.

The Illinoian drift is moderately thick and is underlain by older drift except in areas where the bedrock is close to the surface. Only the larger valleys and uplands of the bedrock surface are reflected in the present topography (fig. 3).

Along the southeast side of the Illinois Valley there is a belt of thick loess, with dune-contours characterizing the bluff-margin, but this body of loess thins rapidly to the southeast.

Mount Vernon Hill Country.—The Mount Vernon Hill Country comprises the southern portion of the Illinoian drift-sheet in Illinois and is characterized by mature topography of low relief with restricted upland prairies and broad alluviated valleys along the larger streams. Except for a southern extension of the Jacksonville moraine, glacial land forms are essentially absent. The southern and western boundaries of the district coincide closely with either the outer limits of glaciation or the outer margin of the Carbondale group of the Pennsylvanian system.

A relatively complete drainage system is present, and most streams have broad terraced valleys and low gradients. Natural drainage is good throughout the upland area, but the larger valley bottoms are poorly drained. Extensive aggraded lowlands along the Wabash drainage system to the east and the Big Muddy basin to the west are outstanding physiographic features.

The Illinoian drift in the district is thin, and deposits of underlying older drift are not known to be present except west of Sparta in Randolph County. The present land surface is primarily a bedrock surface of low relief, which is only slightly modified and subdued by a mantle of drift (fig. 3).

Geologic history of the Till Plains section.—Prior to glaciation the Till Plains section had a long and complex erosional history (Horberg, 1946, pp. 179–192). An extensive lowland—the central Illinois peneplain—was eroded in the weak Pennsylvanian rocks of the Illinois basin east of the Illinois River; it was bordered on the west and south by uplands, on which remnants of an older erosion surface are extensively preserved. Just prior to glaciation a system of deep bedrock valleys, many of which are occupied by present streams, were entrenched below the level of the central lowland. The gross features of the section as well as local features in the Rock River Hill Country and in the Mount Vernon Hill Country are determined to a large degree by this preglacial topography. The greater relief and higher elevations in the Rock River Hill Country and in the Galesburg Plain are determined by the preglacial uplands, whereas the low plains in the remaining districts reflect the central Illinois peneplain.

With the advent of glacial conditions and the approach of the Nebraskan glacier, there was probably a change from erosion to aggradation along major streams as the result of increased load and drainage derangements. The oldest deposits along the ancient Mississippi Valley (middle and lower Illinois) and its buried eastern fork, Mahomet Valley, appear to represent this stage. This was followed by the Nebraskan glacial invasion, which is known to have covered at
least a large part of the upland of western Illinois. There is no evidence that the early fills in the preglacial valleys were more than partially removed during the succeeding Aftonian interglacial stage. The Kansan glaciers, which followed, advanced from both the northeast (Labradorean center) and northwest (Keewatin center), probably in that order, and together covered most of the district except for the Rock River and Mount Vernon hill lands. Mahomet Valley and its tributaries in the central part of the section were largely buried and, because of the diversion of drainage, were not re-excavated during the ensuing Yarmouth interglacial stage (fig. 3) (Horberg, 1945, pp. 349–359).

With the advance of the Illinoian glacier from the Labradorean center, the ice attained its maximum extent in Illinois, and the entire Till Plains section was ice-covered. Except in the Rock River and Mount Vernon districts, where older drift is largely absent, the ice moved across a subdued land surface with fills of early drift and during retreat left behind a relatively smooth till plain. Following Sangamon erosion, which was not important except locally, the Wisconsin glaciers of the Tazewell stage covered the northeastern part of the state and formed the glacial landscape which is still so extensively preserved.

**DISSECTED TILL PLAINS SECTION**

The Dissected Till Plains section in western Illinois is represented by a narrow isolated segment of the Kansan drift-sheet maturely dissected into an upland of high relief. The eastern boundary is determined by the Illinoian drift margin and the southern boundary by an arbitrary line, south of which the drift occurs as patches and is unimportant physiographically. From a regional standpoint, essentially the entire section lies west of the Mississippi River, and the eastern boundary of the section was drawn along the river by Fenneman. The refinement of the boundary here proposed is of only local significance.

The Kansan drift in the area is thin, and the topography closely reflects the ruggedness of the underlying bedrock upland. Valley-train terraces along the Mississippi Valley and thick loess deposits on the adjoining bluffs are features of secondary importance. The geomorphic history closely parallels that of the adjoining Ozark Plateaus and is discussed later.

**WISCONSIN DRIFTLESS SECTION**

The Wisconsin Driftless section, which constitutes the final subdivision of the Central Lowland province in Illinois, is a submaturely dissected, low plateau bordering the outwash-filled valley of the upper Mississippi River. The eastern boundary follows the edge of the Illinoian drift and is unchanged from Fenneman's classification.

The upland is underlain by the Galena-Platteville dolomite and Maquoketa shale of Ordovician age and by outliers of Silurian dolomite. Flat upland areas, which coincide closely with the top of the Galena-Platteville dolomite, are considered remnants of the Lancaster peneplain. A possible higher surface—the Dodgeville peneplain—may be represented by the crests of mounds and narrow ridges capped by Silurian dolomite. Benches clearly controlled by structure occur along the lower reaches of the principal valleys, where the Maquoketa shale has been stripped from the top of the Galena-Platteville dolomite.

The plateau is maturely to submature-
ly dissected by a number of dendritic drainage systems tributary to the Mississippi. The Mississippi Valley has broad terraced bottom lands and precipitous walls. Most of the minor valleys are youthful, with narrow V-shaped valleys and some with incised meanders. There is considerable underground drainage through small caves and solution channels, but sinkholes and other karst features are not conspicuous. The canyon of Apple River is a prominent local feature resulting from glacial diversion of the former headwaters of Yellow River (Trowbridge and Shaw, 1916, pp. 95–99). As elsewhere, thick loess deposits mantle the bluffs of the Mississippi Valley and thin eastward.

The geomorphic history of the region is largely one of stream erosion and involves numerous uncertainties. The broad outlines, however, may be summarized as follows: (1) development of the Dodgeville surface, probably as a peneplain; (2) rejuvenation and erosional development of the Lancaster surface to a partial peneplain; (3) uplift and entrenchment of the Mississippi bedrock valley and some of its larger tributaries; (4) partial filling of the valley by glacial outwash with a maximum thickness of more than 300 feet; and (5) postglacial erosion.

OZARK PLATEAUS PROVINCE

The Ozark Plateaus province forms a discontinuous upland along the southwest margin of the state and represents the eastern edge of an extensive upland in southern Missouri and northern Arkansas (fig. 2). It includes the driftless and thinly drift-covered cuestas on pre-Pennsylvanian rocks which are structurally and topographically a part of the Ozark dome. Two important modifications of Fenneman’s classification are proposed: (1) the Salem Plateau section is expanded northward to include the partially drift-covered Mississippian cuesta in Randolph, Monroe, and St. Clair counties, which is clearly a part of the Ozark dome; (2) the Lincoln Hills section, first distinguished by E. M. Shepard (1907, pp. 8, 10–11) in Missouri and later by W. W. Rubey (1936) in Calhoun County, Illinois, is recognized as a new subdivision. Fenneman included both these areas in the Till Plains section of the Central Lowland province.

Lincoln Hills section.—The Lincoln Hills section includes the partially drift-covered dissected plateau above the junction of the Mississippi and Illinois rivers in western Illinois. It is part of a larger upland which, bisected by the Mississippi, lies partly in Missouri. The principal physiographic feature in Illinois is a maturely dissected central ridge, which forms the watershed between the Mississippi and the Illinois rivers throughout the length of the section. As previously noted, the northern boundary is arbitrary, and the eastern boundary follows the Illinoian drift border. The southern boundary with the Salem Plateau is drawn along the Cap au Grès flexure in southern Calhoun County.

The upland is determined by a subsidiary structure of the Ozark dome, the Lincoln fold, along which the more resistant pre-Pennsylvanian limestones and dolomites crop out. In Illinois the plateau is largely underlain by Osage limestones, of which the Burlington limestone is most important physiographically; and the boundaries coincide quite closely with the Mississippian-Pennsylvanian contact. The southern part of the section is driftless except for loess deposits and a single high-channel filling of outwash gravel, presumably Kansan. It has long been known as the Calhoun
County driftless area. Patchy remnants of Kansan drift are preserved in the northern part of the section.

The plateau surface is rugged and broken by closely spaced valleys and ridges. Restricted areas of flattish to gently rolling upland representing the Calhoun peneplain (Rubey, 1936) are present along the crest of the ridge. The valleys of the Mississippi and Illinois rivers are broad, deeply alluviated, terraced, and have precipitous walls. Most of the minor valleys are narrow, V-shaped, and steeply graded.

Salem Plateau section.—The Salem Plateau comprises the major part of the Ozark dome in southern Missouri, but only two small segments, isolated by the Mississippi River, are present in southwestern Illinois. Both segments are immaturely dissected, partially truncated cuestas, dominated by a single central ridge. The northern segment is covered by thin Illinoian drift, but the southern segment lies south of the glacial boundary. In the northern segment an arbitrary boundary with the Shawnee Hills is drawn where the sandstones and conglomerates forming the lowerPennsylvanian escarpment give way to finer sediments and the escarpment dies out, the east margin closely follows the overlapping edge of Pennsylvanian strata, and the northern boundary coincides with the Cap au Grès flexure. The southern segment is delimited from the Shawnee Hills to the east along the contact between Carboniferous and older rocks and follows Fenneman's boundary.

The northern segment is developed on Mississippian strata and lies on the back slope of the Meramec-Osage cuesta, which flanks the Ozark uplift on the north and east. It is underlain by Meramec limestones on the west and north and by Chester strata on the southeast. The plateau is submaturely dissected; and gently rolling summit areas, considered remnants of the Ozark peneplain, occur along the central ridge. Because of the drift mantle, the topography does not appear as rugged as the Lincoln Hills or the Salem Plateau sections. Karst features, developed primarily on the St. Louis limestone, are present at many places within the area. The central ridge forms the watershed for tributary drainage, but the Mississippi and Kaskaskia rivers cross the ridge without regard to structure. The valleys of these two major streams have broad alluvial flats and steep walls, whereas most of the tributaries are youthful.

The south unglaciated segment of the Salem Plateau in Illinois is underlain largely by a thick succession of deeply weathered Devonian chert and cherty limestone formations which on the south are overlapped by Coastal Plain sediments. Structurally, the area is clearly a part of the Ozark dome, but it is complicated by a zone of folds and faults trending north-south and northwest-southeast. A clearly defined physiographic boundary separates the plateau from the Shawnee Hills to the east and north, the contrast being marked by more rugged hills, closer drainage texture, absence of structural control, and higher elevations in the plateau section. Most of the plateau is maturely dissected by intricate dendritic drainage, although small remnants of a flat upland surface representing the Ozark peneplain are preserved throughout the region. The northern part of the segment is drained by streams which head in the Shawnee Hills and flow westward across the plateau into the Mississippi River, whereas in the southern part a central divide separates the Mississippi and Cache Valley drainage. In contrast to other parts of the Ozark
Plateau in Illinois, most of the larger tributary valleys, as well as the Mississippi Valley, are deeply alluviated, and only the secondary tributaries are youthful.

Geomorphic history.—The Ozark Plateaus are essentially a preglacial land surface whose erosional history has continued during the glacial period. The oldest landscape features in the province are isolated summit areas, over 800 feet above sea-level, which may be peneplain remnants correlative with the Dodgeville peneplain of the Wisconsin Driftless section and the Buzzard’s Point plain (Salisbury, in Weller, Butts, Currier, and Salisbury, 1920, pp. 47–52) of the Shawnee Hills. An alternative interpretation is that they are simply monadnocks on the lower Ozark peneplain. In either case an extensive surface, called the "Calhoun peneplain" in the Lincoln Hills section and the "Ozark peneplain" in the Salem Plateau section, was developed below the level of these isolated remnants and is responsible for the general accordance of summit levels found throughout the plateau at elevations about 700 feet above sea-level. Near the southern margin of the plateau the Ozark peneplain is believed to transect Wilcox (Eocene) strata and therefore to have been completed sometime during the Tertiary (Flint, 1941, pp. 634–636). The weathering and leaching of the Devonian formations in the southern part of the Salem plateau to depths of about 400 feet is of unusual interest and has been ascribed to prolonged alteration under peneplain conditions (Weller, 1944, pp. 101–102). Following completion of the peneplain, and probably prior to erosion of the Central Illinois peneplain, "Lafayette"-type gravels were spread over its surface. It appears likely that the major preglacial drainage lines were determined at this time and that, with uplift of the peneplain, streams occupying the Mississippi, Illinois, and Kaskaskia valleys became incised without regard to structure. There is no clear evidence of the succeeding central Illinois peneplain and Havana strath cycles in the region, probably because the weaker formations on which they are elsewhere developed are absent. During the glacial period the preglacial topography was modified by alluviation of the major valleys and by deposition of loess on the uplands.

INTERIOR LOW PLATEAUS PROVINCE

Shawnee Hills section.—The Interior Plateaus in southern Illinois are represented by the western part of the Shawnee Hills section and include a complex dissected upland, underlain by Mississippian and Pennsylvanian strata of varied lithology. It is, in the main, the area generally referred to popularly as the "Illinois Ozarks." The northern margin is drawn along a marked topographic boundary which lies along the inner flank of the lower Pennsylvanian (Caseyville) cuesta just within the Illinoian glacial drift boundary, and the southern boundary follows the northern edge of the overlapping Coastal Plain sediments. These are essentially Fenneman’s boundaries, the only important modification being a northwestward extension of the section to include the thinly drift-covered Pennsylvanian cuesta in Jackson and Randolph counties.

The section is situated along the southern rim of the Illinois basin, so that the lower Pennsylvanian cuesta com-

2 The section was originally distinguished by R. F. Flint (1928, pp. 451–457) and named the "Shawnee Hill Section." Fenneman (1938, p. 435) used the name "Shawnee section." The suggested usage of the term "Shawnee Hills section," in the present report is proposed purely for descriptive reasons.
prises the northern part of the region and a dissected plateau underlain largely by Chester (Mississippian) formation comprises the southern part. This regional structure is complicated by faulting and folding, which to a varying degree involved a large part of the area.

The Pennsylvanian escarpment forms a continuous ridge and watershed, extending completely across the state. In most places the ridge is maturely dissected by youthful valleys, but remnants of flat upland are locally preserved on narrow ridge crests throughout the length of the escarpment.

The plateau on Mississippian rocks to the south is maturely dissected, and the larger valleys are alluviated. There are numerous minor escarpments, structural benches, fault-line scarps, and subsequent valleys which reflect local structure and the varied lithology of the bedrock. Only small patches of flat upland are present. Karst features in the St. Louis limestone are present near Cave in Rock, Hardin County, and in south-central Union County.

Geomorphic history.—The erosional history of the region is similar to that of the Ozark Plateaus previously outlined. Remnants of the Ozark peneplain appear to be extensive along the Pennsylvanian escarpment, and local higher summits, especially to the east, may represent an older (Buzzard’s Point plain) cycle (Salisbury, in Weller, Butts, Currier and Salisbury, 1920, p. 47–52). Lower surfaces on the Mississippian rocks, 500–550 feet and 600–650 feet in elevation, are of uncertain origin. Remnants of “Lafayette”-type gravels are found both on the escarpment and at lower elevations south to the Ohio River. A deep weathered zone on the gravels overlain by loess indicates that a long period of stable conditions followed their deposition and that the major period of valley-cutting occurred late in the Tertiary (Weller, 1940, p. 45). Loess deposition and valley alluviation were the principal events during the glacial period.

COASTAL PLAIN PROVINCE

The Coastal Plain in Illinois includes the southern tip of the state and is underlain by unconsolidated Cretaceous and Tertiary sediments, which overlap the older Paleozoic rocks to the north. Three physiographic subdivisions are recognized: (1) and (2) the coextensive alluvial plain of the Cache and Mississippi valleys and (3) the Cretaceous hills between the Cache Valley and the Ohio River. The alluvial plains are characterized by terraces and recent floodplain features. The Cretaceous hills are maturely eroded into a low upland of gently sloping knolls and ridges. Outwash and alluvium extend far up tributary valleys, so that the upland is partially buried and certain segments are essentially isolated.

The earliest events in the geomorphic history of the region are indicated by remnants of “Lafayette”-type gravels which occur in the Cretaceous hills. The erosion surface at their base is evidence of a long period of denudation, during which the Coastal Plain deposits were lowered and stripped back. This was followed by deposition of the gravels, their weathering under stable conditions, establishment of major drainage lines, and final dissection of the bedrock topography. Prior to glaciation, Cache Valley was occupied by the Ohio River and the present Ohio Valley was occupied by the Cumberland and Tennessee rivers. During Illinoian or possibly Wisconsin time the valleys were aggraded to the level of the divide between the Ohio and the Cumberland rivers at Bay City in south-
ern Pope County, and the present lower course of the Ohio was opened. Both courses were kept open during subsequent stages, so that flood waters still pass through Cache Valley, and it was only in relatively recent time that the southern channel became the permanent course of the river.

REFERENCES CITED


