THE LOOK OF OUR LAND

AN AIRPHOTO ATLAS OF THE RURAL UNITED STATES:

North Central

U.S. DEPARTMENT OF AGRICULTURE
ECONOMIC RESEARCH SERVICE
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ABSTRACT

Airphotos illustrate land use patterns and terrain for 28 land resource areas in three land resource regions in 14 North Central States. Portions of small-scale airphoto index sheets and a stereopair of airphotos from each sheet accompany the description of each area that is reproduced from U.S. Department of Agriculture, Agriculture Handbook 296, "Land Resource Regions and Major Land Resource Areas of the United States."

Key Words: Land resources, Land use patterns, Airphotos, Land resource regions, Land resource areas, North Central States.

Studies in the series on The Look of Our Land—An Airphoto Atlas of the Rural United States include:

A. Northwestern Forest, Forage, and Specialty Crop Region
B. Northwestern Wheat and Range Region
C. California Subtropical Fruit, Truck, and Specialty Crop Region
D. Western Range and Irrigated Region
E. Rocky Mountain Range and Forest Region
F. Northern Great Plains Spring Wheat Region
G. Western Great Plains Range and Irrigated Region
H. Central Great Plains Winter Wheat and Range Regions
I. Southwestern Plateaus and Plains Range and Cotton Region
J. Southwestern Prairies Cotton and Forage Region
K. Northern Lake States Forest and Forage Region
L. Lake States Fruit, Truck, and Dairy Region
M. Central Feed Grains and Livestock Region
N. East and Central General Farming and Forest Region
O. Mississippi Delta Cotton and Feed Grains Region
P. South Atlantic and Gulf Slope Cash Crop, Forest, and Livestock Region
R. Northeastern Forage and Forest Region
S. Northern Atlantic Slope Truck, Fruit, and Poultry Region
T. Atlantic and Gulf Coast Lowlands Forest and Truck Crop Region
U. Florida Subtropical Fruit, Truck Crop, and Range Region

This handbook, subtitled “North Central,” includes regions K, L, and M.
The Look of Our Land—
An Airphoto Atlas of the Rural United States:

NORTH CENTRAL

BACKGROUND

The Economic Research Service has been conducting studies on present and potential uses of land in the United States. In connection with this activity, USDA Agriculture Handbook 153 “Land Use and Its Patterns in the United States,” by F. J. Marschner, was published in 1959. This landmark publication contained a color map scaled at 1:5,000,000, entitled “Major Land Uses in the United States.” An unusual feature of the Handbook was 168 aerial photographs showing land use patterns across the 48 contiguous States. The map, text, and photos together showed the ways that our land is used. This bulletin updates Agriculture Handbook 153, which is out of print and may be found only in major libraries.

In 1965, another landmark publication appeared: “Land Resource Regions and Major Land Resource Areas of the United States,” USDA Agriculture Handbook 296, for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Morris E. Austin and many others in the Soil Conservation Service compiled this classification and systematic description of U.S. resource regions. Twenty land resource regions were delineated, which were further subdivided into 156 land resource areas, with information on land use, elevation and topography, climate, water, and soils for each.

This atlas then brings together the text of Agriculture Handbook 296 with photos to show land use and related information according to an established regional and area classification of U.S. land resources.

The airphotos in this handbook were selected to show characteristics and land use in 28 resource areas in three regions comprising all or parts of 14 North Central States. Accompanying the photos of each area is a brief description of land use, climate, soils, and topography for that area.

The ways we use our land are usually described verbally or quantitatively, or are depicted on maps. These presentations are informative but limited. There is no substitute for seeing, and an aerial view is unsurpassed for observing certain phenomena on the surface of the earth. Aerial photographs, used with maps and descriptions, provide a comprehensive idea of how land is used. Such richly detailed photos can be viewed stereoscopically for three-dimensional study of relationships between items on the earth’s surface and man’s activities.

USE OF THE AIRPHOTO ATLAS

Two facing pages are devoted to each land resource area. A stereopair, usually at a scale of 1:20,000, shares each right-hand page with a description of the area that is reproduced from Agriculture Handbook 296. To locate and orient the terrain shown in the stereopair, the reader should refer to the numbers on the photo index sheet (described below) on the left-hand page. He will note that the compass orientations of the stereopairs vary, but the index sheet clarifies the orientation.

The area shown on a stereopair overlaps two points on a flight line showing the same portion of the earth’s surface. When viewed through a simple pocket stereoscope the scene appears three-dimensional. Any text on aerial photographic interpretation or photogrammetry describes how such photos are made and how to use the stereoscope.

Each left-hand page shows an aerial photographic index sheet that includes the area of the facing stereopair. Each index sheet was selected to match the land use description for the given area. An index sheet is an uncontrolled mosaic made up of many individual airphotos. The photos are assembled with their identification numbers showing, matched by eye, and mounted on a board. The group is rephtographed, reduced in scale, and printed for use as a reference for locating specific photographs. Most of the index sheets in this bulletin are reproduced at their original scale of 1:63,360. A caution about using the index sheets: Since many individual photos were fitted together by eye, the fit is not always precise, so measurements of distance or area on index sheets are only approximate.

Each index sheet is oriented with north at the top. In some cases, flight lines of the individual photos were other than north-south, so the page must be rotated to read the number. To aid identification, the bottom label of each index sheet gives the following identification:

Land resource area number, county, State, year and month of photography, index sheet number and scale, and agency for which the photography was flown. The letter “P” on the label indicates only partial coverage of the county.

Abbreviated sources shown on the photo index sheets are: ASCS, Agricultural Stabilization and Conservation Service; SCS, Soil Conservation Service; and USFS, Forest Service, of USDA.

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NORTHERN LAKE STATES FOREST AND FORAGE REGION

88 Northern Minnesota Swamps and Lakes
89 Minnesota Rockland Hills
90 Central Wisconsin and Minnesota Thin Loess and Till
91 Wisconsin and Minnesota Sandy Outwash
92 Superior Lake Plain
93 Northern Michigan and Wisconsin Stony, Sandy, and Rocky Plains and Hills
94 Northern Michigan Sandy Drift
K—NORTHERN LAKE STATES FOREST AND FORAGE REGION

103,200 square miles

Poor soils and a short cool growing season impose severe restrictions on agriculture in this region. The annual precipitation ranges from 20 to 32 inches; the heaviest rainfall occurs during the growing season. Average annual temperatures are 35° to 45° F., and the freeze-free season ranges from slightly less than 100 days to 140 days.

Podzols in sandy parent materials and Gray Wooded soils in finer textured parent materials are the dominant soils in the better drained areas. Bog soils, Humic Gley soils, Low-Humic Gley soils, and Ground-Water Podzols occupy the wet uplands and depressions. Lithosols and rough stony land are extensive on hills and low mountains.

A large part of this region is forested, and lumbering and recreation are the principal uses. Mining is a major industry in all but the eastern part of the region. Forage and some grains for livestock are the main crops in the farmed areas. Potatoes are important locally.
88—Northern Minnesota Swamps and Lakes

Minnesota
20,700 square miles

**Land Use:** More than 80 percent of the area is in forest and lakes; lumbering and recreation are the major uses. Only 10 to 15 percent is cropland, and 3 or 4 percent is in pasture. Forage for livestock is the principal crop, but some feed grains and legume seeds are grown also.

**Elevation and Topography:** 1,100 to 1,500 feet, increasing from northwest to southeast, some ridges in the south more than 1,700 feet. A broad lake plain including large swamps and many lakes makes up the northern half and a rolling glacial moraine broken by areas of outwash the southern part. The northern part is nearly level and has only slight local relief, but in the south some ridges rise 100 to 200 feet above the adjacent lowland.

**Climate:** *Average annual precipitation*—20 to 25 inches; highest from midspring to early autumn; winter precipitation is snow. *Average annual temperature*—35° to 40° F. *Average freeze-free period*—100 to 130 days.

**Water:** Abundant water supplies meet all present needs in the area. The many lakes provide recreational facilities. Much of the lowland must be drained before it can be used for general agricultural crops or tame pasture.

**Soil:** *Gray Wooded soils* (Nebish, Rockwood, Beltrami, and Taylor) from calcareous glacial till and clays are dominant. *Bog soils* occupy broad level areas in the Lake Agassiz basin; other soils in this basin are *Podzols* (Hiwood) and *Low-Humic Gley soils*. Of small total extent but locally conspicuous in the south are *Brunisols* (Wadena and Hubbard) from glacial outwash.
89—Minnesota Rockland Hills

Minnesota
3,500 square miles

Land Use: Nearly all the area is in national forest used for recreation and lumbering. Timber production is low because of the unfavorable soils.

Elevation and Topography: 1,200 to 2,000 feet, increasing from west to east, narrow strip bordering Lake Superior about 600 feet. Lakes, swamps, and other wet lowlands are scattered through the irregular low hills. Hills rise 200 to 300 feet above the adjacent lakes and lowlands.

Climate: Average annual precipitation—25 to 30 inches; highest from midspring through early autumn; winter precipitation is snow. Average annual temperature—35° to 40° F. Average freeze-free period—100 to 120 days.

Water: Water from lakes and streams is ample for present and future needs. Many lakes are suited to recreational uses but are little developed at present.

Soil: Detailed information is lacking. Large areas of acid and basic crystalline rock outcrops are intermingled with extensive areas of Lithosols on low hills. There are small areas of Podzols and Gray Wooded soils in the deeper glacial-till deposits. Some Low-Humic Gley soils and Bog soils occupy the lowlands among the hills.
90—Central Wisconsin and Minnesota
Thin Loess and Till
Minnesota and Wisconsin
26,200 square miles

Land Use: Nearly all the area is in farms except the part west of Lake Superior, which is in State and National forests. Slightly more than one-fourth is cropland used mainly for growing feed grains and forage for dairy cattle. Potatoes are an important cash crop locally, and other vegetables and fruit are grown on some of the sandy soils. About one-sixth of the area is in pasture of tame and native grasses. Most of the remainder is in forest, mainly farm woodlots. The State and National forests are used for both timber production and recreation.

Elevation and Topography: 1,050 to 1,750 feet, narrow band along the shore of Lake Superior about 600 feet. The level to rolling till plains are mantled locally by silt. Topography is irregular; there are low hills and ridges throughout and many lakes in basins. Local relief is mainly in a few feet to a few tens of feet, but some hills rise 100 or 200 feet above the adjacent lowlands.

Climate: Average annual precipitation—25 to 30 inches; highest from late spring through early autumn; winter precipitation is snow. Average annual temperature—40° to 45° F. Average freeze-free period—120 to 140 days.

Water: The moderate rainfall is generally adequate for crops and pasture, but crops on sandy soils are damaged by lack of moisture in dry years. Much of the somewhat wet and wet lowland needs to be drained before crops and tame pastures can be grown successfully. Ground water is abundant in deep glacial drift but scarce where the drift is thin. The many lakes provide recreational facilities.

Soil: Detailed modern soil surveys are lacking for most of the area. Available information indicates that Gray-Brown Podzolic soils (Santiago, Otterholt, and Spencer) in silt-mantled till and Gray Wooded soils (Hibbing and Milaca) in noncalcareous till are the dominant soils. Podzols (Cloquet) in more acid till are important in the east. In the northwest Brown Forest soils (Ahmeek) and Sols Bruus Acidos (Brainerd) are in stony till having a relatively low lime content and rock outcrops are common on the steeper hills. Soils in wet areas include somewhat wet Gray-Brown Podzolic soils (Almena and Freer), Low-Humic Gley soils (Warman and Nokay), Humic Gley soils (Adolph), and Bog soils.
91—Wisconsin and Minnesota
Sandy Outwash
Wisconsin and Minnesota
8,000 square miles

Land Use: About 90 percent of the area is in farms; about 10 percent, mostly in Wisconsin, is owned by Federal and State Governments. Nearly one-third of the area is cropland. Feed grains and forage for livestock are the main crops, but truck crops are important also. Some of the wet areas are cranberry bogs. About one-tenth is in forest used mainly for timber production. These forests and associated lakes provide recreational facilities.

Elevation and Topography: 900 to 1,100 feet. Topography is irregular on this nearly level to gently rolling outwash plain. In Minnesota there are many lakes, both large and small, in basins and depressions. Local relief throughout the area is in a few feet to a few tens of feet.

Climate: Average annual precipitation—About 25 inches in Minnesota and 30 to 32 inches in Wisconsin; highest from mid-spring to early autumn; winter precipitation is snow. Average annual temperature—40° to 45° F. Average freeze-free period—About 140 days.

Water: On sandy soils the moderate rainfall is barely adequate for crops and pasture in normal years and in dry years crop yields are seriously reduced. Irrigation is widely used for high-value crops. In contrast, the wet lowlands need to be drained before the common cultivated crops and tame pastures can be grown successfully. Ground water is abundant in the glacial deposits. The many lakes are used for recreation.

Soil: The dominant soils are weakly developed Gray-Brown Podzolic soils (Coloma) and Regosols (Plainfield and Zimmerman) in sandy glacial outwash. On the associated wet lowlands also underlain by outwash are Humic Gley soils (Newton, Dillon, and Isanti), Low-Humic Gley soils (Roscommon, Granby, and Kinross), and Bog soils.
92—Superior Lake Plain
Minneapolis, Wisconsin, and Michigan
3,000 square miles

Land Use: More than three-fourths of the area is in forest, nearly all privately owned and used for timber production and recreation. Between 5 and 10 percent is cropland. Feed grains and hay for dairy cattle and other livestock are the principal crops. Locally, potatoes and small fruit are important cash crops. Only 1 or 2 percent of the land is in pasture.

Elevation and Topography: 600 to 1,000 feet, increasing gradually from lakeshore inland. This nearly level lake plain has some inclusions of rocky knobs, hills, and low mountains. Local relief on the lake plain is in only a few feet, but the adjoining hills and mountains rise sharply 100 feet to several hundred feet above the plains.

Climate: Average annual precipitation—25 to 30 inches; highest in midsummer and lowest in midwinter; winter precipitation is snow. Average annual temperature—38° to 40° F. Average freeze-free period—Less than 100 days to 140 days, decreasing from the lakeshore inland.

Water: Rainfall is adequate for crop and pasture needs. Level areas of moderately wet and wet soils need to be drained before cultivated crops can be grown successfully. There are few inland lakes, but much of the area has access to Lake Superior for recreation.

Soil: Gray Wooded soils (Ontonagon, Watton, and Hibbing) from fine-textured lacustrine sediments and glacial till are dominant. Low-Humic Gley soils (Pickford and Bergland) occupy wetter areas and Podzols (Munising, Iron River, Gogebic, and Hiawatha) are in acid sandy materials.
93—Northern Michigan and Wisconsin
Stony, Sandy, and Rocky Plains and Hills

Wisconsin and Michigan
21,400 square miles

Land Use: More than four-fifths of the area is in
forest, mostly privately owned; about one-sixth is in
national forest. Lumbering and mining are impor-
tant industries, and recently recreational use of the
area has increased. Only about 10 percent is cropped
or in pasture. Feed grains and forage for dairy
cattle and other livestock are the main crops. Potat-
toes are an important cash crop in places. Cultivated
blueberries are grown on some of the acid sandy soils
having a high water table, mainly in Michigan, and
cranberries in some of the bogs.

Elevation and Topography: 1,100 to 1,700 feet,
some mountains more than 1,800 feet, and a narrow
strip bordering the Great Lakes about 600 feet. These
undulating glacial-drift plains are bordered on the
north by rugged hills or low mountains. Local relief
is mainly in a few tens of feet to 100 or 200 feet;
the hills and mountains rise several hundred feet
above the adjacent lowlands. The area is dotted by
many small lakes and a few large lakes.

Climate: Average annual precipitation—About 30
inches; highest in midsummer and lowest in mid-
winter; winter precipitation is snow. Average an-
nual temperature 38° to 42° F. Average freeze-free
period—80 to 140 days, decreasing with increasing
elevation and from the Great Lakes inland.

Water: On the coarse-textured soils, rainfall supplies
barely enough moisture for crops and pasture in many
years. In contrast, the wet lowlands must be drained
before the common field crops and tame pastures can
be grown successfully. Ground water is abundant in
areas covered by deep glacial drift, but where the
drift is thin, ground water is scarce. The many lakes
used for recreation by people from the populous areas
in the south are an important economic resource.

Soil: Podzols are the dominant soils (chiefly Munising,
Vilas, Pence, Iron River, Gogebic, and Hiawatha from
sandy glacial drift and Stambaugh in the small areas
of silt-mantled drift in the central part). Regosols
(Omega) are in rapidly drained deep sands; Low-
Humic Gley soils (Roscommon) and Bog soils (Spald-
ing, Greenwood, Lupton, and Carbondale) are exten-
sive on wet lowlands. Stony land and rockland
occupy parts of the steeper slopes, knobs, hills, and
low mountains.
Northern Michigan Sandy Drift
Michigan
20,400 square miles

Land Use: More than four-fifths of the area is forested and about one-fifth is in national forest. Most of the remaining forest is in small holdings; there are a few large holdings. Lumbering and recreation are the principal uses of these forests in the Upper Peninsula where only 1 or 2 percent of the land is in crops and pasture. In the Lower Peninsula about one-fifth of the land is in crops and pasture. Forage and feed grains for dairy cattle and other livestock are the principal crops. Potatoes are an important cash crop in places, and other vegetables and some fruit are grown also.

Elevation and Topography: 600 to 970 feet in the Upper Peninsula, increasing gradually from the shores of the Great Lakes inland; in the Lower Peninsula, 600 feet along the lakeshores to more than 1,500 feet in the central part. This broad glacial-drift plain includes belts of morainic hills, especially in the Lower Peninsula. Much of the area is nearly level to gently rolling and has local relief of only a few feet, but the morainic areas have local relief of several tens of feet to a few hundred feet.

Climate: Average annual precipitation—About 30 inches, fairly evenly distributed through late spring, summer, and early autumn and lowest in winter; winter precipitation is mainly snow. Average annual temperature—40° to 45° F. Average freeze-free period—120 to 140 days along the lakeshores.

Water: Because of the only moderate rainfall, moisture must be carefully managed to insure enough water for crops and pasture on the sandy soils. The wet lowlands must be drained before the common field crops and tame pastures can be grown. Ground water is abundant in the deep glacial drift that covers nearly all the area. The many lakes, both large and small, are used extensively for recreation.

Soil: Podzols (Rubicon, Kalkaska, Montcalm, McBride, and Emmet) from sandy glacial drift are the dominant soils. Associated with them are Regosols (Grayling) in excessively drained deep sands and Low-Humic Gley soils (Roscommon, Ensley, and Edmore) on poorly drained flats and in depressions. In fine-textured materials containing more lime Gray Wooded soils (Nester, Kawkawlin, and Ontonagon) are the major soils, and Humic Gley soils (Bergland, Bruce, and Sims) and Low-Humic Gley soils (Pickford) occupy the associated wet lowlands. Bog soils (Carbondale and Lupton) are extensive in basins and depressions throughout.
LAKE STATES FRUIT, TRUCK, AND DAIRY REGION

95  Southeastern Wisconsin Drift Plain
96  Western Michigan Fruit Belt
97  Southwestern Michigan Fruit and Truck Belt
98  Southern Michigan Drift Plain
99  Erie - Huron Lake Plain
100  Erie Fruit and Truck Area
101  Ontario - Mohawk Plain
I.—LAKE STATES FRUIT, TRUCK, AND DAIRY REGION

61,200 square miles

The soils and climate in this region of nearly level to gently sloping, glaciated plains are favorable for agriculture. The average annual precipitation ranges from 28 to 36 inches over most of the region but increases to 45 inches in the extreme eastern part. Distribution is fairly even throughout the year. Average annual temperatures are 45° to 51° F. over most of the region but only 43° F. in the northwestern part. The freeze-free season is 140 to 170 days, except in narrow belts adjacent to the Great Lakes where it is as long as 200 days.

Gray-Brown Podzolic soils are dominant throughout this region, but Humic Gley soils, Low-Humic Gley soils, and Bog soils are extensive in the level areas and depressions.

The region has a wide variety of agricultural enterprises. Dairy farming is important, especially near the larger urban centers. Canning crops, corn, soft winter wheat, beans, and sugar beets are among the leading crops. Fruit growing is very important in a narrow belt adjacent to the Great Lakes. Rural residences occupy much land near many of the larger cities, and a little farming is done on a part-time basis by people who earn their main income in the cities.
95—Southeastern Wisconsin Drift Plain
Wisconsin and Illinois
14,200 square miles

Land Use: More than 90 percent of the area is in farms and nearly two-thirds is cropland. Feed grains and hay are the most extensive crops. Much of the grain is fed to dairy cattle and other livestock on the farms where it is grown, but cash-grain farming is also important. Canning crops, potatoes, fruit, and other specialty crops are important, especially along the lakeshore. Between 5 and 10 percent of the area is in tame pasture, and 10 to 20 percent is in farm woodlots. Five to ten percent is urban, mostly in the south.

Elevation and Topography: 600 to 950 feet. This area consists of a glaciated plain and belts of morainic hills, beach ridges, and outwash terraces. Drumlins (long low steep-sided oval hills) are a prominent feature in the southwest. Local relief is mainly in a few feet to a few tens of feet, but the moraines and drumlins rise 100 to 250 feet above the adjacent lowlands.

Climate: Average annual precipitation—30 to 32 inches; highest from midspring through late summer and lowest in winter when it is mostly snow. Average annual temperature—Mainly 45° to 48° F. and 42° F. along the northern edge. Average freeze-free period—140 to 170 days, decreasing from south to north and from the Lake Michigan shoreline inland.

Water: Rainfall provides enough moisture for crops and pasture, but in years of below-normal rainfall yields are reduced on the coarse-textured soils. Many of the fine-textured soils need artificial drainage so that tillage and harvesting can be done more easily. The poorly drained soils must be drained before cultivated crops can be grown successfully. Ground water is abundant in the underlying drift; the sandy and gravelly outwash yields the largest amounts. Lake Michigan and the many inland lakes provide recreation for this and adjoining areas.

Soil: Gray-Brown Podzolic soils (Miami, Kewaunee, and McHenry) in medium- to fine-textured glacial drift that has a thin silt mantle are dominant throughout the area. In the south Brunizems (Warsaw, Saybrook, Parr, Wea, Dodgeville, and Tama) occupy nearly level prairie outliers on drift plains. Podzols (Emmet and Onaway) are in coarse-textured materials in the northeast. Humic Gley soils (Poygan, Kokomo, and Brookston) and Bog soils (Carlisle) are on wet lowlands throughout.
Western Michigan Fruit Belt

Land Use: About two-thirds of the area is in forest, mainly farm woodlots, but 10 percent or more is in State and National forests. Most of the remainder is cropland; about 5 percent is in pasture. Forage and feed grains for dairy cattle occupy most of the cropland, but fruit and specialty crops are of greater economic importance. This is one of the largest cherry-producing areas in the United States. Potatoes and vegetable crops are grown, especially in the north.

Elevation and Topography: 600 to 1,100 feet. The area consists mainly of rolling to hilly moraines and beach ridges, but it includes some nearly level plains. Local relief is mainly in several tens of feet to 100 or 200 feet; the plains have relief of only a few feet. Much of the area rises sharply from the lakeshore to the adjoining hilltops.

Climate: Average annual precipitation—About 30 inches; fairly evenly distributed through the year but low in late winter and early spring; winter precipitation is snow. Average annual temperature—45° to 47° F. Average freeze-free period—140 to 170 days, increasing from north to south.

Water: The moderate rainfall is adequate for crops in normal years but in below-normal years yields are reduced, especially on the deep well-drained sandy soils. Ground water is abundant in the deep sandy glacial drift. The many bays along Lake Michigan and the numerous inland lakes are well-known vacation areas.

Soil: Podzols (Montcalm, Kalkaska, Emmet, and Rubicon) in moderately coarse to coarse textured drift are the dominant soils and associated with them are Regosols (Grayling) in deep acid sands. Low-Humic Gley soils (Roscommon) also in deep sands are locally conspicuous but of small total extent. Gray Wooded soils (Nester, Kawkawlin, and Selkirk) are in fine-textured drift in the south and Bog soils (Carbondale and Lupton) on many small and a few large flats and depressions.
Land Use: Nearly four-fifths of the area is in farms and slightly more than one-half is cropped. Fruits, especially peaches and grapes, are grown extensively near the Lake Michigan shore. Many other fruits, vegetables, and melons are grown also. Forage and feed grains for dairy cattle and other livestock are important. Some land is in permanent pasture, but most of the farmland not in crops is in woodlots. A large part of the land not in farms is in State forests and parks and about 5 percent is urban.

Elevation and Topography: 600 to 800 feet, some hills 1,000 feet. This area consists of a nearly level glacial-drift plain and scattered gently to strongly rolling morainic hills. Local relief is in only a few feet in much of the area, but in the rolling areas local relief is in several tens of feet to 100 or 200 feet.

Climate: Average annual precipitation—32 to 36 inches; fairly evenly distributed through the year but slightly higher in late spring and early summer and lowest in midwinter as snow. Average annual temperature—48° to 50° F. Average freeze-free period—160 to 180 days, decreasing from west to east.

Water: The moderate rainfall is adequate for crops in normal years but in below-normal years yields are reduced by lack of moisture. Most of the fine-textured soils need some artificial drainage to improve timing of tillage operations, and wet areas must be drained before they can be used successfully for crops. The deep glacial deposits yield an abundance of ground water for domestic, municipal, and industrial uses. The many small lakes are used extensively for boating, fishing, and other recreation.

Soil: Gray-Brown Podzolic soils (Kalamazoo and Oshtemo) from moderately coarse and coarse glacial drift are the dominant soils. Associated with them in the coarsest deep sands are Regosols (Plainfield). Other Gray-Brown Podzolic soils in finer textured materials (Miami, Conover, St. Clair, Morley, and Blount) are locally conspicuous but of small total extent. Bog soils (Carlisle) are in small to medium-sized depressions and basins throughout the area.
98—Southern Michigan Drift Plain

Michigan and Indiana
17,200 square miles

Land Use: About three-fourths of the area is in farms; much of the remainder is urban although some is in State forests and parks. Nearly one-half of the area is cropped. Corn, other feed grains, and hay for dairy cattle and other livestock are the major crops. Soft winter wheat, dry beans, and potatoes are important cash crops, and fruit and vegetables are grown in many places where soils and markets are favorable. Less than 10 percent of the area is in permanent pasture and most of the rest of the land in farms is in small woodlots.

Elevation and Topography: 750 to 1,000 feet, some hills more than 1,100 feet. This broad glaciated plain is deeply mantled by till and outwash. Much of the area is level to gently rolling and local relief is in a few feet to a few tens of feet. Belts of morainic hills have stronger slopes and relief of a few tens of feet to 100 or 200 feet.

Climate: Average annual precipitation—30 to 36 inches; fairly evenly distributed through the year but slightly higher in late spring and early summer. Average annual temperature—45° to 50° F. Average freeze-free period—Mainly 140 to 150 days but 160 days in the southwest.

Water: The moderate rainfall is adequate for crops over much of the area, but moisture conservation is a serious problem on the coarse-textured soils. Ground water is abundant in the deep glacial drift. Many small and medium-sized lakes and many perennial streams are additional sources of water and are used extensively for recreation.

Soil: Gray-Brown Podzolic soils (Fox, Kalamazoo, Oshtemo, Hillsdale, Miami, Lapeer, and Conover) in medium- to coarse-textured acid and calcareous glacial drift are the dominant soils in much of the area. Associated with them in flats and depressions are Humic Gley soils (Brookston, Gilford, Maumee, and Newton) and Bog soils (Houghton, Carlisle, and Edwards). In the northwest Podzols (Montcalm, Kalkaska, Emmet, and McBride) are the principal soils. Associated with them in wet areas are Low-Humic Gley soils (Roscommon, Edmore, and Ensley) and Bog soils (Carbondale and Lupton). On prairie outliers in the south Brunizems (Warsaw and Door) are conspicuous locally but are of small total extent.
99—Erie-Huron Lake Plain
Michigan and Ohio
12,200 square miles

Land Use: Nearly nine-tenths of the area is in farms and about two-thirds is cropland. This is an important cash-crop area. Corn, winter wheat, soybeans, and hay are the major crops, and sugar beets and canning crops are also important. Some fruit and truck crops are grown on the coarse-textured soils. Dairying is important on some farms near the larger cities. The remaining farmland includes small areas in permanent pasture and miscellaneous uses, but most of it is in small farm woodlots. About 10 percent of the area is urban.

Elevation and Topography: 600 to 800 feet, increasing gradually from the lakeshores inland. Local relief on most of this nearly level broad lake plain is in only a few feet, but some beach ridges and low moraines rise several feet to a few tens of feet above the general level.

Climate: Average annual precipitation—28 to 36 inches; fairly evenly distributed through the year but slightly higher in late spring and early summer. Average annual temperature—45° to 50° F. Average freeze-free period—140 to 160 days.

Water: The moderate rainfall provides enough water for crops in nearly all years. Many of the soils require artificial drainage before they can be used for crops, and even the better drained soils need some drainage to improve the timing of tillage operations in spring and fall. The abundant ground water meets domestic and municipal needs in much of the area. Large cities bordering the Great Lakes obtain water from the lakes, which are major transportation arteries and are used for recreation.

Soil: Medium- and fine-textured Humic Gley soils (Toledo, Brookston, Parkhill, Colwood, Sims, Hoytville, and Wauseon) are the dominant soils. Closely associated with them are Low-Humic Gley soils (Brevort, Paulding, and Latty). Gray Wooded soils (Kawkawlin and Capac) are important on the better drained areas in the north. In the south somewhat wet Gray-Brown Podzolic soils (Nappanee, Fulton, and Kibbie) are in fine- and medium-textured materials and better drained members (Seward and Ottoske) in sandy materials. There are some Podzols (Memeninee, Iosco, and Manistee) and Low-Humic Gley soils in the north.
100—Erie Fruit and Truck Area
Ohio, Pennsylvania, and New York
2,700 square miles

Land Use: Slightly more than two-thirds of the area is in farms. About a third is cropland; the other third is about equally divided between pasture and woodland but small areas are in rural residences and other miscellaneous uses. The cropland is in vineyards, orchards, small fruits, canning crops, and truck crops. Dairying is also important, especially near the larger cities. A large part of the area not in farms is urban, and major highways, railroads, and parks occupy a sizable acreage.

Elevation and Topography: 600 to 900 feet, increasing gradually from the lakeshore inland. This nearly level to gently sloping plain is underlain mostly by lacustrine sediments but partially by glacial till. Low beach ridges are a prominent feature. Local relief is mainly in a few feet but in some places along the lakeshore there are steep wave-cut cliffs.

Climate: Average annual precipitation—30 to 35 inches; evenly distributed through the year; heavy snowfall is common in winter. Average annual temperature—50° to 51° F. Average freeze-free period—Mainly 160 to 180 days but 200 days in a narrow belt in Ohio.

Water: Rainfall is adequate for crops during most years except on the coarse-textured soils. Supplemental irrigation water for high-value fruit and vegetable crops is obtained from wells or from the Great Lakes. The wettest soils must be drained before they can be used for crops and many other soils benefit from drainage. The abundant ground water meets domestic, industrial, and municipal needs in much of the area, but some of the larger cities obtain water from the Great Lakes. The Great Lakes also provide transportation and are used extensively for recreation.

Soil: Gray-Brown Podzolic soils are dominant in the west (Painesville and Caneadea in fine-textured materials; Collamer, Tuscola, and Kibbie in medium-textured materials; and Coloma and Chili in coarse-textured materials). Associated soils on wet lowlands are Humic Gley soils (Lorain and Colwood). In the east most of the moderately and well-drained soils are Sols Bruns Acides (Williamson, Wallington, and Chenago). The associated wet soils are mostly Low-Humic Gley soils (Canadice and Fredon) but there are also some Humic Gley soils (Toledo).
101—Ontario-Mohawk Plain
New York
10,700 square miles

Land Use: About four-fifths of the area is in farms and about two-fifths is cropland. The largest acreage is in feed and forage crops for dairy cattle but many cash crops, including canning and truck crops, various fruits, and winter wheat, are grown also. About one-fifth of the land in farms is in permanent pasture and about one-fifth in forest, mostly farm woodlots. Of the one-fifth of the area not in farms, about one-half is urban and the remainder is in miscellaneous uses, including rural residences and parks.

Elevation and Topography: 250 to 1,000 feet, increasing gradually from the lakeshore to the Allegheny Escarpment, which forms the southern boundary of the area. Most of the area is a nearly level to rolling glacial drift plain. Drumlins (long narrow steep-sided oval hills) are prominent in an east-west belt near the center of the western two-thirds of the area. Low beach ridges are common. Local relief is mainly in a few feet to a few tens of feet, but the larger drumlins rise 100 to 200 feet or more above the adjacent lowlands.

Climate: Average annual precipitation—35 to 45 inches, increasing from west to east; evenly distributed through the year; large amounts of snow fall in winter, especially in the west. Average annual temperature—45° to 50° F. Average freeze-free period—Mainly 140 to 160 days but 180 days in a narrow belt along Lake Ontario.

Water: The moderate rainfall is adequate for crops and pasture in most years but yields are reduced in dry years. Farm ponds, Lake Ontario, and wells supply water for supplemental irrigation of high-value crops on many farms. Ground water is abundant in most of the area. Several large lakes are used for recreation; Lake Ontario provides recreation and is a major transportation artery. The New York Barge Canal crosses the area from east to west and is an important transportation artery.

Soil: Gray-Brown Podzolic soils from calcareous glacial drift are dominant (Ontario, Hilton, Honeoye, and Lima from calcareous glacial till; Odessa, Schoharie, Fulton, and Lucas in lacustrine sediments; and Palmyra in outwash). Associated with these soils are Humic Gley soils (Lyons and Toledo) in wet areas and Brown Forest soils (Nellis and Benson) on uplands where soils are thin over limestones. In more acid materials, mainly in the east, Sols Bruns Acides (Sodus and Williamson) are extensive. Associated with them are some Podzols (Camroden) and Low-Humic Gley soils (Marcy). Bog soils occupy many small depressions and a few large swamps throughout the area.
CENTRAL FEED GRAINS AND LIVESTOCK REGION

102  Loess, Till, and Sandy Prairies
103  Central Iowa and Minnesota Till Prairies
104  Eastern Iowa and Minnesota Till Prairies
105  Northern Mississippi Valley Loess Hills
106  Nebraska and Kansas Loess - Drift Hills
107  Iowa and Missouri Deep Loess Hills
108  Illinois and Iowa Deep Loess and Drift
109  Iowa and Missouri Heavy Till Plain
110  Northern Illinois and Indiana Heavy Till Plain
111  Indiana and Ohio Till Plain
112  Cherokee Prairies
113  Central Claypan Areas
114  Southern Illinois and Indiana Thin Loess and Till Plain
115  Central Mississippi Valley Wooded Slopes
M—CENTRAL FEED GRAINS AND LIVESTOCK REGION
203,900 square miles

Fertile soils and favorable climate make this one of the outstanding grain-producing regions of the world. The annual precipitation is 25 to 35 inches over much of the region but ranges from 20 inches in the extreme northwest to 45 inches along the eastern and southeastern fringe. Somewhat more than half falls during the growing season. Average annual temperatures are 45° to 55° F. in much of the region but range from 40° F. in the extreme northwest to 63° F. in the extreme southwest. The freeze-free season is 140 to 180 days in most of the region but is as short as 130 days along the northern fringe and as long as 235 days in the extreme southwest.

Gray-Brown Podzolic soils in the east and Brunizems in the west are the dominant soils. Humic Gley soils and Bog soils on wet lowlands and Alluvial soils in bands along the major streams are also important.

Corn, soybeans, oats, and other feed grains are the most extensively grown crops. Hay, winter wheat, and many other crops are grown also. Much of the grain is fed to beef cattle and hogs on the farms where it is grown, but a large amount is shipped to other regions for livestock feed. Part of the grain is processed for food and for industrial uses.
102—Loess, Till, and Sandy Prairies
South Dakota, Minnesota, Nebraska, and Iowa
35,100 square miles

Land Use: Almost all the area is in farms and between two-thirds and three-fourths of it is cropland. Corn, wheat, other small grains, and soybeans grown for feed and for sale are the major crops. Some alfalfa and other hay are grown for beef cattle. About one-fifth of the area is in pasture. Many pastures are largely of native grasses but on the better soils tame grasses and legumes are grown as well. Less than 1 percent of the area is in woodland. Wooded areas are mainly narrow bands along streams and a few shelterbelt plantings around farmsteads.

Elevation and Topography: 1,000 to 2,000 feet. This nearly level to rolling glacial plain is mantled by loess except in the north. Slopes are long, smooth, and gentle except the hilly to steep slopes bordering some of the larger stream valleys. In the northeast slopes are irregular and short. The Missouri River and a few of its larger tributaries have nearly level to gently sloping flood plains and terraces. Relief is mainly in a few feet to a few tens of feet.

Climate: Average annual precipitation—20 to 30 inches, increasing from north to south and from west to east; about three-fourths falls from mid-spring to early autumn; the sparse winter precipitation is snow. Average annual temperature—40° to 50° F., increasing from north to south. Average freeze-free period—140 to 160 days.

Water: Crops and pasture depend on the moderate rainfall. Year to year fluctuations are large and crop yields are seriously reduced in dry years. Shallow wells in the glacial deposits are the principal source of water for domestic and livestock needs; some water for livestock is stored in small ponds and reservoirs. Many small lakes in the northeast are important for recreation.

Soil: Chernozems (Barnes, Forman, Aastad, Bonilla, and Vienna) are dominant in the north. Regosols (Buse) on more sloping areas and Humic Gley soils (Parnell) and Solonetz soils (Cavour) in depressions are extensive. In the loess-mantled parts of the area, Chernozems (Moody and Kranzburg) are dominant but Regosols (Crofton) are on the associated steeper slopes. Other Chernozems in stratified sediments are Poinsett and Sinai soils. Alluvial soils (Onawa) and Humic Gley soils (Luton) are the principal soils on flood plains.
103—Central Iowa and Minnesota

Till Prairies

Minnesota and Iowa
27,900 square miles

Land Use: Nearly all the area is in farms and about three-fourths is cropland. Corn, soybeans, and other feed grains are the major crops. Some cropland is in hay and dairy farming is important in the north. Between 10 and 15 percent is in permanent pasture of tame and native grasses. Narrow bands of woodland on steep slopes border stream valleys, and some of the wet bottom lands are also forested. About 5 percent is urban and a like amount is in miscellaneous other uses.

Elevation and Topography: 1,000 to 1,300 feet. Most of the area is a nearly level to gently rolling till plain, but there are some morainic hills in the east. Relief is mainly in a few feet to a few tens of feet, but some major valleys are 100 to 200 feet below the adjoining uplands.

Climate: Average annual precipitation—25 to 33 inches; two-thirds or more falls during the freeze-free period. Average annual temperature—Mainly 43° to 48° F., decreasing to 40° F. in the northwest. Average freeze-free period—130 to 160 days.

Water: The moderate rainfall is adequate for crops but yields are reduced in years of low rainfall. Ground-water supplies are adequate for domestic, livestock, and municipal needs. Some natural lakes and ponds and a few artificial reservoirs provide water and recreation.

Soil: Brunizems (Clarion and Nicollet) and soils transitional between Gray-Brown Podzolic soils and Brunizems (Lester) in medium-textured calcareous glacial till are dominant. Gray-Brown Podzolic soils (Hayden) are on the morainic hills in the east. Associated soils on wet flats and in depressions are Humic Gley soils (Webster and Glencoe).
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104—Eastern Iowa and Minnesota
Till Prairies
Minnesota and Iowa
9,700 square miles

Land Use: Nearly all the area is in farms and more than three-fourths is cropland. Corn, soybeans, other feed grains, and some hay for livestock are the major crops. Less than 10 percent is in pasture of tame and native grasses. A like amount is wooded, mainly wet bottom land but also steep slopes bordering stream valleys.

Elevation and Topography: 1,000 to 1,200 feet. This nearly level to gently sloping till plain has a thin mantle of loess. Local relief is mainly in a few feet to a few tens of feet. The streams have narrow and shallow valleys in their upper reaches, and only in the east is there much dissection.

Climate: Average annual precipitation—28 to 33 inches; more than two-thirds falls during the freeze-free period. Average annual temperature—43° to 47° F. Average freeze-free period—140 to 160 days.

Water: Rainfall is generally adequate for crops, but yields are reduced in dry years. Many of the wetter soils require artificial drainage before they can be used successfully for the common field crops. Ground water in the glacial drift is adequate for livestock, domestic, and municipal needs.

Soil: Brunizems (Kenyon and Ostrander) and soils transitional between Gray-Brown Podzolic soils and Brunizems (Kasson) from leached glacial till are dominant. On flats and wet drainageways Humic Gley soils (Floyd and Clyde) are the major soils.
105—Northern Mississippi Valley
Loess Hills
Wisconsin, Iowa, Minnesota, and Illinois
18,400 square miles

Land Use: Nearly all the area is in farms but only about two-fifths is cropland. Feed grains and hay for dairy cattle and other livestock are the principal crops. About one-fifth is in permanent pasture of tame and native grasses. Nearly one-third, mainly the more sloping parts, is in forest.

Elevation and Topography: 600 feet on the valley floors to 1,200 feet on the highest ridgetops. The sloping to hilly uplands are thoroughly dissected by both large and small tributaries of the Mississippi River. Bottom lands of all streams are narrow. Around the perimeter of the area some broad ridgetops have undulating slopes. Local relief is mainly in several tens of feet to a few hundred feet.

Climate: Average annual precipitation—30 to 35 inches; two-thirds or more falls during the freeze-free period. Average annual temperature—45° to 50° F. Average freeze-free period—140 to 160 days.

Water: The moderate rainfall and the many perennial streams are important water sources. Ground water is abundant in outwash deposits in the valleys but the amount varies in the uplands—areas underlain by sandstone and shale commonly have a meager supply. The Mississippi River, which crosses the area, is a major transportation artery and also provides recreation.

Soil: Gray-Brown Podzolic soils (Fayette, Dubuque, Seaton, and Gale) from a loess mantle over bedrock or glacial till are dominant. Brunizems (Tama, Dodgeville, and Muscatine) are on gently sloping broad ridgetops. Lithosols (Boone) and steep rocky and stony land are extensive on steep slopes bordering the major valleys.
106—Nebraska and Kansas

Loess-Drift Hills
Nebraska and Kansas
10,200 square miles

Land Use: Nearly all the area is in farms and between one-half and two-thirds is cropland. Wheat is the important cash crop but corn, other feed grains, and alfalfa and other hay occupy more acreage. Most of the grain and hay is fed on the farm where it is grown. About one-fourth of the area is in pasture. Pastures are of tame grasses and legumes on the better soils but of native grasses on the more sloping shallow soils. Woodland is confined to narrow bands on slopes bordering stream valleys and to some wet bottom lands.

Elevation and Topography: 1,000 to 1,500 feet, increasing from east to west. This dissected glacial-drift plain is mantled in most places by thick loess. Ridgetops are broad and smooth and slopes are undulating to rolling. Stream valleys are bordered by relatively narrow bands of hilly to steep slopes. Valley floors are narrow except along one or two of the larger tributaries of the Missouri River. Local relief is mainly in several tens of feet but some of the larger valleys are 100 to 200 feet or more below the level of the adjacent uplands.

Climate: Average annual precipitation—30 to 36 inches, increasing from northwest to southeast; about three-fourths falls from late spring through early autumn; the scant winter precipitation is mainly snow. Average annual temperature—About 55° F. Average freeze-free period—160 to 190 days.

Water: Rainfall is generally adequate for crops but yields are reduced in some years by lack of moisture. Locally, small areas along some of the perennial streams are irrigated. Shallow wells in glacial drift supply water for domestic and livestock needs on most farms, and small ponds and reservoirs are another important source of water for livestock. In some places deep wells provide water.

Soil: Brunizems are the major soils (Sharpsburg, Marshall, and Grundy on the undulating to gently rolling loess-mantled ridgetops and upper slopes and Burchard, Pawnee, and Shelby on ridge slopes underlain by glacial till). Regosols are on the steep slopes (Crofton and Hamburg on steep slopes that have a deep loess cover and border the larger stream valleys and Steinauer on the lower steep slopes underlain by glacial till). Humic Gley soils (Wabash and Colo) are on the relatively narrow wet bottom lands along most streams.
107—Iowa and Missouri Deep Loess Hills

Iowa and Missouri
19,200 square miles

**Land Use:** Most of the area is in farms and about three-fifths is cropland. Corn, other feed grains, and hay for livestock are the principal crops. One-fifth of the area is in permanent pasture of tame and native grasses. About one-tenth, mainly in narrow belts of steep slopes bordering stream valleys and wet bottom land, is in forest.

**Elevation and Topography:** 800 feet along the Missouri River flood plain in the south to 1,500 feet on the highest ridgetops in the north. This rolling to hilly loess-mantled plain is intricately dissected. Small valleys have narrow flood plains but larger valleys have broad floors. Local relief is mainly in several tens of feet to 100 or 200 feet.

**Climate:** Average annual precipitation—25 to 36 inches; two-thirds or more falls during the freeze-free period; the low winter precipitation is mainly snow. Average annual temperature—45° to 55° F. increasing from north to south. Average freeze-free period—160 to 190 days, increasing from north to south.

**Water:** The moderate rainfall and abundant streamflow are important water sources. Ground water is abundant in deep outwash in the valleys but is less plentiful in the uplands. The Missouri River is a major transportation artery and is used for recreation.

**Soil:** *Brunizems* (Marshall, Sharpsburg, and Monona) from moderately deep to very deep loess on gentle to rolling slopes are the major soils. On steep slopes having a deep loess mantle *Regosols* (Ida and Hamburg) are extensive, but *Gray-Brown Podzolic soils* (Knox) occur in narrow bands on some slopes where moisture supplies are favorable for forest growth. *Humic Gley soils* (Marcus) are on upland flats and in depressions where loess is underlain at a moderate depth by glacial till. *Alluvial soils* (McPaul, Albaton, Haynie, and Sarpy) are on the better drained bottom lands throughout the area. *Humic Gley soils* (Wabash, Colo, and Luton) are extensive on the wet bottom lands.
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Tama Co., Iowa  September 1963.
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108—Illinois and Iowa Deep Loess and Drift
Iowa and Illinois
34,900 square miles

Land Use: Nearly all the area is in farms and about three-fourths is cropland. Corn, soybeans, and other feed grains are grown extensively on the less sloping parts and are sold as cash crops. Where slopes are stronger, more of the land is in hay and pasture and more of the grain is fed to livestock on the farms where it is produced. About 10 percent of the area is in pasture of tame and native grasses; the narrow bands of forest on steep valley sides and wet bottom land constitute an additional 5 percent. Five percent is urban and the remainder is in other uses.

Elevation and Topography: 500 feet on the lowest valley floors to 1,000 feet on the highest uplands, increasing gradually from east to west. Much of this dissected loess-mantled glacial plain is rolling to hilly, but some of the broad uplands far from the large streams are level to undulating. The smaller streams have narrow valley floors but the large streams have broad flood plains. Local relief is mainly in several tens of feet to 100 or 200 feet but the upland flats have relief of only a few feet.

Climate: Average annual precipitation—30 to 35 inches; two-thirds or more falls during the freeze-free period; the low winter precipitation is mostly snow. Average annual temperature—47° to 53° F. Average freeze-free period—160 to 180 days.

Water: The favorably distributed moderate rainfall and the many perennial streams are important water sources. Ground water is abundant in the glacial drift that underlies much of the area. The Mississippi River and a few large tributaries are transportation arteries and are used for recreation.

Soil: Brunizems (Tama, Muscatine, Flanagan, Sharpsburg, Shelby, and Mahaska) from loess are the dominant soils throughout the area. Associated with them on flats and in depressions are Humic Gley soils (Sable, Taintor, and Drummer). Gray-Brown Podzolic soils (Fayette, Seaton, Clinton, and Lindley) are conspicuous on the steep slopes of valley sides but constitute only 10 to 15 percent of the total area. Alluvial soils (Nodaway and Lawson) on the broader flood plains are locally very important to agriculture. Humic Gley soils (Colo and Zook) are on wet bottom land.
109—Iowa and Missouri Heavy Till Plain  
Iowa, Missouri, and Illinois  
17,900 square miles

**Land Use:** Nearly all the area is in farms and somewhat more than one-half is cropland. Corn, other feed grains, and hay for livestock are the principal crops. About one-fourth is in pasture of tame and native grasses and about 10 percent is woodland.

**Elevation and Topography:** 700 feet in the lowest valleys to 1,100 feet on the highest ridges. This dissected till plain has a thin loess mantle. Slopes are mostly rolling to hilly but some broad ridgetops are nearly level to undulating. The slopes bordering major stream valleys are steep. A few large rivers have nearly level broad valley floors. Local relief is mainly in several tens of feet to 100 or 200 feet, but the upland flats and valley floors have local relief of only a few feet.

**Climate:** *Average annual precipitation*—35 to 40 inches; about two-thirds falls during the freeze-free period; the low winter precipitation is snow. *Average annual temperature*—50° to 55° F. *Average freeze-free period*—160 to 180 days.

**Water:** The favorably distributed moderate rainfall provides enough water for crops in most years. The many small perennial streams and a few large streams are additional sources of water but are little used at present. Ground-water supplies are small and undependable.

**Soil:** *Brunizems* (Shelby, Seymour, and Grundy) from moderately fine textured glacial till or thin loess are the principal soils. On broad upland flats *Planosols* (Edina) are extensive and associated with them in the wettest areas are *Humic Gley soils* (Haig). *Alluvial soils* (Nodaway) and *Humic Gley soils* (Colo and Wabash) on the flood plains are very important to agriculture locally.
110—Northern Illinois and Indiana
Heavy Till Plain
Illinois and Indiana
7,700 square miles

**Land Use:** Most of the area is in farms but about one-fifth of the area, consisting of Chicago and its suburbs in the north, is urban. Urbanization is removing additional land from agriculture rapidly. Farmed areas are used mainly for cash-grain farming; corn and other feed grains are the principal crops. Feed grains and forage for dairy cattle are very important in some places. Woodland occupies less than 5 percent of the area and is confined mainly to wet flood plains, steeply sloping valley sides, and morainic ridges.

**Elevation and Topography:** 600 to 800 feet, increasing gradually from Lake Michigan south. Streams have cut only shallow valleys over much of this nearly level to gently sloping glaciated plain. Local relief is in a few feet to a few tens of feet.

**Climate:** Average annual precipitation—30 to 35 inches; about two-thirds falls during the freeze-free period; winter precipitation is snow. Average annual temperature—48° to 52° F. Average freeze-free period—About 160 days but 180 days in a narrow belt along Lake Michigan.

**Water:** The favorably distributed moderate rainfall is adequate for crops in most years. Ground water is abundant in glacial drift and meets domestic and municipal needs in much of the area. The large cities in the north depend on Lake Michigan for water. A few large perennial streams are other potential sources of water but are not much used at present. Extensive areas of wet soils must be drained before they can be used for agriculture or other purposes.

**Soil:** Brunizems (Saybrook, Elliott, Swygert, and Clarence) from calcareous glacial till are the major soils. Associated with them on flats and in depressions are large areas of Humic Gley soils (Drummer, Ashkum, and Bryce). Gray-Brown Podzolic soils (Morley, Miami, and Blount) also from glacial till are dominant on small tracts of formerly forested land in the north.
Indiana and Ohio Till Plain
Indiana, Ohio, Michigan, and Illinois
32,900 square miles

Land Use: More than 90 percent of the area is in farms and about 80 percent is cropland. Corn, soybeans, other feed grains, and hay for livestock are the principal crops. Dairying is important near cities, and truck and canning crops are grown extensively where soils and markets are favorable. Small areas of permanent pasture and small farm woodlots make up the rest of the land in farms.

Elevation and Topography: 700 to 1,000 feet, increasing very gradually from west to east. This gently sloping glacial-till plain is broken in places by hilly moraines, kames, and outwash terraces. Relief is mainly in a few feet to a few tens of feet but locally hills rise as much as 100 feet above the adjoining plains. The few large streams commonly have narrow and shallow valleys.

Climate: Average annual precipitation—35 to 40 inches; half or more falls during the freeze-free period; winter precipitation is low and is mostly snow. Average annual temperature—50° to 55° F. Average freeze-free period—155 to 180 days.

Water: The favorably distributed moderate rainfall is adequate for crops in normal years but yields are reduced by drought in some years. Ground water in glacial deposits is the principal water source for domestic, industrial, and municipal uses. A few large streams, mainly tributaries of the Ohio River, are potential sources of water but are not much used at present. A few lakes in the western part of the area are widely used for recreation.

Soil: Gray-Brown Podzolic soils (Miami, Blount, Russell, Crosby, Fincastle, Cardington, and Morley) from calcareous glacial till that is mantled by silt in the south are the dominant soils. Associated with them on flats and in depressions are Humic Gley soils (Brookston) and Bog soils (Carlisle, Houghton, and Edwards). Gray-Brown Podzolic soils (Fox and Ockley) and Humic Gley soils (Westland) are extensive in areas of gravelly glacial outwash.
**112—Cherokee Prairies**

Kansas, Oklahoma, and Missouri
25,400 square miles
Arkansas—1,000 square miles

**Land Use:** Nearly all this area is in farms and about half is cropland. Winter wheat, soybeans, corn, grain sorghum, other feed grains, and hay are the major crops. Some cotton is grown in a few Oklahoma counties. About one-third of the area is in pasture, mainly of tame grasses and legumes but of native grasses on the more sloping parts. Much of the area in Arkansas is in pasture. About one-tenth of the area, the steeper valley slopes and some of the wet bottom land, is woodland. The amount of woodland in Kansas is considerably less than that in the other three States.

**Elevation and Topography:** 400 to 1,200 feet. These gently sloping to rolling dissected plains are underlain by sandstones, shales, and limestones. Thin loess covers the northern part. Even though the area is thoroughly dissected, local relief is in only a few tens of feet and large valleys are about 100 feet below the adjacent uplands.

**Climate:** Average annual precipitation—35 to 45 inches; highest from late spring through autumn. Average annual temperature—55° to 63° F. Average freeze-free period—190 to 235 days.

**Water:** The moderate rainfall is adequate for crops and pasture in many years, but summer droughts of sufficient severity and duration to reduce crop yields are common. Shallow wells are the principal source of water for domestic use and for livestock in much of the area, but small ponds and reservoirs on individual farms are increasingly important sources of water for livestock. Deep wells, especially in the limestone areas, also provide water.

**Soil:** Planosols (Oswego, Parsons, Cherokee, and Taloka) on nearly level to undulating slopes are the dominant soils; associated with them on gentle slopes are Brunisols (Woodson, Dennis, Summit, Okemah, and Bates). Rendzinas (Snead) are on undulating to rolling slopes underlain by soft limestones and calcareous shales and Lithosols (Darnell, Sogn, and Collinsville) on more strongly sloping areas underlain by sandstones, shales, and limestone. Alluvial soils (Verdigris and Lightning, Pope and Philo in Arkansas) and Low-Humic Gley soils (Osage) on flood plains are of small total extent but are among the best agricultural soils in the area.
113—Central Claypan Areas
Missouri and Illinois
11,000 square miles

Land Use: Nearly all these areas are in farms and about three-fifths is cropland. Corn, soybeans, other feed grains, and hay for cattle and other livestock are the main crops. About one-tenth is in permanent pastures of tame and native grasses. An additional one-sixth, mainly on the steeper slopes and wet bottom land, is in forest; about 5 percent is urban and the remainder is in miscellaneous other uses.

Elevation and Topography: 750 to 950 feet in Missouri and 500 to 600 feet in Illinois, increasing gradually from south to north in both States. These areas consist of nearly level to gently sloping silt-mantled old till plains. Stream valleys are shallow and most of them are narrow. Local relief is mainly in a few feet to a few tens of feet.

Climate: Average annual precipitation—About 40 inches; about 60 percent falls during the freeze-free period. Average annual temperature—55° F. Average freeze-free period—180 to 190 days.

Water: The moderate rainfall is adequate for crops in most years. Low to moderate supplies of water are available from ground water. A few large perennial streams are potential sources of water that are not much used at present. Most of the soils are imperfectly to poorly drained, and claypans prevent effective artificial drainage on most of them.

Soil: Planosols with a claypan, mostly from loess overlying old glacial till, are the principal soils (dark-colored Putnam and Mexico in Missouri and lighter colored Hoyleton, Cowden, Cisne, Wynoose, and Bluford in Illinois). On hilly and steep valley sides Gray-Brown Podzolic soils (Lindley, Hickory, Weller, and Gara) are the dominant soils. Alluvial soils (Westerville and Sharon) and Humic Gley soils (Wabash) on narrow flood plains are of small total extent but are among the best agricultural soils of the area.
Southern Illinois and Indiana
Thin Loess and Till Plain
Illinois, Indiana, and Ohio
14,400 square miles

Land Use: Nearly all the area is in farms but only about one-half is cropland. Corn, soybeans, other feed grains, and hay for dairy cattle and other livestock are the principal crops. Some tobacco is grown as a cash crop in Indiana and Ohio. About one-fifth of the area is in forest, much of which is in small farm woodlots but some is in large holdings. Most of the remaining farmland is in pasture. About 5 percent of the area, mainly along the Ohio River, is urban or in industrial use.

Elevation and Topography: 400 feet on valley floors to 1,200 feet on ridgetops, the ridgetops increasing gradually in elevation from west to east. This dissected old glacial-till plain has a moderately thick mantle of loess. Most of the ridgetops are narrow but some are broad. Ridge slopes and valley sides are steep. Local relief on the ridgetops is in a few feet to a few tens of feet but stream valleys are one to several hundred feet below the adjoining uplands.

Climate: Average annual precipitation—35 to 45 inches; highest in spring and early summer and least from midsummer through autumn. Average annual temperature—53° to 58° F. Average freeze-free period—180 to 200 days.

Water: The moderate rainfall is adequate for crops in most years but yields are reduced occasionally by droughts. Ground-water supplies meet domestic, industrial, and municipal needs in most of the area, but ground water is scarce in parts where shale is near the surface. Many small streams are potential sources of water not much used at present.

Soil: Planosols (Bluford, Vigo, Avonburg, and Clermont) from moderately thick loess over old glacial till on level to sloping ridgetops are the dominant soils. Gray-Brown Podzolic soils (Cincinnati and Ross-moyne) are dominant on more sloping uplands and Rendzinas (Fairmount) in shaly limestone materials on valley sides. Alluvial soils (Haymond, Belknap, and Bonnie) on the relatively narrow flood plains are of small total extent but are highly important to agriculture locally.
115—Central Mississippi Valley
Wooded Slopes
Missouri, Illinois, and Indiana
19,200 square miles

Land Use: Nearly all the area is in farms and about two-fifths is cropland. Feed grains and hay for livestock are the principal crops, but peach and apple orchards are important on some of the more sloping parts. About one-third of the area is in forest, mainly in small farm woodlots but partly in large tracts that include some national forest. Most of the remainder of the land in farms is in pasture of tame and native grasses.

Elevation and Topography: 400 feet on the main valley floors to 1,000 feet on the ridgetops. This dissected glacial-till plain has rolling narrow ridgetops and hilly to steep ridge slopes and valley sides. The small streams have narrow valleys and steep gradients. The major rivers have nearly level broad flood plains. Valley floors are one to several hundred feet below the adjoining hilltops.

Climate: Average annual precipitation—35 to 45 inches; about two-thirds falls during the freeze-free season in the west; highest in spring and early summer and lowest from midsummer through autumn in the southeast. Average annual temperature—53° to 58° F. Average freeze-free period—180 to 200 days, increasing from north to south.

Water: Rainfall is adequate in most years for the crops commonly grown but yields are reduced by drought in some years. Ground water furnishes domestic and livestock needs on farms. The Mississippi, Missouri, and Ohio Rivers are major transportation arteries and are used for recreation.

Soil: Gray-Brown Podzolic soils are the dominant soils (Menfro, Alford, Princeton, Lindley, Weller, and Weldon in loess over old glacial till and bedrock on rolling to steep slopes and Gara and Lindley in till areas lacking the loess mantle). On ridgetops in the south Gray-Brown Podzolic soils with fragipans (Hosmer, Grenada, and Union) are important. Alluvial soils (Genesee, Haymond, Sharon, Beaucoup, Westerville, and Allison) and Humic Gley soils (Wabash and Darwin) on level flood plains occupy about one-tenth of the area and are among the more important agricultural soils.
SELECTED REFERENCES


