DELTA SOILS OF SOUTHEAST MISSOURI

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Contents

Delta Soils of Southeast Missouri

H. H. KRUSEKOPF

Prof. Emeritus of Soils

Introduction

The Lowland Region of southeastern Missouri has attracted the interest of agriculturists and geographers in the last 50 years as has no other section of the state. The opportunity for the production of a variety of crops on the level, fertile soils has held an appeal to the land seeker and a challenge to the landowner. The central location in the U.S., the accessibility by land and water, the favorable climate, and the successful results of reclamation efforts are other factors that have stimulated the development of the region.

It is a new land. Its physical features made possible the application of the newest technological advances—particularly in farm mechanization—that accelerated almost phenomenal reclamation and development. The vision, labor, and sacrifices of many individuals of former years, has culminated in the creation of an agricultural land whose potential for production has only recently become apparent.

It is well to remember, however, that the present prosperity of the region was preceded less than four or five decades ago, by the toil and struggle of the pioneers who cleared the land and constructed the first drainage ditches. There were many failures in capital investment for reclamation before the land became productive. The physical, agricultural and cultural development of the Lowland Region forms a special chapter in the history of the state that has not yet been adequately recorded.

A Distinct Agricultural Region

The Lowland of southeastern Missouri is a distinct physiographic and agricultural region. Its physical boundaries are sharply defined by river and bluff. It is distinct because of its geologic structure and origin. It is an alluvial valley of recent geologic age. It is a region characterized by rapid agricultural development and a varied type of farming. The conversion from forest to farmland, begun more than 100 years ago, was accomplished largely since 1910, after the development of comprehensive drainage. The agriculture has undergone several changes, from subsistence to large commercial operation, but has not yet reached stability or become adjusted to the environmental factors. Basic in all this is an understanding of the soil resources of the region.

The purpose of this report and the soil map included is to indicate the different kinds of soils and their location, to interpret their basic differences, and to evaluate their potential for production and adaptation to different

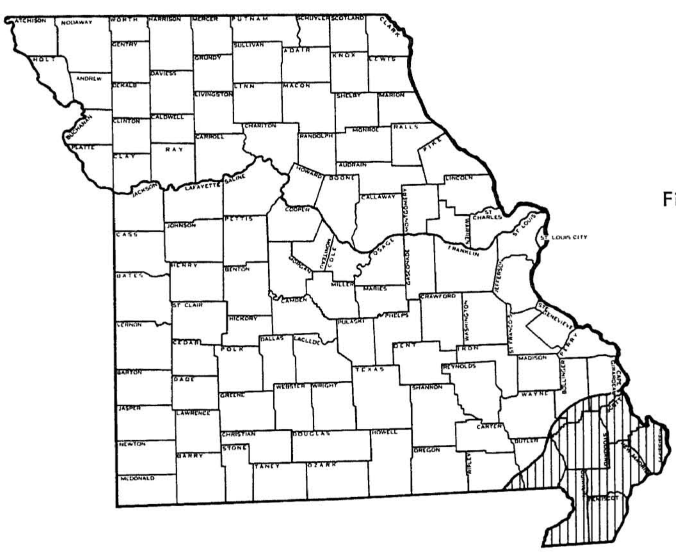

Fig. 1 - Location of Lowland Region

crops. There is greater contrast in the physical properties of the soils in this region than in any other section of the state. The vast and complex drainage problem, and the factors of soil arrangement will be reviewed. The economy of the region is based on agriculture. A knowledge of the physical differences is of decisive importance in land drainage, irrigation, soil management and land use.

The Lowland Region in Missouri is the northern end of the vast Mississippi alluvial valley that extends from Cape Girardeau south for a distance of 600 miles to the Gulf of Mexico (Fig. 1). The northern and western boundary is the Ozark escarpment or bluff line that extends from Cape Girardeau southwest to Poplar Bluff and thence to the Arkansas state line. The eastern boundary is the Mississippi River. The southern limit is the Arkansas state line. It includes all or part of 11 counties: Bollinger, Butler, Cape Girardeau, Dunklin, Mississippi, New Madrid, Pemiscot, Ripley, Scott, Stoddard, and Wayne. The total area is about 3900 square miles, or 2,509,000 acres.

Known by Several Names

Because the Lowland is a distinct geographic area, various names have been applied to it. It is sometimes designated as the *delta.* Under present usage this name is applied to younger and active areas of river sedimentation. It therefore is not applicable to the Lowland in Missouri. The name *Mississippi valley* is too comprehensive, but the more specific name—*Mississippi alluvial valley*—may be acceptable. It should be noted that a large part of the Lowland, east of Sikeston Ridge, was formed by the Ohio River.

Most of the Lowland under virgin conditions was poorly drained and even inundated part of the year. The region was considered swampland. A swamp has a soft bottom—usually an accumulation of partially decomposed organic material. The Lowland has a firm bottom and therefore is not true swampland. The name *bootheel* has come into frequent use because part of the region projects below the rest of the state in a shape that some imagine resembles a boot heel. However, this name has an undesirable connotation and the name, Lowland, is preferred. Thus, *Lowland,* or more specifically, *Lowland of Southeastern Missouri,* is used in this report. This name indicates the real physiographic character of the area, and also contrasts it to other sections of the state.

Evolution of the Lowland

For an understanding of the physical structure and origin of the Lowland (1902) and especially for an understanding of the soil variations, a brief review of the evolution of the Lowland is presented.

Several theories, substantiated by observable features, have been developed by geologists and geographers. The theories are similar in their main interpretation, but may vary in detail. All conclude that the present land forms, and especially all surface deposits or soil forming materials, are of recent geologic time.

Recent generally is accepted as the geologic time since the Wisconsin glacial stage during Pleistocene time. The length of most recent time is estimated at approximately 25,000 years. This is in strong contrast to the great age of the Ozark upland, which is estimated at many millions of years. Only a brief sketch of the main events that occurred during the evolution of the Lowland are presented here. For a more complete discussion the reader should consult special reports (1944).

Shifts of Rivers

The Mississippi River originally turned west at Cape Girardeau and occupied the western Lowland between the Ozark Upland and Crowley's Ridge. The Scott County Hills and Crowley's Ridge were a continuous upland and formed the divide between the Mississippi and Ohio Rivers. At the same time the Ohio River occupied the eastern Lowland south of Scott County Hills, and flowed south along the eastern edge of Crowley's Ridge. The Ohio eventually shifted to the east, to approximately the position now occupied by the Mississippi below Cairo. The junction of the two large rivers was near Helena in the southeastern corner of Arkansas.

Subsequently, the Mississippi formed a gap east of Bell City, between the Scott County Hills and Crowley's Ridge and occupied the broad lowland east of Crowley's Ridge, formerly occupied by the Ohio. Kennett Ridge and Sikeston Ridge formerly were joined, and are the remnants of the former Ohio alluvial plain. This plain was degraded or destroyed by the Mississippi river, except for the two sand ridges just mentioned.

At a later stage the Mississippi shifted to occupy the gorge north of Commerce, and joined the Ohio River near Cairo. The combined rivers followed a meandering course south to the state line and beyond to the Gulf of Mexico.

The smaller streams from the Ozark upland that flowed into the Mississippi when it occupied the western Lowland, made adjustments when the main river abandoned its valley. Thus the St. Francois River continued to flow southward. It eventually cut through Crowley's Ridge at the Missouri-Arkansas state line, and then occupied the abandoned channel of the Ohio River along the eastern edge of Crowley's Ridge south of Campbell. Castor River shifted from the western Lowland, and occupied a small abandoned valley across the northern part of Crowley's Ridge from Leora to Aquilla. Whitewater Creek and Hubble Creek flowed south, and joined Castor to form the ill-defined Little River near Morehouse. Castor and Whitewater have been canalized and joined to form the Headwater Diversion Channel. This large artificial channel was built in 1913, flows east, and then joins the Mississippi about 2 miles south of Cape Girardeau. (1957)

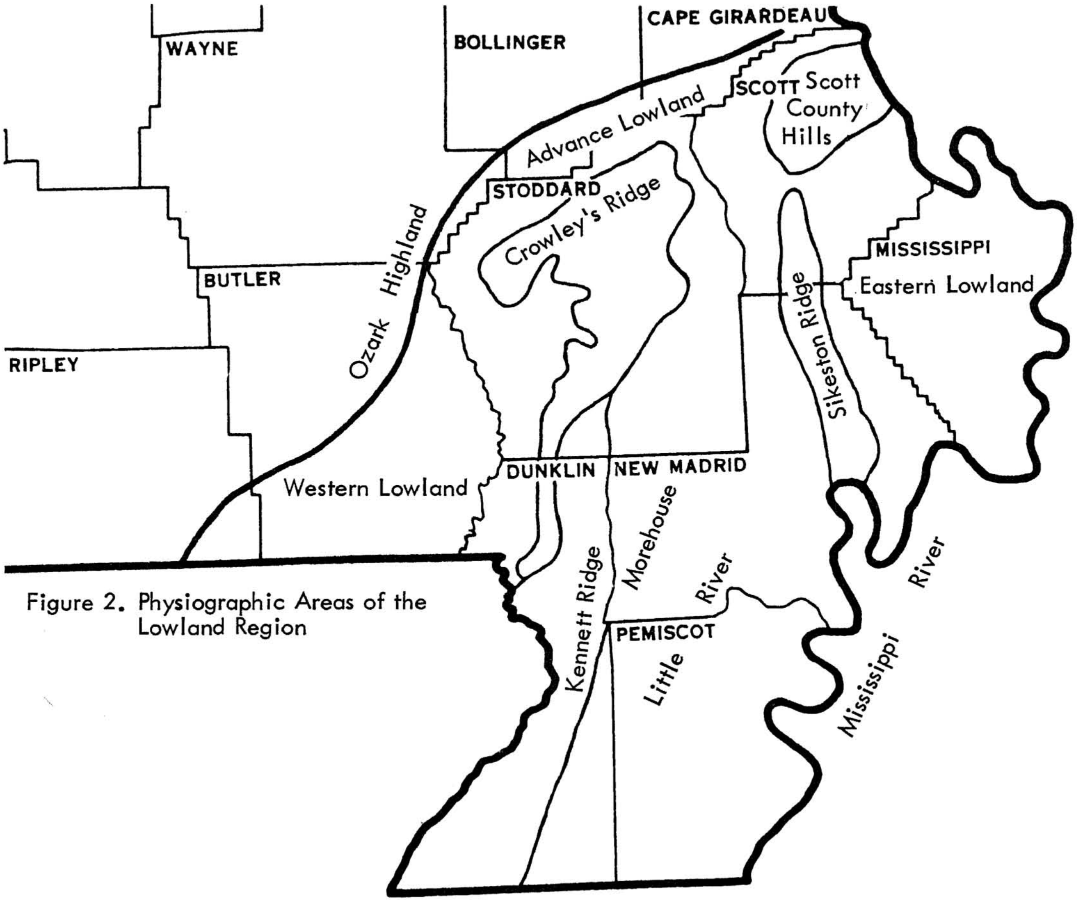

Figure 2. Physiographic Areas of the Lowland Region

Subareas of the Lowlands

Shifts of the two major streams—Mississippi and Ohio—during the evolution of the Lowland, have altered the land surface to form distinct physiographic subareas or lowlands (Fig. 2). The name assigned to these is the same as that adopted by geologists and geographers in earlier regional studies (1958). Each subarea is characterized by soil and drainage conditions that distinguish it from every other area. These variations are described in the soils section of this report. An understanding of the origin and formation of the physical subareas is essential for an understanding of the varied soil and agricultural conditions.

The Subareas

Upland—Crowley's Ridge and Scott County Hills

Advance Lowland
Western Lowland
Kennett Ridge
Sikeston Ridge
Morehouse Lowland
  Essex terrace
  Little river overflow

Eastern (Cairo) Lowland
  Charleston terrace
  Mississippi meander belt

Identifiication of Subareas

Upland—Crowley's Ridge and Scott County Hills

The most conspicuous feature of the Lowland Region is Crowley's Ridge and Scott County Hills. These are remnants of upland, formerly continuous until divided by the Mississippi River when it formed the Bell City-Oran gap. The southern and eastern edges of the two uplands rise abruptly from the lowland to a height of 100 to 150 feet. The general slope of the land is to the west. Hickory Ridge, Baker Hill, and Goose Pond Hills are narrow steep sided ridges. Bird, Cow, Lost and Ringer Hills are isolated hills or knobs, near the northeastern part of Crowley's Ridge, and formerly were a part of the main upland.

Western Lowland

The broad, almost level alluvial plain between the Ozark escarpment and Crowley's Ridge is designated as the western Lowland. It extends from Wapapello south to the Arkansas state line. It is the former Mississippi alluvial valley, now occupied by the Black and St. Fran-

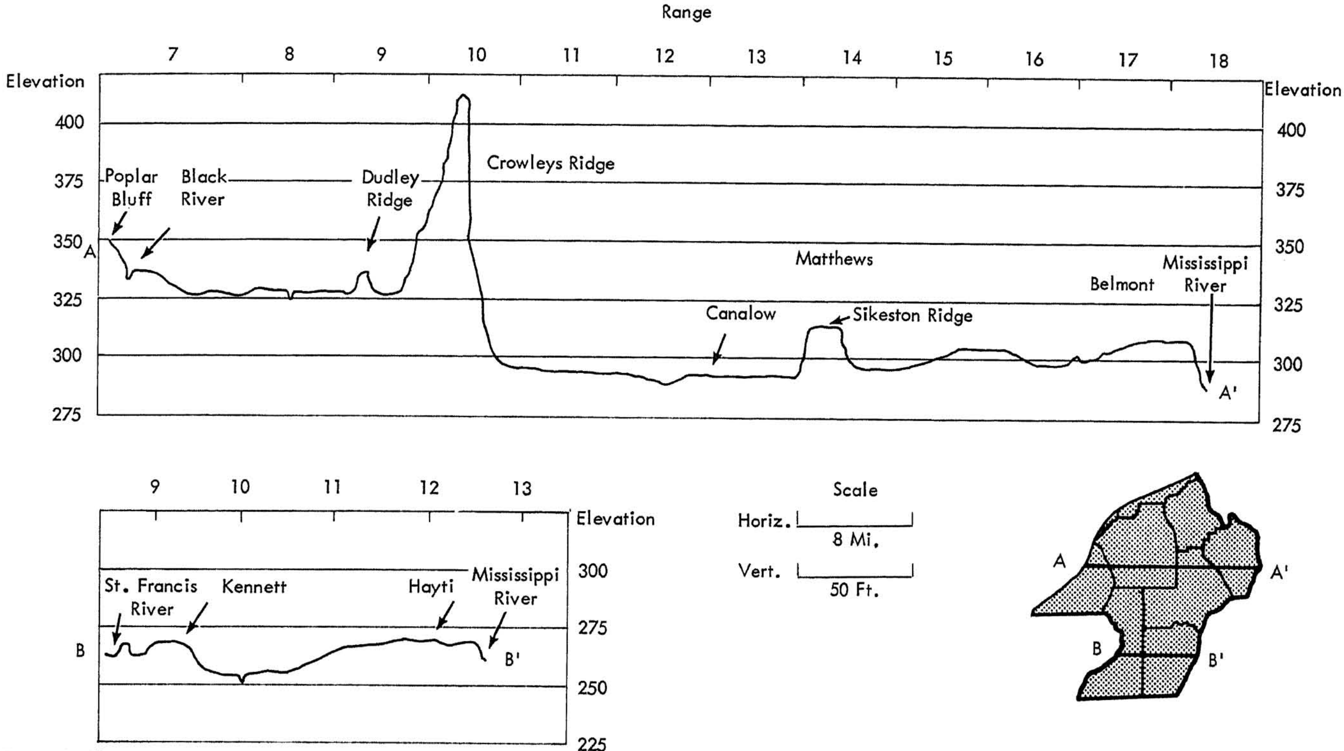

Figure 3. The upper diagram depicts a cross section of the land surface elevation along the base line of Township 25 N, from Poplar Bluff to Belmont on the Mississippi River, A to A' on the map. (The sharp changes in elevation result from condensing the horizontal distance more than the vertical so the whole profile can be shown.) Diagram at lower left shows cross section of land surface elevation from point on the St. Francis River near Kennett to the Mississippi River near Hayti, B to B' on the map. (Based on U.S. Topographic maps.)

cois Rivers. The aggraded valley has an elevation over 300 feet, and averages 15 to 25 feet higher than the lowland east of Crowley's Ridge. With the possible exception of Kennett and Sikeston Ridges, the alluvial deposits here are older than those in other parts of the Lowland Region.

Advance Lowland

The *Advance Lowland* includes the northern tip of the Lowland Region. It extends from Cape Girardeau west to the St. Francois River near Wapapello. It is bounded on the north by the Ozark escarpment, and on the south by Scott County Hills and Crowley's Ridge. This subarea, like the western Lowland, is the former alluvial valley of the Mississippi river. It has been filled by alluvial fan deposits of Castor, Whitewater, Hubble and other Ozark streams. The loess-covered upland supplied vast quantities of sediment that covers and obscures the old drainage lines. The elevation at Delta is 335 feet.

The west end of Advance Lowland is blocked by the alluvial fan of the St. Francois River, resulting in Mingo swamp area. About 1 mile east of Advance, the former channel of the Mississippi is marked by natural levees. Successive terraces conforming to the bend in the river, diminish in height eastward. The bog area, known as *Old Field,* is obviously a remnant of the abandoned Mississippi River channel that has been completely filled with sediment.

Kennett and Sikeston Ridges

Kennett and Sikeston ridges are distinct, level, sandy terraces. They are similar in origin, and are remnants of the Ohio alluvial plain, formed when the Ohio occupied the lowland east of Crowley's Ridge. The plain was degraded and destroyed by the Mississippi River when it shifted to occupy this section of the Lowland. The ridges formerly were connected. Their edges are marked by steep slopes, indicating they were formed by stream erosion.

Sikeston Ridge is slightly higher than Kennett Ridge (Fig. 3). The elevation of Sikeston is approximately 325 feet, and that of New Madrid 295 feet above sea level. The elevation of Kennett and Malden is about 267 feet. Both ridges have scars—swales and shallow sloughs—marks of the former Ohio River channels. These are most apparent north and west of Kennett. The area formerly known as Varney River swamp west of Kennett is considered a former Ohio River channel. The St. Francois River now occupies an abandoned main channel of the braided Ohio system. Before canalization, the St. Francois River had a poorly defined channel and the exact location of the state boundary could not definitely be established. This accounts for discrepancies in the state boundary of early maps.

Morehouse Lowland

The Morehouse Lowland as defined in this report includes the entire area extending from Advance Lowland on the north to the Missouri-Arkansas state line on the south. It is bordered on the west by Crowley's Ridge and Kennett Ridge, and on the east by Sikeston Ridge and the Mississippi River, south of New Madrid. It has an elevation of about 315 feet near Bell City, and about 235 feet at the state line, or a slope of about 1 foot per mile. That portion of the Lowland south of Morehouse was formerly known as *Little River Overflow,* because of frequent inundation by water from Castor and Whitewater Rivers.

A subarea of the Morehouse Lowland is the low sandy terrace east of Dexter, and extending from Essex in the north to near Gideon on the south. The surface is marked by numerous swales—former channels of the braided Mississippi River. The broad, shallow swale in the eastern part of the Morehouse Lowland, and bordering Sikeston Ridge, probably was the channel last to be abandoned by the Mississippi River. It was a swamp until drained. Except for the Essex terrace, most of the Morehouse Lowland is characterized by a level surface and clay soils.

Eastern (Cairo) Lowland

The Eastern Lowland, also known as Cairo Lowland, lies south of Scott County Hills, east of Sikeston Ridge, and is bordered on the east by the Mississippi River. It is a lowland formed by the combined action of the Mississippi and Ohio Rivers. It consists of two subareas—designated in this report as the *Charleston terrace* and the *Mississippi meander belt.* The former extends from Morley on the north to East Prairie on the south. The meander belt is the broad lowland bordering the Mississippi, and extending from the Scott County Hills to New Madrid.

The boundary between these subareas is an irregular escarpment, about 10 feet high that extends from about three miles west of Commerce to about six miles south of East Prairie. The elevation at Charleston is 325 feet which is about the same as Sikeston ridge. The surface of the terrace is bisected by broad swales that mark the former channels of the braided Mississippi River. The surface of the meander belt is uneven because of natural levees and swales of former river meanders. It has the most recent alluvial deposits, and was aggrading until protected by levees.

General Soil Features

The soils of the Lowland Region—except on the uplands—are alluvial sediments deposited by the Mississippi, Ohio, and other streams that enter the lowland. The thickness, as determined by numerous borings, averages more than 125 feet. The deep substratum material consists largely of stratified beds of sand and gravel and is coarser in texture than the upper or surface deposits in which silts and clays dominate (1944).

The Ohio brought in material from the Ohio drainage area, the Mississippi from the vast central basin of the U.S., and the St. Francois and Black Rivers brought in silts from the loess covered hills of the southeastern Ozark region. The alluvium is geologically young and was deposited subsequent to the deposition of the loess on the upland, variously estimated at about 25,000 years ago. Not all of the alluvial material was deposited at the same time. In general the older sediments occur on terraces and are leached and weathered. More recent sediments are near streams and are most extensive along the Mississippi River.

The alluvial soils are characterized by a wide range in texture, from sands to clays, and in mineralogic composition. Sands predominate on the terrace, and clays on the low bottoms. Soils of medium texture are largely derived from loess, and predominate in the western Lowland. Local variations in texture occur most frequently on natural levees. Sand and coarse material are near the streams, and the finer sediments are back from the channel.

The soils of the Lowland have been classified in 14 groups, mainly on the basis of texture (see color map of Lowland soils). Wide contrasts in texture are easily recognized, and are related to drainage and soil management problems. Other factors considered in establishing the groups are color, soil profile development and relief or elevation of the land. Each group includes several soil types, but all are characterized by a general similarity of the physical properties. To indicate the many variations will require a more detailed survey and a large scale soil map. Each group is named after the dominant soil type or types, and its geographic location is indicated. Most of the soil groups conform in part to the physiographic or lowland areas. It should be recognized that this is the first attempt at a general classification of the soil of the region, and that a detailed classification is required for soil management and land use planning.

SOIL GROUPS

Soils on Upland	*Dark Clay Soils*
Loring silt loam	Sharkey clay
Soils of Western Lowland	Iberia clay
Calhoun silt loam	Muck
Qulin subarea	*Soils From Recent Alluvium*
Waverly silt loam	Sarpy soils
Vastus subarea	Lintonia silt loam
Soils on Sandy Terraces	Riverwash
Dexter fine sand	
Dexter fine sandy loam	
Dexter sandy loam	
Bertrand sand	
Dubbs-Dundee soils	
Dogwood sandy loam	

Soils on Hills

The upland, or hill land, within the Lowland Region, includes Scott County Hills, Crowley's Ridge, Hickory Ridge, Baker Hill, Goose Pond Hill, and the small isolated hills named Bird, Cow, Ringer and Lost. All of the upland is covered by loess, ranging from 10 to 20 feet in thickness. The greatest thickness is in the eastern part of the Scott County Hills. The loess was deposited previous to the deposition of the alluvium in the Lowland and, therefore, is geologically older. The loess material has been severely eroded. On many slopes the surface has been lowered five or more feet, and the underlying sand and gravel deposit is exposed. Because of the general slope of the land to the west, the eroded material has accumulated to great thickness on the lowland west of Crowley's Ridge. This erosion process is still active.

Loring Silt Loam. This is the dominant soil of the upland. It is characterized by a light brown or gray brown mellow silt loam, grading into yellow brown at 8 to 10 inches. The subsoil below 16 to 18 inches is a yellow-brown or reddish brown silty clay that usually becomes mottled gray and more friable below 30 inches.

On the gentle slopes and level areas the surface soil tends to be gray in color, and the subsoil is more compact and mottled yellow and gray. The subsoil below 30 inches may be a fragipan, which is a dense, brittle, gray silty clay. This variation is classified as Grenada silt loam. loam.

In general, the Loring soil has a more uniform brown color throughout the profile than the Grenada and occurs where loess is thick. It is the dominant type in the eastern part of the Scott County Hills. The Grenada soil has a more developed profile, more mottling, and occurs on the thinner loess. Because of erosion, the surface soil of any type may be less than 6 inches in depth. Variations in the color and texture of the surface are mainly due to erosion. A silty clay surface soil characterizes most eroded slopes.

The topography of the upland soil is moderately hilly, although the surface is dissected by numerous drains and ditches. Most fields are irregular and relatively small—less than 10 to 20 acres in extent. The eastern part of Crowley's Ridge, especially to the north and east of Bloomfield, has steeper slopes than elsewhere. Hickory Ridge, and the small isolated hills, are severely dissected and have little arable land.

Crowley's Ridge and the Scott County Hills were settled at an early date, previous to the settlement of the Lowland. The pioneers were attracted because the land was well drained, easily tilled, and covered with large timber—indicative of its fertility. Wheat was the main crop, but has been replaced by corn. Cotton and soybeans are of minor importance. Clover thrives if the land is fertilized. The extensive pastures are of inferior quality. Small commercial orchards of peaches and apples have been operative for many years on sites where the loess is thick and has a permeable subsoil. There are many favorable sites for the extension of this industry.

Under the type of grain farming followed in former years, there was deterioration of soils. The soils are very responsive to fertilization and such treatment is required for satisfactory yields. Erosion control by structures is difficult because terraces deteriorate rapidly in the soft soil. Improving the pastures is effective in soil conservation. Much of the land has been destroyed for cultivation and erosion control is the major land problem of the area. The establishment of permanent forest on much of the very hilly land would be desirable.

At various places on Crowley's Ridge the loess has been eroded from the ridge and slopes, and the underlying Costal Plains material consisting of sand and rounded gravel forms the surface. Land of this type is most extensive in the dissected area between Bloomfield and Dexter. The soil is variable. The surface soil may be a thin layer of brown silt loam, but more frequently it is a gray-brown sandy or gravelly loam, grading to a yellow or reddish yellow gravelly clay loam. The material may consist of stratified beds of gravel interspersed by beds of red clay. The soils are of low fertility, very acid, and droughty. The original forest cover consisted of small oak trees. Sassafras and persimmon sprouts mark the old cleared fields. Gravelly areas are mined for road material. When cleared of forest, most of this sandy land is used for pastures.

Soils of the Western Lowland

The soils of the Western Lowland are distinguished from the soils of other sections of the Lowland region by the light gray color, silty texture, slow internal drainage, and distinct evidences of leaching. Associated with this is a generally lower level of fertility. Two dominant soil types have been established, each including one or more subareas.

Calhoun silt loam
  Qulin subarea
Waverly silt loam
  Vastus subarea

Calhoun Silt Loam. The Calhoun soil area includes all the land between Crowley's Ridge on the east and the St. Francois River, in Stoddard and Dunklin Counties. It forms a terrace that is five or more feet higher than the bottomland west of the river. It is part of the former Mississippi alluvial plain that has been aggraded by a vast amount of silt washed from Crowley's Ridge. The slight but general slope of the land is to the west. Excepting Kennett and Sikeston Ridges, it is the oldest of the Lowland soil areas. The effect of the long time weathering, and the fact that the soil is mainly derived from loess, gives to the soil more uniformity in texture and morphology than other soil groups.

The surface soil is a gray to brownish gray silt loam that tends to become hard and brittle when dry. The distinct subsurfaces from about nine to 18 inches is a gray to almost white, structureless, silty material containing many small iron concretions. The subsoil varies from brownish gray silty clay to plastic gray clay, mottled yellow and brown. The lower subsoil below 30 inches usually is a friable, highly mottled silty clay. The bleached gray color throughout the profile indicates that the soil has developed under poor drainage for a long time, and has acquired a dense, compact structure.

Within the Calhoun soil area are broad shallow swales, hardly distinguishable from the slightly higher land. The soil in these low places contains more clay. The surface soil is a silty clay to clay loam that grades into a gray, drab clay. Yellow and brown mottles occur throughout the profile. Cultivated fields, when dry, are almost white. Use of the land is about the same as for the surrounding soils.

At the foot of Crowley's Ridge where there is slope wash, and especially on alluvial fans, the soil is brown in color, and has a friable silty clay subsoil. It is well drained, easily tilled, and much more productive than the typical Calhoun soil. These areas average about a half mile in width, and are too small to indicate on the soil map. Corn is the main crop. Another minor soil variation is on Dudley Ridge, the site of Dudley village. The ridge is about 1 mile wide, extends north and south for about 4 miles, and is 10 to 20 feet higher than the surrounding land. It is better drained, has a deeper topsoil but a denser subsoil.

The Calhoun soil was heavily forested, mainly pin-oak and elm, with post oak on the flats. Most of the land is used for pasture. Corn, cotton, and wheat are minor crops. Soybeans are grown on the better drained sites. Rice has been grown successfully. The level surface and slowly permeable subsoil are favorable for flooding. Yields average about 60 bushels per acre.

Soil improvement is difficult, because the response to fertilizer is erratic. Either dry or wet seasons have an unfavorable effect. The soil is acid. More field ditches are needed to provide better drainage.

Qulin Subarea of Calhoun Silt Loam. The Qulin subarea of the Calhoun silt loam is similar to the main area east of the St. Francois River, but has a more uneven surface and therefore is better drained. The large swales and depressions are considered to be abandoned braided channels of the Mississippi River. The soil in the broad swales west of Fagus is darker and more productive than elsewhere. The northwestern edge of Qulin Ridge, between Qulin and Carola is a steep escarpment 20 to 30 feet higher than the lowland to the west. The soil on the top of the escarpment is a band about half a mile wide of brown silt loam, with a gray brown silty clay subsoil. This variation is more productive than the typical Calhoun. Most of the Qulin Ridge is cleared. Corn, soybeans, and wheat are the principal crops. Yields are relatively low.

Waverly Silt Loam

The Waverly soils, locally known as "grayland" because of the light color, are extensive in the northwestern part of the Lowland Region. The largest area is in Butler County, between the Ozark upland and the St. Francois River. Other large areas are near Mingo, south of Delta, and at Clines Island north of Hunterville. The alluvial material from which the soils are formed, was deposited by the Black, St. Francois, Castor, Whitewater and other streams. It consists mainly of loess that was eroded from the upland and accumulated to great thickness on the former Mississippi floodplain. The soils, therefore, are uniform in texture—mainly silt loams. The entire area formerly was subject to prolonged flooding, so that the soils are leached and have a gray color.

The surface soil is dominantly gray to dark gray silt loam that has a weak granular structure. This grades into a lighter gray and at about 20 inches changes to a gray silty clay mottled yellow and brown. In swales and low places the subsoil usually is a gray plastic clay. The greater accumulation of clay in the subsoil is considered due to deposition and soil forming processes. The horizons in the profile are not sharply defined.

Rounded iron concretions occur throughout the profile, but are most abundant in the subsurface. An abundance of concretions is always associated with a light gray color and a dense, brittle structure, On slight elevations of only one to two feet, and on natural levees bordering former sloughs, the surface soil tends to have a light brown color and have fewer concretions. In general, the Waverly soils have poor structure, become hard and brittle when dry, and are not drought resistant.

The Mingo area of the Waverly soils is an almost level basin between the Ozark upland and Crowley's Ridge, and extending from the St. Francois River on the west to Castor River on the east. It has always been characterized by poor drainage. Floodwater from Castor and other streams inundated the land for long periods of time. Because of the level surface and low gradient of the land, removal of the water was slow. This condition was aggravated by the higher elevation of the alluvial fan along the St. Francois River. Much of the Mingo area has a high but fluctuating water-table, probably due to artesian conditions. The south central part has the lowest elevation, and averages three to five feet lower than the land bordering the Ozark upland. The central part of the Mingo area was originally forested with cypress, ash, elm, gum, and maple.

The soils are light gray silt loam or silty clay loams. Several small areas of shallow muck soil occur in low places. The muck is underlain by a gray plastic clay.

A large part of the Mingo area is included in the Mingo National Wildlife Refuge, and the Duck Creek Wildlife Area. Most of the land in private ownership is cleared and farmed. Corn and soybeans are the principal grain crops. Yields are low. A successful agriculture can not be developed until better surface drainage is provided.

The Waverly soil area south of Delta is on the southern or lower part of the large alluvial fan formed by Whitewater and Hubble Creeks. The land has a higher elevation and therefore is better drained than the Waverly soils elsewhere. The area received new sediment from floodwaters until the Diversion Channel was constructed. The surface soil ranges from brownish gray to dark gray in color. The soil is productive, and all of it is intensively farmed for grain and grass.

The Waverly soil area at Clines Island, north of Hunterville, is the alluvial fan formed by Castor River. The floodwaters deposited a silt sediment over a large area and buried the clay soil. The northern and eastern limits of the fan are not sharply defined where the sediment thins to less than 12 inches. The sediment is thickest bordering the former channel of the river, and here the soils have a light brown color. Because of the underlying clay, internal drainage is slow, and most of the soils have a uniformly light gray color. Practically all of the land is in cultivation. Corn, soybeans, and wheat are the principal crops.

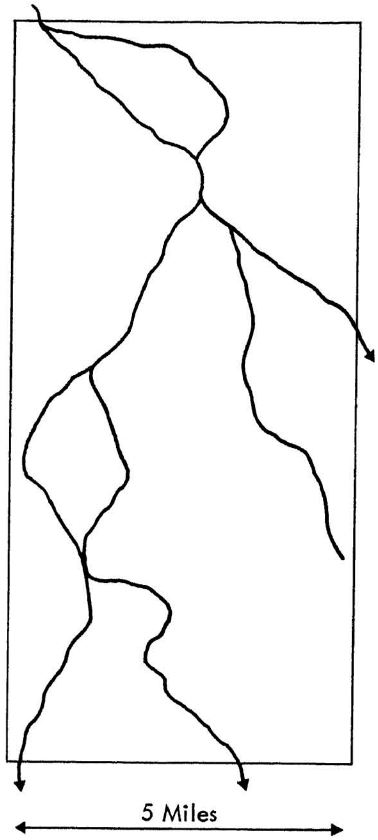

Figure 4. Diagram of a section of the former braided Castor River in Stoddard County

Vastus Subarea. A significant variation in the Waverly soils is the area near Vastus, west of Qulin Ridge. Here the soils are dark gray in color, mainly silty clay loam in texture, and contain fewer concretions. Apparently at one time this area had swamp-like conditions and accumulated more organic matter. The soil is more productive than the typical Waverly, but because of inadequate drainage has been only partially reclaimed.

The Waverly soil areas were heavily forested. Elm, maple, ash, and several kinds of oak were the dominant species. There was little gum or cypress compared to the forests in the Eastern lowland region. Small tracts of forest remain, but these will eventually be removed. Reclamation of the land was delayed because of inadequate drainage, and the low fertility of the soils. Partial crop failures occur in wet and dry seasons but this condition is steadily being improved. More surface drainage is needed.

Soybeans and cotton are the main crops. Corn and wheat are minor. Yields are variable, and the effect of fertilizer is variable, dependent on an excess or deficiency of rain. Nitrogen fertilizer is most effective. Most of the soils are acid. Rice has been grown successfully. There are few permanent pastures. Pasture grasses thrive only on the better drained sites.

Soils on Sandy Terraces

The soils on Kennett and Sikeston Ridges are similar in origin and morphological features. All are sandy but there is regional variation in degree of sandiness. This is significant because it affects the moisture holding and general productiveness of the soils. Three soil groups are recognized, all belonging to the same soil series, but occuring in different geographic locations.

Dexter fine sand—northern part of Kennett Ridge (Malden area)
Dexter fine sandy loam—southern part of Kennett Ridge (Senath area)
Dexter sandy loam—Sikeston Ridge

Dexter Fine Sand

This type includes the northern part of Kennett Ridge extending south from near Dexter to the city of Kennett. The soil is dominantly brown fine sand that grades at 10 to 12 inches into yellow brown or reddish brown fine sand with little change in color or texture to a depth of three or more feet. The soil is loose, and when dry tends to blow or drift.

The sand is coarsest near the eastern edge of the terrace, and gradually increases in clay content toward the west. Associated with this change in texture the surface soil becomes lighter in color. The subsoil usually is a gray-brown sandy clay mottled yellow and gray, and slowly pervious to water. Bordering Crowley's Ridge, the sandy soil may be mantled by silty material washed from the upland. These areas usually have a gray surface color. In general the soil in the western part of the Dexter fine sand area is more compact and not as productive as in the eastern part.

That portion of Kennett Ridge between Gibson and Kennett has an uneven surface because of numerous swales or depressions. These have a northeast-southwest trend and are remnants of former stream channels. The soil in these low places varies from gray sandy loam to sandy clay loam. It is poorly drained and less productive than the higher lying sands. Drainage is provided by open ditches.

The Dexter fine sand includes some of the oldest farm land in the state. It is easily tilled and because of frequent cultivation the organic matter has been reduced to a low level. The very sandy areas tend to be droughty, but the low moisture holding capacity is offset by the great depth of root penetration. Cotton is the main crop. Corn and soybeans are grown extensively. Rye is grown as a green manure, and to retard soil blowing. Special crops are melons, cantaloupes, potatoes, and berries. Crops that make greatest growth in spring and early summer are the most successful. There are few pastures. Fertilizer is used on most crops.

Dexter Fine Sandy Loam

The Dexter fine sandy loam includes the southern part of Kennett Ridge, south of the city of Kennett. The dominant soil is a brown fine sandy loam that grades into a yellow-brown slightly heavier fine sandy loam. In many places the lower subsoil below 24 or 30 inches is yellow brown silty clay loam. The deeper and sandier variations are on the slight ridges. The eastern edge of the terrace, north of Hornersville, is somewhat sandier than elsewhere.

The Dexter fine sandy loam area includes several broad sloughs or swales a fourth to a half mile wide (Honey, Cypress, and Buffalo Swamps) that are former braided channels of the Ohio River. The soil in these low places is a dark gray loam or clay loam. It is much darker and heavier than the higher sandy land. Also there are broad, shallow depressions (ex. east of Cardwell and west of Europe) that have a brown surface soil that grades to a dark gray sandy loam. The sub-soil below 24 inches is a gray stiff clay, usually mottled yellow and brown. These variations are not as productive or well drained as the dominant sandy loam.

The area formerly known as Varney River Swamp, southwest of Kennett, and the belt of land along the St. Francois River, has a more variable soil ranging from dark brown to gray brown sandy loam, interspersed with narrow swales of clay loam. The soil is productive and all in cultivation. It was subject to frequent flooding, but now is protected by levees. The Varney River area is sometimes considered to be "sunk-land," formed during the earthquake in 1811. All evidence indicates that these lower areas are aggraded former river channels. Sandblows occur on all the higher land, but have been destroyed by frequent cultivation and are no longer evident.

The Dexter fine sandy loam soil area is intensively farmed. Cotton and soybeans occupy more than 60 percent of all land. Corn ranks third in importance. Wheat is a minor crop. Special crops include melons, sunflowers, peanuts, berries and potatoes. The wide range in crop adaptation and responsiveness to good management, make this one of the most productive and valuable soils of the Lowland Region. Because of a generally higher content of very fine sand throughout the profile, the soil is more retentive of moisture than the sandier types of the Dexter soil group, and crop production is more regular.

Sikeston Ridge

Sikeston Ridge is a distinct soil area that stands about 15 feet higher than the surrounding darker and heavier textured bottomland. The dominant soil on the ridge is a brown sandy loam, but it varies from dark brown loam in slight depression to light brown fine sand on the slight ridges. Below the surface the color changes to yellow brown, and may be mottled yellow and brown below 30 inches. There is little change in texture, although in many places the lower subsoil is a brown silty clay or sandy clay loam. This horizon is depositional in origin, and is not due to soil-forming processes. In general, the soil along the western edge of Sikeston Ridge is deep, loose sand that tends to blow.

Near the center of Sikeston Ridge are numerous slight depressions or swales on the relatively level surface. The soil in these locations may be a hard, gray or brownish gray loam with a gray sandy clay subsoil usually mottled yellow and brown. The largest of these depressions—a former stream channel—curves around to the north and east of LaForge. The soil is a gray sandy loam underlain by a gray, plastic clay. These depression soil variations are poorly drained and of low productivity. In the extreme southeastern corner of Sikeston Ridge, northeast of New Madrid, and along Dry Run Ditch, much of the soil is a deep, dark gray, silty clay. This variation probably is due to sediment deposited when the Mississippi River flooded this area.

The Dexter sandy loam tends to compact and crust when dry. Where surface drainage is slow, the lower subsoil may have a weak fragipan. The content of organic matter is relatively low and difficult to increase because of rapid oxidation. Fertilizer is regularly used on cotton and all grain crops. Nitrogen is the most needed element. The response to fertilizer treatment is consistent and large.

Sikeston Ridge was settled at an early date because it was accessible to the river and because it was well drained. Previous to 1914 wheat was the main crop. Major crops now are cotton, soybeans, corn, and wheat. In favorable seasons soybeans are planted after wheat is harvested. The area of permanent pasture is small but may increase with the increasing number of livestock. Orchard grass and fescue are used. Rye, vetch, and crimson clover are grown alone, or seeded between the rows of cotton, to supply organic matter, and also prevent wind erosion. All of the land is intensively farmed. Frequent cultivation is reducing the organic matter in the soil. To restore this, and also to improve the structure of the soil, will require that grass or sod legumes be grown more extensively.

Bertrand Sandy Loam

The Bertrand sandy loam includes the extensive but irregular sandy terrace in Mississippi and Scott Counties. Local names have been applied to the different sections. The very sandy area in Scott County is sometimes known as Morley Ridge. The sandy terrace in Mississippi County is designated as Charleston Ridge. The sandy material is Ohio River alluvium, similar to that on Kennett and Sikeston Ridges, but was reworked and eroded when the Mississippi River shifted to this section of the Lowland. The numerous broad swales that dissect the sandy area are former channels of the Braided Mississippi River. The surface of the very sandy area is characterized by broad ridges, hummocks, and mounds and occasional dunes. The sand ridges are highest near Morley, and have the same elevation as Sikeston Ridge.

In the northern part of the Bertrand area, the soil is dominantly brown or gray brown fine sand, with little change in texture to a depth of three or more feet. The soil is loose, droughty and subject to wind erosion. The surface is uneven, characterized by low, rounded ridges. Where the soil contains more fine material to give it a sandy loam texture, the surface soil is brown or dark brown, changing at about 12 inches to yellow brown fine sand. Occasionally the lower subsoil is mottled yellow and brown. On the level areas, notably south of Charleston, and between Vanduser and Morehouse, the surface soil is gray brown and the subsoil a friable yellow-gray sandy loam, mottled gray and brown. In general, the sand is thicker and coarser in the northern part of the Bertrand area, and grades to a finer material to the south.

Included in the Bertrand soil area are the sandy mounds and ridges—Henderson Mound, Barnes Ridge, and Sugar Creek Ridge—all in eastern New Madrid County. Included also are the sandy areas near Advance in Stoddard County, Brosely in Butler County, and Neeleyville in Ripley County. All these were formed from similar material and probably at the same time as the main sand area in Scott County. These sites, because of their higher elevation and better drainage, were the first to be occupied by the early settlers, and have been intensively farmed since that time.

The Bertrand soils are easily tilled. They have been cultivated excessively resulting in the reduction of organic matter. The low moisture-holding capacity and wind erosion limit crop production in dry seasons. Wheat formerly was the main crop, but has been replaced by cotton, soybeans and corn. Melons are grown commercially. On the very sandy areas, rye is grown extensively for green manure, pasture or grain. Attempts at soil improvement by growing legumes—crotelaria, lespedeza, etc.,—have not been effective. The judicious use of fertilizer, and the inclusion of grass or small grain in the cropping system, have greatly improved the productivity of the soils.

Dundee Soils

The Dundee soils form the large area of moderately sandy land east of Kennett Ridge, and extending from Essex on the north to Gideon on the south. It is a low terrace that has distinct boundaries except on the south where it grades into Sharkey clay soils. The soil material is old alluvium deposited or reworked by the Mississippi River when it occupied the Morehouse Lowland.

The soils vary from heavy loam to fine sandy loam in texture, and from gray to brown in color. The sandier soil occurs on the low ridges and bordering the sloughs and slight depressions. The surface soil usually is a grayish brown to dark brown friable fine sandy loam 8 to 10 inches thick. The subsurface layer, extending to depths of 20 to 24 inches is brownish gray heavy loam to sandy clay loam mottled with gray and yellow. The substratum is yellowish gray silty clay or sandy clay, mottled gray and yellow. It is stiff and fractured by cleavage planes that are filled with precipitated iron and manganese. Occasionally the substratum is a mass of loose sand.

On the level and slightly lower areas between the sand ridges, the soil is lighter in color and contains more clay. The surface soil is a brownish gray very fine sandy loam or loam 6 to 10 inches thick. The subsoil varies from yellowish gray to yellowish brown, firm clay or sandy clay loam. Iron concretions occur in the surface soil on poorly drained sites. In general the lighter colored and finer textured soil is not as productive and well drained as the sandy variation.

The soils of the Dundee area are more variable and differ in texture and color from the Dexter soils on the sandy ridges. They contain more clay—especially in the subsoil—are lighter in color and are not as well drained. The slow internal drainage is indicated by the yellow and gray mottling in the subsoil. These variations are associated with the numerous slight variations of the land surface, formed by the low natural levees and broad shallow swales of the braided channels of the former Mississippi River.

The variation in the sand and clay from one horizon to another in all the Dundee soils, suggests that the profile features are due to the stratification of the alluvium rather than soil forming processes. However, the soils are leached and there is evidence of clay movement downward from the surface. Plant roots penetrate to all parts of the profile. The soils are not as well drained as the Dexter soils, and are not as easily cultivated.

The Dundee soil area has many sloughs or swales, varying in width from 100 to 1200 feet, that cannot be indicated on the general soil map. The soil varies from gray sandy clay loam to dark clay loam. The latter variation is the more extensive. All these low places must be drained for successful crop production. They were the last to be cleared and were originally forested with cypress, ash, and maple. Much of the land is now used for pasture. The soils in the northern part of the Dundee area, for a distance about four miles south of Essex, have been modified by silt deposits from Castor River. The surface soil is lighter in color and finer in texture than the normally fine sandy loam in other parts of the general area.

Most of the Dundee soil area was cleared after the Little River drainage was constructed—after 1915. Previous to this most of the cleared land was between Dexter and Essex. Wheat and clover were the main crops. Now cotton is the main crop, especially on the sandier and better drained sites. Soybeans are grown on about half of all the cultivated land. The trend toward more pasture and livestock production has made greatest progress in the northern part of the area.

All the soils tend to become very hard when dry. They tend to be brittle and compact, especially sites that have slow surface drainage. Fertilizer is used on cotton and grain crops with good results. Crop yields are moderate except where the soils have been given special treatment. Early spring tillage and planting usually is desirable because of frequent dry periods in late summer and the tendency of the soils to lose moisture rapidly.

Dark Sands and Clays

Dogwood Sandy Loam
"Black Sand"

The soil locally known as "black sand" occurs in swales and level low places within the area of Bertrand sandy loam, in Scott and Mississippi Counties. It is soil material that has accumulated in the former channels of the braided Mississippi River. It is sandy and, because of recent deposition, has not acquired definite soil profile characteristics.

The surface is dominantly a very dark brown to almost black loam or sandy loam, well supplied with organic matter. This grades at 10 to 12 inches to dark gray or dark brown sticky loam or sandy clay loam, usually mottled yellow. Below a depth of 24 inches the material may be gray sandy clay, or consist of stratified sand and clay. This zone may be in the range of the water table, and generally has a blue to steel gray color. In the narrow swales in the deep sand near Morley, the entire soil profile may consist of sand. In the broader swales the soil material contains more clay, especially in the subsoil. It blends into and includes areas of Iberia clay. The Dogwood soil area west of Sikeston consists of deep, dark brown very fine sandy loam on the low terrace, and a black clay loam on the lower positions. This is very productive and superior to the sandier soils.

The isolated area of Dogwood sandy loam southeast of Charleston has a higher elevation and is better drained than most of the type. It is deep, dark-brown very fine sandy loam, and very productive under good management.

The Dogwood sandy loam in the lower positions was formed under swamp-like conditions. covered with water for several months each year. This was reduced rapidly after the land was drained. All the land is now drained by open ditches. Seepage in the ditch banks is evidence of a water table usually below a depth of 3 feet. The soil is productive, but crop failures occur in wet seasons. Corn and soybeans are the main crops. Much of the land is in pasture. The abundant moisture provides for growth of grass throughout the summer season.

Sharkey Clay

The Sharkey clay is the most extensive soil area in the Lowland Region. It extends as a continuous band from the southern part of Cape Girardeau County south to the Arkansas state line. The entire area is characterized by a level surface and dark clay soil. The surface soil, usually about six inches in depth, is a dark gray (black when wet) silty clay or clay or clay loam that has a dark gray or yellow gray plastic clay subsoil with yellow and brown mottlings. The subsoil below 20 to 24 inches is a dull gray to bluish gray plastic clay that extends to a depth of many feet. Nearly everywhere coarse grains of sand are disseminated through the soil mass, but are most abundant in the surface. Sand pockets, two or more feet in diameter, or yellow-brown coarse sand may occur at various depths.

Variations in the rather uniform clay texture and level surface of the Sharkey clay soil area should be noted; they are not indicated on the soil map.

The Sharkey clay in the northern part of Stoddard County, to the north and east of Bell City, has overwash sediments from upland streams. The soil here is deeper, darker, contains less clay, and is somewhat more productive.

Another variation in the Sharkey soil area is the sandy land to the northeast of Kennett. Here the soil is a yellow-brown sandy loam underlain by yellow-gray clay, mottled yellow and brown. It is better drained, and more easily cultivated than the typical Sharkey clay.

Numerous "sand-blows" characterize the Sharkey clay in the southern part of Dunklin and Pemiscot Counties (Fig. 5). These are low circular or elongated sandy mounds,

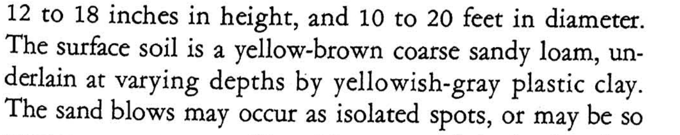

Figure 5. Profile of a rounded sand blow

12 to 18 inches in height, and 10 to 20 feet in diameter. The surface soil is a yellow-brown coarse sandy loam, underlain at varying depths by yellowish-gray plastic clay. The sand blows may occur as isolated spots, or may be so numerous as to cover 25 to 50 percent of the land surface. Cultivation and leveling have spread the sand so that the surface soil may have a sandy clay texture. In general, the soil in the sand spots is less productive and more acid than elsewhere.

The large areas of clay soil in Mississippi and Scott Counties is of more recent deposition that the Sharkey clay west of Sikeston Ridge. The surface soil is darker, and in places there is a silty overwash. The largest area of silt loam soil is on the low ridge at Wyatt. Thin lenses of fine sand, and occasional lime concretions may occur in the lower subsoil. The Sharkey clay in the southeastern part of New Madrid County, east of the town of New Madrid, has until recently been subject to frequent inundation by backwater from the Mississippi River. The soil is an extremely heavy clay—dark at the surface and bluish-gray below. Crop production is uncertain in wet seasons. Much of the land remains forested.

The Sharkey clay is difficult to cultivate. Depth of plowing is about five inches. Both surface and internal drainage is slow. In wet seasons planting may be delayed, limiting the use of the land for cotton. The soil is not well suited for corn because of the clay subsoil. Large cracks, due to shrinking, develop in dry periods, and the soil becomes hard. There is evidence that better drainage, occasional deep drying and continued cultivation have resulted in better aeration and granulation, especially of the surface soil. Older farmed areas have a more "loamy" surface soil and are more easily tilled. This change is most apparent where crop rotation has been practiced, and where the organic matter has been maintained.

The original clay land forest consisted of elm, maple, gum, various species of oak, hickory and ash. Pure stands of cypress and ash occurred in sloughs and overflow areas. The trees were shallow rooted, and stumps were easily removed. The forest has been completely removed since 1920 and future generations will have no knowledge of the magnificent forest that once covered the land.

Cotton and soybeans are the major crops, especially in Dunklin, Pemiscot, and New Madrid Counties. In the northern half of the clayland area, corn, soybeans, and wheat are the main crops. Corn is not well suited for the clay soils because of the heavy subsoil. It thrives best on the better drained and deeper soil sites.

The Sharkey clay soils are fertile, but are adversely affected by wet or dry weather conditions. They are fairly high in organic matter, and a high content is essential to maintain a desirable soil structure. Most of them are moderately acid in reaction, and fairly high in available potassium. Response to fertilization is variable, and is not as pronounced as with the better drained soils. Nitrogen fertilizer is the most effective.

Adequate drainage and maintenance of soil aggregation and good soil tilth are the most important problems in management. Low permeability requires drainage by surface ditches. Fall plowing tends to improve soil aggregation. Residue from cotton and soybeans may not be adequate to maintain the organic matter and good soil tilth. An occasional grass crop helps increase pore space and provide root channels for further improvement in drainage and aeration.

Iberia (Black) Clay

Organic (muck) and black clay soils are intimately associated. The larger areas of each are indicated on the soil map. The black clay, classified as Iberia clay, is located in various parts of the Lowland Region. In all cases the sites are former river channels that have been aggraded in recent times. The soil material consists of clay with large amounts of organic matter resulting from the decomposition of swamp vegetation. All sites have a high water table, and receive underground seepage water from the adjacent higher sandy land. Each site is drained by one or more ditches that have a perennial water flow.

The top soil is a black or very dark brown clay or clay loam, that extends to a depth of 12 to 20 inches. This grades into a dark gray or bluish gray plastic clay. The substratum, at varying depth but usually below 30 inches, is a yellowish-gray sand, saturated with water.

One of the largest areas of black clay is east of the sand terrace in the eastern part of Scott County. It is drained by North-cut ditch. The surface soil may contain small amounts of sand blown from the adjacent high sandy land.

A band of black clay, one-fourth to one-half mile in width, borders both the east and west side of Sikeston Ridge. In places the surface soil is a black or dark brown sandy clay loam. Sand lenses and sand pockets may occur at varying depths in the soil profile.

The irregular area of black clay at the north edge of Kennett is part of the former Varney River swamp. The surface soil is moderately sandy in places, because of material blown from the surrounding sand ridges. The extensive clay soil area east of Kennett Ridge is intensively farmed.

All the black clay soils are very fertile. The problem of management is to provide surface and subsoil drainage. This is accomplished by open ditches. Corn and soybeans are the main crops. Late planting in wet seasons may reduce yields. Turning under crop residue, fall plowing, and land bedding are methods of maintaining the tilth in the heavy clay soil.

Muck (organic) Soils

Muck or organic soils are of almost insignificant extent, and constitute the only real "swamp land" in the Lowland Region. They occur only in the lowest places, in former river channels that lacked drainage and had a high water table. With improved drainage, these soils are destined to lose their special characteristics, and will be similar to the black clay soils with which they are closely associated.

The largest area of muck soil, locally known as *Old Field,* includes about five or six thousand acres, and is located in the southwestern corner of Cape Girardeau County and the northeastern corner of Stoddard County. Originally this was an open water swamp and covered with swamp vegetation such as grass, water-lilies, shrubs, and trees—cypress, ash, and gum. It received water from Hubbell and Whitewater Creeks. The decaying vegetable matter accumulated to a depth of 10 or more feet near the center of the swamp where it was deepest. When the land was drained and the water table lowered, the organic material decomposed and the land surface was lowered 2 to 3 feet. Most of the muck soil that formerly contained 50 percent or more of organic material now may have only 10 to 30 percent. This will continue to decrease and the soil will acquire more clay-like properties.

The muck soil is mixed with varying amounts of clay. It usually is black or brownish-black in color. It varies in depth from five or six feet near the center of the area, to less than six inches near the outer border where it grades into dark clay. Below the organic surface is gray to bluish gray plastic clay that may be mottled yellowish or dark brown. In the deep muck there may be lenses of bogiron, now mostly broken and destroyed when near the surface. A water table usually is less that three feet below the surface, but fluctuates during the season. Seepage in the ditch banks makes for perennial stream within the muck area.

When first brought into cultivation, the muck soils were uncertain for crop production. They were either too wet or too dry. As the soil material mineralized it became more productive. Corn is the dominant crop. Small grains tend to grow rank, leafy and weak stemmed. Adapted pasture grasses make rank growth, but use of the land for pasture is not feasible under wet conditions. Maintaining drainage to keep the water table below three or more feet is essential for successful cultivation of the land. Additional field drainage may be desirable.

Big Lake Slough, about three miles north of Charleston, in Mississippi County, is poorly drained and most of it is forested. Several areas, usually less than 20 acres in extent, occur within the area of Iberia clay west of Sikeston Ridge and elsewhere. These are farmed similarly to the surrounding land.

Recent Alluvial Soils

All the alluvial soils of the Lowland Region were formed in recent geologic time. The group of soils designated as "Recent Alluvial Soils" in this report are soils that are now—except where protected by levees—receiving new sediment from flood waters. They therefore, are the youngest or most immature soils of the region. The Sarpy and Lintonia soils are in this category.

Sarpy Soils

"Mississippi River Front Land"

The band of recent alluvial soils bordering the Mississippi River is the most variable and one of the most fertile in the Lowland Region. It includes most of the "meander belt" or zone where the Mississippi River has frequently shifted its channels in recent geological time. The soils vary from sand to clay over short distances, and with slight differences in surface elevation. To show the variations will require a large scale soil map and, therefore, the general features only are described in this report. Variations in profile features are due to stratification of the alluvial material, and not to soil forming processes. The soils are slightly leached, and have not acquired unfavorable structural features, such as compact layers and unstable aggregates. Any unfavorable physical properties are due to a high content of clay, or to a coarse sandy texture.

The Sarpy soils vary from dark brown to light brown in color, and from fine sandy loam to clay loam in texture. The sandy types vary from fine sand to silt loam in the top soil, but the subsoil is dominantly a yellow-brown very fine sandy loam. In the lower subsoil there may be lenses of clay or sand due to deposition. The internal drainage is good, and plant roots can penetrate to great depth. The soil is loose and easily tilled. The land surface is uneven, due to low natural levees. The sandy material composing the Sarpy soils has a complex mineralogic composition and gives to the soils a high inherent fertility.

The clay loam soils included in the Sarpy area generally occur in swales and inner loops of former stream channels. The soils are black to dark brown, and are much darker than the adjacent sandy types. The clay may be several feet in depth, but often it is underlain by very fine sand at depths of less than two or three feet. In the deep clay areas the subsoil is a dark gray or pale yellow plastic clay. A sandy subsoil characterizes much of the soils nearest the river. This type of land is very productive, but generally not as well drained or as easily tilled as the sandy areas.

A variation included in the Sarpy soils is a very dark brown to almost black silt loam to fine sandy loam that occurs on the highest natural levees of former river channels. One of the sites is on the eastern edge of North-cut bottom, about 11 miles east of Morley in Scott County. Another is three miles east of Hayward, on the south side of Portage Bay, in the northeastern corner of Pemiscot County. Similar soil occurs near Wyatt, in Mississippi County. The deep, dark surface soil grades into dark brown or yellow brown silty clay, which usually changes at about three feet to a very fine sandy loam. All the soils are well drained and easily tilled. The natural levees are steep sided bordering the former channel, and are five to 15 feet higher than the adjacent low bottom. The high fertility of the soil makes it especially valuable for cotton, soybeans, and corn. It has been intensively farmed since the early settlement of the region.

That portion of the Sarpy soils inside the levee—between the levee and the Mississippi River— is subject to overflow and sedimentation. Most of the soil is a fine sandy loam, but there are many areas, especially in the northeastern part of Pemiscot County, where the top soil is a dark clay loam and the subsoil a fine sandy loam. It is very productive, much of it is farmed, but crop failures occur because of floods.

Low places within a distance of about one-half mile outside the levee occasionally are inundated by underground seep water, when the river is at high flood for a prolonged period. When this occurs it may delay planting of crops or use of the land.

Because of the generally high fertility, practically all of the Sarpy soils outside the levee are in continual cultivation. Cotton, soybeans, and corn are the main crops. Alfalfa is grown extensively. Small fruits and vegetables thrive. The soil conditions are favorable for the production of truck crops. Winter legumes are vetch and crimson clover. Soil management includes the extensive use of nitrogen fertilizer, especially on cotton and corn. The soils are moderately acid, and generally give low response to liming.

Lintonia Silt Loam

Alluvial Fans—Loess Outwash

The streams of the Ozark upland that enter the Lowland from the north, have deposited great quantities of silty material to form alluvial fans and outwash deltas. Those deposits form an almost continuous band at the base of the upland. They attain greatest thickness or height and width along the larger streams—Castor, Hubble, Whitewater, Black and others. At the debauche the surface may be 10 or more feet above the level of the bottomland. The fans have a gentle slope, and merge gradually with the lower bottom.

The soil material is derived largely from the loess covered upland. The soils therefore are uniformly silt loam in texture. When first deposited and on the higher slopes, the soil is well drained, has a uniform brown or dark brown color, and little change in profile texture. As the slope decreases and the surface levels, the soil becomes lighter in color and finally grades into the Waverly silt loam. The change in profile features occurs first in the subsoil. The later becomes gray, and is mottled yellow and brown. The slower internal drainage also is indicated by small iron concretions, most abundant in the subsurface.

Most of the Lintonia soils continue to receive new sediments, except where protected from overflow by levees.

The alluvial fan formed by Caney Creek, south of Chaffee, indicates the vast amount of soil material washed from the upland. The soil on the fans and natural levees of St. Francois and Black Rivers, and Caney Creek, is similar to the Lintonia soils elsewhere, but is more weathered and not as deep and, therefore, is less productive. Its occurrence indicates the location of the former braided channels of Black River and other streams.

The Lintonia soil, especially in Cape Girardeau and Bollinger Counties, is deep, mellow, easily tilled, and very productive. Corn is the main crop but clover and wheat are grown extensively. In the Butler County area, cotton and soybeans are the main crops. The response to fertilizer is large. Moisture retention is much more favorable than for the associated gray soils. All of the land is intensively farmed, and is adapted to a wide range of crops.

Included in the Lintonie soil area is the narrow band of land between the levee and the river, bordering the Black and St. Francois Rivers. The mixed soil is deep, loose, and often stratified fine sand and silt. It is fertile but, because of frequent flooding, it is too hazardous to farm and is forested. The growth of trees is rapid. There are many species—including elm, maple, bur-oak, hickory, walnut, gum and cottonwood. The most practical use of the land is for permanent forestry.

Soil Genesis, Morphology and Classification

The varied character of the soils of the Lowland Region is due primarily to the soil-forming material, and the drainage condition under which the soils developed. Alluvial sediments from the Mississippi and Ohio Rivers are the parent material of the soils east of Crowley's Ridge. The loess covered hills of the Ozark upland and Crowley's Ridge are the source of the alluvial sediments north and west of Crowley's Ridge. The thickness of the alluvial material averages over 125 feet but is shallower near the upland. (Fisk, 1944)

The soils of the Lowland Region are geologically young, i.e. formed since the Wisconsin glacial age, which is variously estimated at about 11,000 to 25,000 years. The alluvial soils were formed after the deposition of the loess which covers all the upland. There is, however, a difference in the age of the alluvium. The older deposits occur on the terraces and ridges, and the more recent deposits are in the flood plain of the Mississippi River and on the alluvial fans of the smaller streams.

There is a wide difference in the texture of the alluvium. On the natural levees and low ridges it is predominantly sandy. In the wide slack water areas back from the channels, clay was deposited. There are many combinations of sediment due to shifts in the channel, of clay over sand and vice versa. Texture variations are more numerous and contrasting in the meander belt of the Mississippi River. There is a general difference in texture related to the source of the alluvial material. The remnants of the Ohio alluvium on Kennett and Sikeston Ridges is sandy. The Mississippi alluvium is predominantly clay or very fine sand. On the sandy ridges there is a gradation in texture from coarse to fine from north to south. This is most apparent on Kennett Ridge and on the Morley-Charleston sand area. The velocity of the south flowing rivers was decreased when they entered the Lowland, and the coarse material was dropped first.

Differences in texture are associated with chemical and lithologic (mineralogic) differences. Coarser sands contain more quartz. Finer sands generally have a more complex mineralogic composition. The minerals in the recent Mississippi deposits are fresh and slightly weathered. These are significant factors and help to explain the differences in productivity of the sandy soils.

The predominantly silt texture of the soils in the western and Advance lowlands indicates the close relation of the alluvium to the loess mantled upland. This is the oldest alluvium—excepting Kennett and Sikeston Ridges —in the Lowland Region. The soils developed under poor drainage and have become thoroughly leached and weathered. Variations in the soils are due mainly to recent alluvial deposits by the Black, St. Francois, and other streams.

Morphology of the Soil

Soil morphology relates to the profile structure. Soil morphology in the Lowland Region is expressed in faint horizons for the younger soils and moderate horizons on the older soils on the upland and on the terraces. Highly developed profiles do not occur because all the soils are relatively young. Horizons are not distinct on the very sandy soils because of the low clay content. On the other extreme, horizons are not distinct in heavy clay soils because of slow percolation. Horizons generally are most distinct in soils of intermediate texture as is evidenced by the Calhoun, Waverly, and Dundee soils. Marked differences in texture within the profile, sand over clay, or clay over sand, are depositional layers, and not genetic horizons. Such stratified horizons are most frequent in the recent deposits near the Mississippi River.

Regardless of the number of years since their deposition, the soils are in various stages of weathering and in range of development from slight to moderate. Differences in rate of weathering were governed by differences in the permeability of the soil forming material. Parent material is the most important factor. Those features indigenous to the kind of parent material tend to remain throughout the life of the soil.

The differentiation of horizons in the soils resulted from one or more of the following processes:

1. Accumulation of organic matter.
2. Leaching of carbonates and soluble salts.
3. Translocation of silicate clay minerals.
4. Reduction and transfer of iron.

The first two of these processes is reflected in the feeble horizons of the Sarpy soils. The last two are the chief cause for the morphology of the Calhoun and Waverly soils.

The accumulation of organic matter applies to all soils. It varies in depth and amount of accumulation, but usually is greatest in the clays. Because of rapid decomposition it is lowest in the sandy soils. The content or organic matter decreases with depth, but its distribution throughout the profile indicates that it was deposited with the sand and clay and not distributed by translocation. This is especially evident in the deep black clay and muck areas.

Because of the high rainfall, all of the soils are leached of carbonates. The most recent deposits near the Mississippi have been leached least, and occasional areas may have free carbonates. Leaching has been most severe on the well-drained sandy soils, as indicated by the generally lower pH. The translocation of silicate clays generally does not occur until the carbonates have been removed.

Profile development or horizon differentiation is most advanced in the Calhoun soil, and to a lesser extent in the Waverly, Dubbs, and Loring. The accumulation of clay in the B horizon of the Calhoun is dense and slowly pervious. The horizons are less distinct in Dubbs and Waverly, but the subsoil is lighter in color and contains more clay than the surface soil. A thin fragipan layer in the lower subsoil of the upland Loring soil indicates the severe weathering of the loess material.

Reduction and transfer of iron has occurred in all the very poorly drained soils. This process known as *gleying* is cause for the gray color and color horizons. In Sharkey clay the gleyed zone may be six to 10 inches below the surface, while at other places it may be at a depth of two or more feet. In general, the gleyed zone is higher in the profile in the southern part of the clay area than in the northern part, because of the slower drainage. The reduced iron may be removed completely from the soil, or segregate in certain horizons to form concretions and mottles. The loss of iron is indicated by the high mineralization of the ground water. Concretions and mottles are most abundant in the Waverly soils. They are generally most abundant in depressions or places of standing water. Soils containing many concretions have a harsh brittle structure and are characterized by low fertility.

Changes in Soils Due to Action of Man

Significant changes in the morphological properties of the soils have resulted from the action of man by removal of the forest, reduced flooding, extensive drainage and frequent cultivation. These changes are most apparent in the color and structure. They are difficult to measure, but their combined effect is generally recognized by those who have observed the development of the Lowland Region.

The removal of the forest and the frequent cultivation of the land has reduced the organic matter. The clay soils have become lighter in color and for the very sandy soils there is a greater tendency to compaction or crusting. Protection from flooding by levees and ditches has eliminated sedimentation, especially along the Mississippi and St. Francois Rivers. Greatest change probably has resulted from drainage. Large areas are no longer subject to prolonged inundation. The water table has been lowered. Reduction processes have been retarded. Aeration extends to a greater depth. Because of the better oxidation, many of the light gray soils have acquired a brownish color at the surface. The deep drying of the clay soils has caused them to be more granular, less sticky, and more easily tilled. These changes will continue, and have not yet reached full expression, especially on the more recently cleared land. The combined effect of these changes should tend to make the soils more responsive to fertilizer treatment.

Classification of Soils by Higher Categories

The soils of the Lowland Region have been placed in 11 groups and two subgroups. Each group includes three or more soil types and is named on the basis of the dominant series. In order to show the relation of the soil groups to each other, and soils elsewhere, they have been classified according to the scheme of classification used in the United States. Only a general classification in larger categories is possible because the soil groups are not soil units. A detailed soil survey is required to indicate the many types of soil in the region.

Classes in the highest category of the classification scheme are the zonal, intrazonal, and azonal. The zonal group comprises soils with evident genetically related horizons that reflect the predominant influence of climate and living organisms in their formation. The intrazonal group includes soils with evident genetically related horizons that reflect the dominant influence of a local factor of parent material and drainage over the effects of climate and living organisms. The azonal order includes soils that lack distinct genetically related horizons mainly because of youth or resistant parent material.

gleying below the surface suggests they belong to the Low-Humic-Gley group.

The Sarpy soils of the azonal group are derived from the most recent alluvial deposits. They vary in texture from sand to clay. Horizons are due to deposition and are not genetically related. Many of the soils classified as intrazonal are marginal to the azonal order because of the low degree of horizonation. The distinction between the two groups is arbitrary and not always apparent.

Soil Classification in Higher Categories

Order	Great Soil Groups	Series areas
Zonal	Grey-Brown Podzolic	Bertrand Dexter Loring
Intrazonal	Alluvial	Dogwood Dubbs Lintonia Waverly
	Low-humia gley	Iberia Sharkey
	Planosal	Calhoun
Azonal	Alluvial	Sarpy Muck

The upland or Loring soils are the most characteristic of the zonal group and are classified as Gray-Brown Podzolic. The Bertrand and Dexter soils have faint horizons, and are considered intergrades to the intrazonal order. The Calhoun soils have a gray A_2 horizon underlain by a plastic clay B horizon and are classified in the Planosol subgroup. The effect of gleying is more evident than is characteristic of most plansols.

All the soils classified as intrazonal have faint genetic horizons but are influenced more by the parent material and drainage than by climate. The better drained areas of the Dubbs and Dundee soils have fairly distinct horizons and are intergrades to the zonal order. The Sharkey soils do not have distinct horizons, but the strong evidence of

According to a recently developed scheme of soil classification and nomenclature, all soils of the United States are grouped into 10 major categories or orders. The soils of the Lowland Region belong to three of these groups, namely, Entisols, Inceptisols, and Alfisols. Entisols, briefly defined, include soils without genetically formed horizons and correspond to soils in the Azonal group. Inceptisols include soils with no significant eluviation or illuviation, or extreme weathering. Profile features are determined by local factors. In general, Inceptisols correspond to soils in the Intrazonal group. Alfisols are characterized by distinct horizons and the accumulation of clay in the B horizon. The Gray-Brown Podzolic soils of the Lowland Region are included in the Zonal group, and belong also to the Alfisols.

Climate

The climate of the Lowland Region is classified as continental, humid, warm temperate. The summers are hot and sultry, and the winters are moderate. The average summer temperature in July is about 80°F. and the average winter temperature in January about 36°. Both average temperature and rainfall are higher than for other parts of the state.

The rainfall is evenly distributed (Table 1), but varies 5 to 10 inches from year to year. Extremes are rare. Occasional heavy rains in spring cause runoff beyond the capacity of present drainage ditches. At such times low lying land may be inundated for several days. Many years farming is delayed in wet springs. Dry periods of two to four weeks duration occur in late summer or early fall, and usually reduce yields, especially of corn. The very sandy and the gray soils are affected most by dry weather. Prolonged periods of dry weather do not occur frequently enough to prompt the extensive adoption of irrigation. Low rainfall is desirable in fall during the cotton harvest. Although the rainfall is about the same for the entire region, there is a northward decrease of two to three inches during the winter months.

Snow may occur during the three winter months, but usually it is light and does not remain more than three to five days. Zero weather is rare. The prevailing wind in summer is from the southwest. Hailstorms and tornadoes occur, but not often and are no more frequent than in other parts of the state.

Killing freezes in spring and fall are not a serious hazard of farming in the Lowland Region. The average date of the last killing freeze in spring is the last week in March or the first days in April. The average date of first killing freeze in fall is about the first of November. The average growing season is more than 200 days, which is adequate for the maturing of cotton. The variation in frost-free days because of late spring frosts from north to south within the Lowland is about 10 days. This seemingly small difference is responsible for the smaller cotton acreage in the northern part of the Lowland. The generally long growing season permits the maturing of soybeans planted after wheat, and the sowing of winter wheat after cotton harvest.

A minor variation in the length of the frost-free period applies to that portion of the Lowland between Hickory Ridge and the Ozark upland. Here the air drainage is retarded and the cold air impounded. Spring frosts may occur later and winter temperature is lower than for the main area of the Lowland.

TABLE 1
MEAN TEMPERATURE*
(average 24 years)

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
Caruthersville	39.9	42.4	50.1	60.2	69.4	78.2	81.1	80.1	73.1	62.5	49.5	41.3	60.7
Poplar Bluff	38.0	40.6	48.8	58.9	67.5	76.7	80.2	79.1	71.7	60.9	47.6	39.0	59.1
Sikeston	37.8	39.6	48.0	58.4	67.8	77.6	80.7	79.3	72.1	61.3	47.3	38.4	59.0

* Bul. 794 - 1963 - University of Missouri - Agricultural Experiment Station.

AVERAGE PRECIPITATION BY MONTHS (Inches)*

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Caruthersville	5.07	3.48	5.48	4.49	4.36	3.60	3.34	3.27	3.28	3.48	3.72	4.20	47.77
Cairo	4.43	3.24	4.40	4.06	3.76	3.65	2.67	3.30	3.20	2.96	3.35	3.53	42.55
Poplar Bluff	4.18	3.10	4.55	4.66	4.78	4.26	3.11	3.70	4.04	3.48	3.73	3.66	47.15
Sikeston	4.96	3.60	5.10	4.53	4.37	4.38	3.14	3.20	4.04	3.11	3.99	3.76	48.18

MONTHLY SNOWFALL TOTAL

	Jan.	Feb.	Mar.	Nov.	Dec.
Caruthersville	2.3	2.2	.4	.2	.8
Cairo	3.0	2.4	1.0	.2	1.2
Poplar Bluff	3.4	2.4	.6	.2	1.6
Sikeston	2.3	2.8	1.0	.2	.9

*Bul. 794 - 1963 - University of Missouri - Agricultural Experiment Station

Development of Land and Agriculture

Settlement

At the time of the Louisiana Purchase in 1803, there were few settlements in the area comprising the Lowland Region of Missouri. All of these were near the Mississippi River, the only route of travel. New Madrid, considered the second oldest in the state, was settled in 1787. It was a logical place, at the southern edge of Sikeston Ridge, and one of the highest sites south of Cape Girardeau; Caruthersville was settled in 1790, and Cape Girardeau in 1793. Grants of land on Sikeston Ridge and near Cape Girardeau were given to the pioneers by the government of Spain previous to 1790. The boundaries of the grants are maintained to this day. The location of the grants indicates the most desirable land, the oldest farmed land in the state.

Crowley's Ridge and Charleston Sand Ridge were settled during the early part of the nineteenth century. Kennett Ridge and the Essex Terrace were largely occupied by 1830. Most of the settlers came from Kentucky, Tennessee, and Virginia. In 1840 there was an influx of German immigrants. Most of these settled on the upland in Scott and Cape Girardeau Counties. The Little River area of the Morehouse Lowland was practically uninhabited before 1910, except for a few sawmill sites. After development of the Little River drainage system, the entire area was settled rapidly. Most of the settlers came from Illinois, Indiana, and northern Missouri. Settlement of the western lowland was late and slow because of poor drainage and inferior soil. It began about 1920, but had its greatest increase after 1940. In general, the most poorly drained lands in the Lowland were the last to be occupied. This is evidenced by the late development of the clay land areas in the southeastern part of Dunklin and of New Madrid Counties. The greatest increase in population has occurred since 1910. The Lowland thus includes the oldest and most recently occupied land in the state. Table shows changes in population by towns since 1900. The highest rural population is in the three southern counties where cotton is the main crop.

Reclamation

Flood Control, Drainage and Clearing

Reclamation or conversion of the Lowland from forest to cultivated land has been a continuous process from the earliest settlement to the present time. It has been accomplished for an estimated 80 percent of the region, but large areas, especially in the western lowland, require further development—mainly clearing and drainage—before the land can be farmed successfully. The upland and high terraces generally were well drained, and were the first to be developed. Practically all other land was subject to flooding from rivers and rains. Protection from overflow was the first requirement before the land could be farmed.

The first levee along the Mississippi river was built in 1900 and has been rebuilt and heightened several times until flooding from the river has been eliminated. The spillway levee from Birds Point to New Madrid, built in 1935, gives added protection from floods.

The most significant flood protection project for the central lowland east of Crowley's Ridge is the headwater diversion channel of the Little River drainage system, built in 1914. It deflected the water from Castor, Whitewater, and other Ozark streams into the Mississippi River a short distance below Cape Girardeau (Fig. 7). Previous to this, much of the Morehouse Lowland flooded during winter and spring. The Little River Drainage District includes 488,000 acres, and extends from the Ozark escarpment south to the Arkansas state line. Dredging started in 1913. The district includes 937 miles of dredged ditches and 304 miles of levees. Payment on the drainage bonds was completed in 1952.

Reclamation of the western lowland was delayed until flood control by levees had been established on the St. Francois and Black Rivers. Upland reservoirs (Wapapello and Clearwater) on the two streams further reduced the danger of flood. As a result there has been rapid clearing and development of the land in recent years. The need for additional drainage ditches to provide better surface drainage is apparent.

Extensive drainage by ditches had been developed previous to 1900, mainly in Pemiscot, New Madrid, and Scott counties. The first drainage districts were relatively small, but as drainage developed, unification of districts became necessary. Not all districts were financially successful. The history of reclaiming the land by drainage is extensive, and cannot be considered here. Excluding the high terraces, practically all the land is subject to drainage and levee tax. The magnitude of the problem is indicated by the estimated total of 3600 miles of drainage ditches and levees in the Lowland Region. There are 155 drainage districts ranging in size from 1000 to 500,000 acres. Drainage taxes range from 15¢ to $1.20 per acre. For most districts this is for maintenance only, and not for new construction.

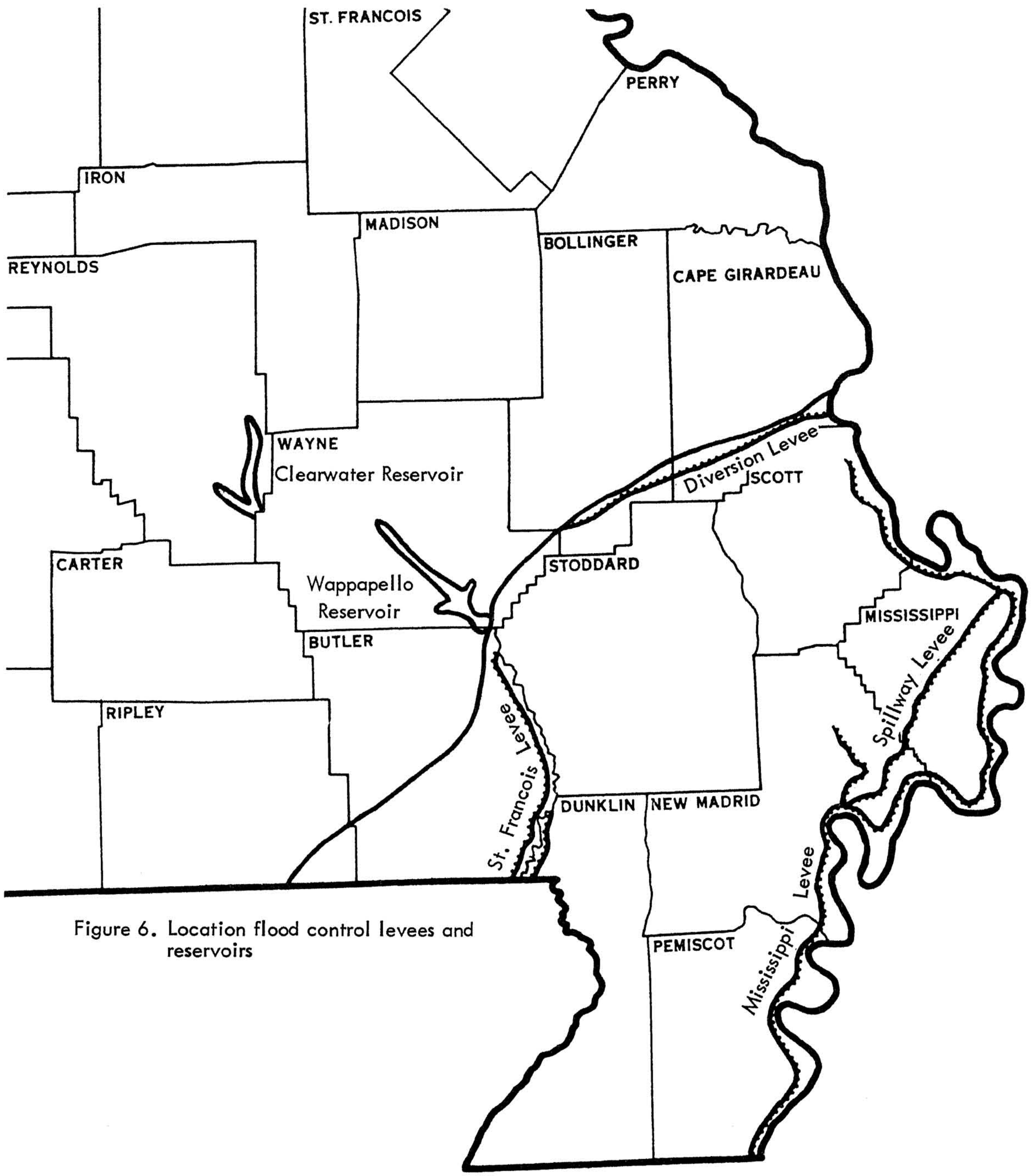

Figure 6. Location flood control levees and reservoirs

Maintenance includes removal of vegetation, periodic clean-out of ditches, and maintenance of levees. The number of years between redredging or clean-out of a ditch will vary from five to 12 years, depending on type of soil and rainfall.

Reclamation or conversion of the Lowland Region from forest to cultivated land has been one of the most outstanding accomplishments of regional development. Originally all of the land except small areas on the higher sand ridges was heavily forested. It is estimated that in 1900 less than 15 percent of the total land area was cleared. In 1950 less than 15 percent of the total land area was forested. Most of the remaining forest is in the western lowland and inside the levee areas along the Mississippi and other rivers. Reclamation by flood control, drainage, and clearing occurred concurrently, but clearing was the

Floodway near Kirk. (Photo by Massie, Missouri Resources Division)

last to be accomplished.

Until recent years, practically all the clearing was by ax, saw and fire. Trees were cut and burned. The larger trees were cut and milled. There were numerous saw mills, some of large capacity notable at Morehouse, Gideon, Kennett, Deering, Caruthersville and Poplar Bluff, that operated their tram lines. The sites of many mills later developed into permanent villages. Lumbering was a major industry from 1890 to 1930.

Clearing followed logging. Stumps were not removed. It should be noted that the stumps disappeared in a relatively short time—usually less than 5 years. Rapid decomposition, and shallow rooting—especially on poorly drained land—made for rapid removal. Stump fires and a haze of wood smoke were a common sight in spring. The toil and hardships of the settlers that cleared the land have not been fully recognized. Inferior homes, no roads, wet land, and low wages were the norm. Cost of clearing ranged from $10 to $20 an acre. It was a condition of good land and poor people. As the forest disappeared, former loggers became land clearers, and then turned to farming. It was a transition period for land and people—from forest to cultivated field, and from woodsman to farmer. This condition no longer prevails, but ended only a few years ago. In recent years most clearing has been done by bulldozers.

Reclamation brought about many economic changes. Much of the land formerly was in large holdings by lumber companies, railroads, and investors. The cost of reclamation required capital; this tended to eliminate the small land owner. Clearing required much labor. Owners leased the land to tenants and sharecroppers. Many small farm units from 40 to 60 or 80 acres were thus established. This is illustrated by U.S. census figures for New Madrid County. Table 2 shows the number of farms in 1910 was 1593. This number steadily increased to 3857 farms in 1950, but by 1960 it had declined again to 2108. In 1950 more than 77 percent of the farmers were classified as tenants. Similar conditions prevailed in other sections of the Lowland. The present trend is to larger farms and fewer tenant farmers.

The entire process of reclamation by drainage, land clearing, and extension of roads has had a unifying effect on the economy and development of the region. Differences in economic and social development between the main soil areas have practically disappeared. A more uniform and stable type of farming has been established, and a high degree of prosperity applies to the entire region.

TABLE 2

	Number of Farms	
County	*1950*	*1960*
Butler	3480	2165
Dunklin	3312	2252
Mississippi	1879	1085
New Madrid	3857	2108
Pemiscot	3347	1844
Scott	1838	1212
Stoddard	4061	2573

U.S. Bureau of the Census
(decrease 39% from 1950 to 1960)

Periods of Development

The agricultural development of the Lowland Region began about 160 years ago but made greatest progress after 1910. The area of cultivated land increased from an estimated 600,000 acres in 1900, to more than 1,800,000 acres in 1960 and constitutes more than 75 percent of the total land area. Much of the "improved" land previous to 1900 was on the upland in Scott and Stoddard Counties.

The first fields in the Lowland were on Sikeston Ridge and a few sites near the Mississippi River. The last fields were developed on inferior soil and poorly drained sites. The Lowland is at the transition zone between the agriculture of the southern states and that of the north-central states. It is at the southern edge of wheat growing and the northern edge of the cotton growing area.

The type of farming has always been based on grain and cotton production with minor consideration to livestock production. The early subsistence farming has been replaced by commercial production of crops. Farming methods that required much hand labor in cultivation and harvesting have been completely mechanized. Corn is a major crop, especially in the northern half of the Lowland Region. It is always the first to be grown on newly cleared land. Because of its deep rooting, corn is not well suited for the heavy Sharkey clay soils. Most of the corn is sold as cash grain crop and processed for commercial stock feed.

Wheat formerly was a major crop, especially on the sandy acreage in Scott County. Production declined after World War I (1918). This former extensive wheat production is the reason for the grain mills at Cape Girardeau, Dexter, Charleston, Sikeston, Oran, and Advance. Mill products and feed grains were shipped to the

Land-leveling in the Delta.

southern states. Red clover was generally seeded with wheat for seed and green manure. The use of fertilizer on practically all the crop, since about 1940, has greatly increased yields, and tended to increase acreage, although federal production control has prevented a large expansion.

Cotton has had a dominating influence on the agricultural development of the Lowland Region. Its production requires much labor. This caused the establishment of many small farms with tenant operators. The cotton acreage increased greatly after 1921 and largely replaced wheat, especially in the northern counties. It exceeds the corn acreage in Pemiscot, Dunklin, and New Madrid Counties (Appendix Table I). The decline in acreage in recent years is because of government production control. There have been great advances in cotton production methods. Earlier maturing and better adapted varieties and the extensive use of fertilizer have resulted in increased yields. Average yields for the entire region now exceed 1 bale per acre. The use of mechanical pickers and sprays for weed control has changed production methods. The cost of labor for cultivation and harvesting has been reduced, and the time of harvest has been shortened.

The most spectacular crop of the Lowland is the soybean. Previous to 1940 it was a minor crop, but after 1950 it was the major crop, exceeding the corn acreage more than three to one in some counties. In New Madrid County the acreage increased from 14,972 in 1940 to 82,946 in 1950, and 146,425 in 1960. The greatest increase was on the clay soils and on the light colored soils in the western lowland. The great popularity of the soybean is attributed to the generally high yields, the adaptation to a wide range of soils, the long planting period from April to July and the ease of harvesting. Yields usually range from 20 to 40 bushels per acre. Beans often are planted after wheat harvest in June. Much of the crop is processed in oil mills in Sikeston, New Madrid, Portageville, Hayti, and Kennett or shipped to New Orleans for export.

Grain crops of very minor importance are winter oats and rye. The former is used for pasture and hay. Rye is grown extensively on the very sandy soils, mainly in Scott and Mississippi Counties. It is grown to provide pasture, prevent soil blowing, as a green manure, and as a cover crop for new grass. Production is increased by the use of fertilizer. Sunflower is a special crop occasionally grown on sandy soils.

Vetch and, to a lesser extent, crimson clover are sometimes sown between the rows of corn and cotton to supply organic matter. Use of winter legumes has decreased because of disease and the greater dependence on fertilizer as a source of nitrogen.

Alfalfa is the most important hay crop, although the total acreage is small. It is grown most extensively on the Sarpy group of soils bordering the Mississippi River. It thrives on the dark clay soils, especially if the substratum is sandy. The potential for increased production is very favorable.

Three to five cuttings are obtained per year. Much of the hay is shipped to markets in the southern delta region. The crop can be grown without use of lime on some soils, but larger yields are generally obtained when the land is limed. It is probable that alfalfa production will be increased with the expansion of livestock farming.

Fescue thrives on well drained soils and is the dominant grass in permanent pastures. Red-top is used on the moderately well drained soils in the western lowland. Bermuda makes a dense sod, and therefore is used on river levees. It thrives best on sandy soils of high fertility.

The possibilities for the successful growing of rice as a special crop have been demonstrated. It was first grown commercially on the Calhoun soil in the western lowland. The level surface and the clay subsoil were favorable for the flooding of the land. There is an abundance of ground water at shallow depth. Rice is now grown on Sharkey clay in other parts of the Lowland. Yields range from 60 to 100 bushels per acre. Fields become foul with weeds if rice is grown more than two years in succession. Prolonged flooding of the land tends to compact the soil; this may have an unfavorable effect for a year on succeeding crops. The potential for a vast expansion of rice production exists, but may not be developed until there is greater demand for the product. An increase in acreage is now limited by government control.

Melons have been grown commercially for many years on the sandy soils. Fields range from five to 20 acres in size. The total acreage is relatively small, probably less than 4000 acres, and market demands are usually well supplied.

Other vegetables such as beans, asparagus, tomatoes, and potatoes can be grown successfully, especially on the moderately sandy Sarpy soils. Present limitations are those of processing facilities—canneries. Another factor is that vegetables grown in hot weather do not have the quality of products grown in cooler seasons and regions. Experimental plantings of sugar beets indicate this crop will thrive on the moderately sandy and clay soils, if they are well drained. Yields of 10 or more tons per acre are obtained and are highest when the land is irrigated.

Orchard fruits—apples and peaches—are not grown commercially except on Crowley's Ridge and Scott County Hills. Late spring freezes make peach production uncertain on the lowland. Extensive commercial orchards in southern Illinois supply fruit needs of the region. Strawberries are grown extensively on sandy soils. Most of the fields are irrigated. The soil conditions are favorable for expanding berry production.

Livestock

The production of livestock is of less significance in the Lowland Region than in other parts of the state. There are few farms devoted exclusively to this type of farming, and there are many without any kind of livestock. Livestock is most abundant in Scott and Stoddard Counties where there are large areas of upland pasture. Livestock numbers are smallest in those sections where cotton is a major crop (Table 4). There is small need for barns and sheds, except for the storage of grain and implements. Dairy farms are located near the larger towns to supply local needs.

An increase in livestock seems probable and desirable, especially on the well drained terrace lands. There is an abundance of grain feed and oil meals. Grasses and legumes are available for the long grazing period. Feeder cattle can be obtained in the adjacent Ozark Region. There is need for the more frequent growing of grasses to improve soil structure on the older cultivated land. The utilization for pasture of the better drained land in the western lowland seems especially desirable. The conversion of more cultivated land to pasture would tend to give greater stability in the type of farming.

Soil Fertility Practices

Most of the alluvial soils are fertile, deep, and retain productivity under continued cultivation. During the early development period previous to World War II, little effort was made at soil fertility improvement. The prevailing opinion was that it was not needed. Farmers were more concerned with clearing and draining the land. Where wheat was grown, clover was included for hay and soil improvement. The decline in productivity of sandy soils prompted the greater use of lespedeza, vetch, crimson clover and crotelaria. Production of these resulted in the use of limestone to a small extent, mainly in Scott and Stoddard Counties.

About 1930 potassium fertilizer began to be used on cotton in Dunklin County. The general use of fertilizer on cotton in all parts of the Lowland began about 1945. It was used most extensively on the sandy soils. Following World War II, the use of nitrogen fertilizers was quickly adopted and this greatly stimulated the use of all fertilizer (Appendix Table II). Now fertilizer is applied regularly to most crops except soybeans.

The response to fertilizer treatment is greatest on the deep, well drained sandy soils, and in the older farming areas. Smaller response occurs on clay and poorly drained soils, especially in wet seasons. The amount and kind of fertilizer vary for different soils and different crops. In all cases, nitrogen is the most important constituent because of the low organic matter content of the soils. Methods of fertilizer application vary but, in general, row application at time of seeding gives the most consistent results. Broadcasting before plowing, bedding, and side dressing are other methods of application. These, as well as the amounts and kinds of fertilizer, may change with time. The use of fertilizer, however, will continue to increase under continued cultivation as the decrease in organic matter and the need for nitrogen become more apparent.

For most of the soils of the Lowland Region where several of the nutrients exist in abundant amounts, the "balanced nutrition" idea has little or no practical application. It is important that each nutrient be supplied in adequate amounts, but no evidence exists to indicate that any given ratio must obtain between them under field conditions. More consideration should be given to the varied soil conditions in adjusting the fertilizer treatment. Nitrogen is the only major nutrient that will be particularly harmful if it is used in excess. With nitrogen, the balancing must be with the plant and not with other plant nutrients.

Limestone has not been used extensively for soil improvement and the response from such treatment has been variable. The soils on the sandy ridges and the gray soils in the western lowland are the most highly leached and have a low content of calcium and magnesium. The use of limestone on these soils seems desirable and will probably increase the effectiveness of other added plant nutrients. Continued cultivation if the land and the increasing use of fertilizer may cause a greater need for limestone on many soils.

Cultural Practices

The type of farming—based on the production of corn, cotton, soybeans, and wheat—and the large percent of land in these crops, require that the land be plowed each year. This is a significant factor from the standpoint of soil fertility and improvement. The sandy soils are easily tilled. Many are plowed excessively—often twice a year. The result has been a decline in organic matter, and a deterioration of soil structure. This is indicated by the tendency of the soils to crust, to be compact, and to be less drought resistant. This condition is most apparent on the light sands, and on the gray soils in the western lowland. It is a condition that will continue to aggravate unless cropping systems are adopted that will restore more organic matter to the soil. Frequency of cultivating corn and cotton is reduced by the use of herbicides.

The clay soils are more difficult to till. On the very heavy clays the depth of the surface soil may be less than eight inches. It should be noted that most of the "gumbo" land was not brought into cultivation until the advent of the tractor. The latter made possible deeper tillage. Depth of plowing is more significant on clay than on sandy soils. Plowing when soil is wet has an unfavorable effect. It causes the soil to be cloddy, hard and brittle. Timeliness of plowing with regard to moisture, may even be more significant on the gray colored soils than on clays. Fall plowing and good surface drainage aid in maintaining favorable soil structure. It may eventually become desirable to fallow the land occasionally, especially clay soil, to restore structure. The adoption of a cropping system that will include a sod crop—either grass or legume—will be the most effective method of maintaining or improving the structure of the soils, whether they be clays or sands.

Subsoil tillage (19-24 inches) has had very little adoption. There is no probability that such treatment is beneficial on either sands or clays. Permeability to moisture and roots is determined primarily by soil texture. The soils of the Lowland Region are young and have not acquired an unfavorable profile structure that can be improved by mechanical disturbance. Deep tillage therefore does not seem necessary or economically feasible.

Land forming or land leveling is a form of soil management that has been adopted in recent years. Its purpose is to eliminate low places and depressions in fields, and to provide better surface drainage. The work must be done with precision because the difference in surface elevations of a 40 acre field may vary less than 12 inches. Where drainage is the objective, a slope of the land from .1 to .4 of a foot per 100 feet, is established. Thus far land leveling has been applied most extensively on the sandy terrace soils. Reduced crop yields may occur on newly formed land until the fertility is restored. Land leveling has been applied on clay soils to eliminate "sand-blows" and mounds, and to mix the sand with the clay. Where sand mounds are numerous, the leveled surface soil may have a

Digging out drainage channel with drag line.

sandy clay texture. Land leveling usually is necessary for surface irrigation, and where rice is to be grown.

In recent years great progress has been made in grading and leveling the spoil banks bordering the drainage ditches. Hundreds of acres of productive land have thus been reclaimed, and the unsightly, weed-covered banks have been eliminated.

Field Drainage

Supplementary field drainage is one of the greatest needs for all but the sandy soils. Because of the level surface, run-off is slow, and water tends to collect and stand in the low places. This has an injurious effect by leaching and compacting the soil. The spotted appearance of crops and of soils usually is due to prolonged wetting. Drainage should be provided on a field basis, rather than a "pothole" basis.

Ditches usually are one to three feet in depth with gently sloping banks. They tend to fill and aggrade and must be renovated every two to three years. Low stability of ditch banks characterizes especially the Waverly soil. The construction of numerous roads and highways with side ditches has done much to improve surface drainage and provide outlets for field ditches. Outlets into the larger drainage ditches frequently cause severe damage to the latter by caving banks and forming bars in the ditch channel. The more extensive use of metal pipes as outlets through the ditch levees seems desirable. Tile drainage has not been adopted, and where tried has not been succesful.

Irrigation

Irrigation has received consideration and adoption. Both overhead and surface irrigation methods are used. The water is applied to corn, cotton, and soybeans. Irrigation was adopted first for the production of rice, mainly on Calhoun and Sharkey soils. The conditions favorable for irrigation are the relatively level surface of the land, the abundance of underground water at shallow depth—usually less than 150 feet. Rarely are more than two applications of water necessary.

Factors that have mitigated the extensive adoption of irrigation in the past have been the adequacy of rainfall in some years, and the uncertainty of need because of the irregular rainfall. In addition, cotton and soybeans are rather tolerant of dry conditions. For surface irrigation it may be necessary to construct low levees to carry the supply ditches. These levees may interfere with the normal surface drainage of the land. Irrigation has generally resulted in increased yields, but the economy of the practice is irregular and this will determine its future expansion.

Where a water table occurs it is below the depth of root penetration. The water table probably is highest in the Mingo area of the Advance Lowland. Here the underground water from the Ozark upland tends to rise in the alluvial material by hydrostatic pressure. A relatively high water table, normally more than three feet below the surface, prevails in the swales bordering Kennett and Sikeston Ridges, and in the Blodgett sand area. In these locations the drainage ditches have a perennial flow.

Population and Towns

The population of the Lowland Region has had a steady increase since 1803—the time of the Louisiana Purchase. It made the greatest gain since 1920. The Appendix gives estimated population by decades for the entire region. More than 75% of the population is classified as rural. There are only 14 towns that have a population over 2500. The population density is greater than for all other sections of the state except near the metropolitan areas of St. Louis and Kansas City.

In recent years there has been a shift in population from farms to towns. This is most apparent on the most recently cleared land on clay soils, and where cotton is a major crop. The Negro population is small, comprising less than .2% of the total. It is concentrated mainly in the older towns in the counties bordering the Mississippi River.

Agriculture is the principal means of livelihood. During the period from 1900 to 1940 many people were employed in saw mills and other woodworking industries. This type of industry is now almost extinct. Flour mills and larger grain storage elevators are located at Cape Girardeau, Charleston, Dexter, East Prairie, Malden, Oran and Sikeston. Cotton seed and soybean oil mills are located at Kennett, Malden, New Madrid, Portageville and Sikeston. Small factories of various kinds (shoes, clothing, cabinet) not directly related to agriculture, have been established in most of the larger towns, and the number is increasing.

Transportation

The Mississippi River has been a means of transportation from pioneer times to the present. Boats from New Orleans plied the river as far north as St. Louis and beyond. Cape Girardeau, Commerce, Cairo, New Madrid and Caruthersville are the important riverports, from which large quantities of agricultural products are shipped to Memphis and New Orleans.

The St. Louis, Iron Mountain (now Missouri Pacific) was the first railroad built, about 1858 and completed in 1870. It extended from Bismark in St. Francois County to Belmont, on the Mississippi River. The Missouri Pacific railroad between Cairo and Poplar Bluff was completed in 1867. There was a rapid extension of railroads to all parts of the region after the Civil War and until 1900. Some of the roads were built to remove the timber, and have been abandoned. Most of the traffic is north and south. New Orleans and Memphis are the principal markets for cotton, soybeans, oil, corn, and wheat. St. Louis is the principal market for livestock.

Forest and Wildlife

The once rich forest resources have been eliminated except for a few small remnants, mainly in Butler County. The original forest included a great variety of species, including elm, maple, gum, various species of oak, hickory, ash, walnut, and cypress. Whiteoak, black oak and post oak were most abundant on the Calhoun soils. Pinoak and elm were dominant on many parts of the Waverly soils. Cypress, ash and maple abounded in the swales and deep overflow areas. Big Tree State Park in Mississippi County is a remnant of the magnificent forest that once covered the Sarpy soil area along the Mississippi River.

The narrow band of land inside the levees along the Mississippi, St. Francois and Black rivers, is subject to frequent overflow, and most therefore remains forested. Because of the deep soil and abundant moisture, trees grow very rapidly. It seems desirable that these sites be utilized permanently for timber production.

With the disappearance of the forests, there has been a disappearance of most forms of wildlife. Migratory waterfowl abounded in vast numbers before the lakes and swales were drained, but now appear at protected sites. Mingo Wildlife Refuge near Puxico includes about 30,000 acres. A similar refuge is located along Little River immediately south of the state line. The only water areas that contain fish are the St. Francois River, refuge reservoirs and the lower reaches of the large floodway ditches.

RESUME

A wide range of soils is the basic resource of the Lowland Region. Their potential for crop production has been established. Past regional efforts of agricultural development have been devoted to reclamation—clearing and draining the land. This largely has been accomplished. Future development of the land must continue to give major consideration to improving drainage, maintaining the organic matter and minimum cultivation. All these factors have a profound effect on the structure or tilth of the soil. The greatest response from fertilizer will be obtained when good soil structure is maintained. This will vary for different soils, but applies to the sands as well as the clays.

Maintaining the structure of the clay soils is especially significant, for when it is degraded, it is difficult to improve. The unfavorable effect of a reduction in organic matter is most apparent in the sandy soils. The improvement of the light colored soils will be more difficult, but improved drainage is one of the essential requirements.

An outsanding feature in the agricultural development of the Lowland Region during the last decade has been the extensive use of fertilizer. Its use will continue to increase. There will be refinements in methods of application, amount, and kinds, adjusted to the different soils and crops. Because of the increase in fertilizer, there will be an increase in the use of limestone, especially on the sandy and light colored soils.

Changes in cropping systems have characterized the agricultural history. This is most apparent in the decline in wheat acreage in some areas, and the phenomenal increase in soybeans for the entire region. Further changes will be made, with better adjustment of crops to soils. New crops and new varieties will be adopted. Because the soils, topography, and climate are favorable to a great variety of crops, changes in cropping systems are readily made.

There is a trend to increased livestock production, especially on the terrace and well drained soils. This will result in more permanent pastures and greater stability in the type of farming. It will create a larger market for the locally grown grain and forage crops.

Special crops—sugar beets, rice, small fruits, and certain vegetables may be grown commercially on some soils. Processing and marketing facilities would be required. Irrigation would be required for the successful production of most special crops.

In the future development of the Lowland Region all of the land will be farmed intensively. A productive agriculture under judicious soil management is assured.

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Dunklin	"	1916
Mississippi	"	1924
Pemiscot	"	1912
Stoddard	"	1914

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Appendix

AREA OF LOWLAND BY COUNTIES

County	Lowland Area	
Bollinger	38,000 acres	
Butler	200,000	
Cape Girardeau	54,000	
Dunklin	347,520*	(10,112 A. upland)
Mississippi	263,000*	
New Madrid	434,560*	
Pemiscot	312,320*	
Ripley	24,320	
Scott	267,520*	(52,000 A. upland)
Stoddard	535,680*	(115,328 A. upland)
Wayne	9,600	
	2,488,560	(177,440 A. upland)

*U. S. Bureau of the Census, 1950

County Soil Survey Reports, U. S. Dept. of Agriculture

ELEVATION

Feet Above Sea-level

Advance	360	Hornersville	248
Arbyrd	242	Kennett	265
Bernie	300	Kinder	345
Blodgett	325	Lilburn	284
Caruthersville	270	Malden	268
Charleston	321	Morehouse	300
Commerce	330	Neelyville	300
Deering	256	New Madrid	295
Delta	335	Old Field (swamp)	325
Dexter	375	Parma	280
Dorena	297	Portageville	280
Dudley	340	Powe	326
East Prairie	306	Qulin	315
Essex	300	Rives	244
Fisk	326	Sikeston	327
Gideon	267	Steele	258
Glennonville	312	Varney River	260
Hayti	270	Wardell	268

LAND USE ACREAGE OF PRINCIPAL CROPS

Changes in crop acreage and land use since 1910 by 10-year intervals. Compiled from State Department of Agriculture and U.S. Bureau of Census reports.

Year	Corn	Wheat	Cotton	Soybeans	Pasture	Woodland	Cropland Harvested
				Butler County			
1910	30320	662	2807				
1920	43850	11853	5101				
1930	32920	1630	11070	4028			69886
1940	37000	2800	13220	5103	31366^{o}	101635	86488
1950	38500	800	18000	12800	32578^{x}	87495	97606
1960	27000	14300	18900	68000	28285^{+}	76089	125058
				Dunklin County			
1910	51633	1594	44061				
1920	103850	15328	42820				
1930	78210	2750	110740	2812			167777
1940	53000	2200	85360	19970	42800^{o}	30131	181534
1950	52800	2200	84200	85500	15130^{x}	22792	232192
1960	27500	31500	93400	122300	9013^{+}	20199	254208
				Mississippi County			
1910	68369	34867	114				
1920	92310	48260	485				
1930	57900	23420	23120	5485			130119
1940	49590	14500	35480	8200	22550^{o}	25929	128285
1950	54000	4400	29000	61000	10362^{x}	22442	166454
1960	65000	17000	29300	90000	7825^{+}	20162	187046
				New Madrid County			
1910	68486	11279	989				
1920	121150	57446	11954				
1930	107890	16300	57640	4446			176906
1940	70070	12900	99010	14972	25277^{o}	18793	221684
1950	60800	6800	120500	105700	10295^{x}	11890	290709
1960	47600	29000	101600	175000	7326^{+}	13590	312207
				Pemiscot County			
1910	38416	0	21688				
1920	65770	1138	37316				
1930	36640	140	134510	468			169410
1940	42600	300	107660	17582	18287^{o}	24111	186369
1950	20300	200	110000	95000	7518^{x}	12338	224275
1960	10200	25800	105200	159000	1522^{+}	7353	258337
				Scott County			
1910	64362	46380	20				
1920	75000	75595	74				
1930	63720	33610	14180	4743			142965
1940	41330	27360	18470	6136	32080^{o}	23632	132798
1950	50700	18600	19300	54100	25340^{x}	23304	167133
1960	57400	21900	18500	70000	31017^{+}	25795	164159

Pasture^{o} - plowable pasture
Pasture^{x} - cropland used only for pasture
Pasture^{+} - total, includes cropland used only for pasture and woodland pastured

LAND USE ACREAGE OF PRINCIPAL CROPS (Continued)

			Stoddard County				
1910	75872	15530	8239				
1920	98670	56044	6254				
1930	91330	12290	22500	7306			173958
1940	80240	21880	44210	11636	82583^{o}	75144	197701
1950	93300	8200	50000	86400	60044^{x}	52889	267910
1960	65200	27600	42800	155000	46473^{+}	44289	276942

$Pasture^{o}$ - plowable pasture
$Pasture^{x}$ - cropland used only for pasture
$Pasture^{+}$ - total, includes cropland used only for pasture and woodland pastured

NUMBER OF LIVESTOCK

County	Cattle 1950	Cattle 1960	Hogs 1950	Hogs 1960
Butler	14463	15583	24936	29393
Dunklin	8626	7030	27683	17963
Mississippi	7789	13827	19428	13108
New Madrid	7709	8894	23693	15241
Pemiscot	3690	3385	12435	7296
Scott	15414	22266	27122	24026
Stoddard	24533	26370	48342	41111

The number of cattle and hogs fluctuate from year to year, and within a year. The figures in table give the comparative number of animals for each county.

POPULATION BY TOWNS
U. S. Census

	1950	1960
Bloomfield	1,382	1,330
Cape Girardeau	24,576	24,947
Campbell	1,931	1,964
Caruthersville	8,614	8,643
Chaffee	3,184	2,862
Charleston	5,502	5,511
Dexter	4,624	5,519
East Prairie	3,032	3,469
Hayti	3,302	3,737
Kennett	8,685	9,098
Malden	3,396	5,007
New Madrid	2,726	2,867
Parma	1,163	1,060
Poplar Bluff	15,064	15,926
Portageville	2,662	2,505
Sikeston	11,640	13,765
Steele	2,360	2,301

NON-WHITE POPULATION

County	
Butler	3532
Dunklin	1632
Mississippi	4934
New Madrid	6345
Pemiscot	10261
Scott	3172
Stoddard	2008
Total	31884

U. S. Census of Population, 1960

FARM TENANTS

County	1950	1954	1960
Butler	748	531	386
Dunklin	1846	1416	1102
Mississippi	1378	1012	656
New Madrid	3021	2236	1621
Pemiscot	2428	2035	1183
Scott	1071	568	475
Stoddard	1561	1289	822

AVERAGE SIZE OF FARMS

	1950	1954	1960
Butler	80.9 acres	96.0 acres	119.5 acres
Dunklin	90.8	103.4	137.7
Mississippi	115.1	146.4	209.8
Pemiscot	81.3	96.0	157.2
New Madrid	89.1	116.8	173.5
Scott	134.1	173.0	294.4
Stoddard	111.3	129.5	162.4

U. S. Bureau of the Census

POPULATION BY COUNTIES
U. S. census

County	Area sq. mi.	Population 1950	Population 1960	Per sq. mi.	Urban 1960	Rural 1960
Butler	714	17534	28040	48	15926	12114
Dunklin	543	45429	39139	72	14105	25034
Mississippi	411	22551	20695	45	9360	11335
New Madrid	679	39444	31350	46	5458	25892
Pemiscot	488	45624	38095	78	12380	25715
Scott	418	32842	32748	78	16541	16207
Stoddard	837	33463	29490	35	5519	23971

FERTILIZER TONNAGES SHIPPED FOR USE BY COUNTIES*

County	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963
Butler	3166	2457	2486	2296	4141	4403	4281	6047	7746	7867	8026	9410
Dunklin	14386	13926	21169	15703	21412	21668	15915	23069	26251	26664	28489	32206
Mississippi	5367	5955	9531	5936	10103	13602	10832	15811	15780	15288	15219	18426
New Madrid	11891	11279	15536	11678	14564	16550	10598	16841	19556	20732	26075	28189
Pemiscot	4760	7209	10424	7211	9355	12291	7605	16690	17369	16319	17258	19407
Scott	8410	9279	8561	7056	9239	10780	8940	11608	12818	10861	7271	13701
Stoddard	13475	11742	12472	11148	13251	13253	11729	15384	16175	16516	17943	21117

*Missouri Fertilizer Report
Fertilizer Control Service

DRAINAGE PROJECTS--1960

County	Drainage districts	Area in districts
Butler	5	238471 acres
Dunklin	40	261254
Mississippi	13	228793
New Madrid	23	368596
Pemiscot	47	275790
Scott	12	151025
Stoddard	44	339066

Cooperative mutual drainage districts and legally organized public drainage districts

U. S. Bureau of the Census

AVERAGE VALUE OF LAND AND BUILDINGS PER ACRE
(in dollars)

County	1959
Butler	109
Dunklin	249
Mississippi	235
New Madrid	280
Pemiscot	323
Scott	176
Stoddard	177

Source: U. S. Bureau of the Census, 1959

AGRICULTURAL PRODUCTS PROCESSING PLANTS

Flour and Grain Mills	Oil Mills
Advance	Hayti
Cape Girardeau	Kennett
Charleston	New Madrid
Dexter	Portageville
Kennett	Sikeston
Malden	
Oran	
Sikeston	

COMMON FOREST TREES* OF LOWLAND REGION

Green ash	Fraxinus pennsylvanic
White ash	Fraxinus americana
Elm	Ulmus americana
Sugar maple	Accer saccharinum
Silver maple	Accer saccharinum
Red maple	Accer rubrum
Sweet gum	Liquidambar styraciflua
Tupelo gum	Nusea aquatica
Hackberry	Celtis accidentalis
Black oak	Quercus velutia
White oak	Quercus alba
Bur oak	Quercus Macrocarpa
Overcup oak	Quercus lyrata
Pin oak	Quercus palustris
Willow oak	Quercus phellos
Swamp chestnut oak	Quercus michauxii
Shagbark hickory	Carya ovata
Shellbark hickory	Carya laciniosa
Pecan	Carya Ilinoensa
Walnut	Juglans nigra
Catalpa	Catalpa speciosa
Persimmon	Diospyros virginiana
Sassafras	Sassafras albidum
Cypress	Tacodium distichum
Sycamore	Platanus occidentalis
Cottonwood	Populus deltoides
Boxelder	Acer negundo

DOMINANT FOREST TREES ON DIFFERENT SOIL AREAS

Upland--Crowleys Ridge etc.	White oak, black oak, hickory, walnut, maple
Calhoun soils	Black oak, pin oak, elm
Waverly soils	Elm, ash, maple, black oak, willow oak
Sandy ridges	Black oak, blackberry walnut
Dubbs--sandy terrace	White oak, black oak, elm, maple, catalpa, red gum
Clay soils	Sweet gum, black gum, elm, maple, ash, black oak, bur oak, cypress
Sarpy loam soils	Maple, elm, sweet gum, ash, bur oak, pecan, cottonwood, cypress

MISSISSIPPI COUNTY

YIELD PER ACRE

Year	Corn	Wheat	Cotton	Soybeans
1950	44.3	17.3	308	24.7
1951	38.8	18.4	270	25.0
1952	42.1	22.6	355	17.8
1953	40.3	26.1	473	14.4
1954	36.1	31.4	505	15.6
1955	52.4	26.6	545	20.0
1956	55.7	36.3	697	17.2
1957	35.0	26.6	369	24.6
1958	69.3	23.8	454	27.4
1959	67.4	36.4	647	26.2
1960	66.4	46.5	571	23.2

PEMISCOT COUNTY

YIELD PER ACRE

Year	Corn	Wheat	Cotton	Soybeans
1950	34.2	20.5	282	28.4
1951	28.8	19.0	279	20.5
1952	28.8	21.2	351	22.5
1953	41.3	28.2	386	9.7
1954	24.3	32.7	524	14.7
1955	46.2	30.4	562	18.0
1956	45.8	43.9	574	16.2
1957	41.5	33.9	277	27.3
1958	51.0	33.9	402	26.5
1959	50.5	33.1	665	24.2
1960	63.4	45.6	533	21.4

NEW MADRID COUNTY

YIELD PER ACRE

Year	Corn	Wheat	Cotton	Soybeans
1950	37.7	12.2	247	25.2
1951	49.5	22.0	222	19.4
1952	16.7	26.1	349	17.8
1953	45.6	27.0	401	16.2
1954	28.3	34.9	461	12.7
1955	48.6	29.8	480	20.9
1956	49.8	38.4	620	22.8
1957	40.6	25.3	250	22.6
1958	50.8	28.1	472	26.4
1959	58.5	37.2	588	24.2
1960	59.4	33.4	534	22.4

BUTLER COUNTY

YIELD PER ACRE

Year	Corn bu.	Wheat bu.	Cotton bales	Soybean bu.
1950	34.2	11.9	257	16.8
1951	29.1	15.8	316	15.2
1952	28.8	17.9	294	11.7
1953	23.3	25.8	297	7.3
1954	12.7	29.1	312	10.2
1955	26.7	32.8	398	10.2
1956	32.9	40.5	537	14.2
1957	24.3	15.9	428	19.6
1958	31.3	25.4	413	25.5
1959	44.6	26.1	571	19.2
1960	29.3	37.6	507	17.4

SCOTT COUNTY

YIELD PER ACRE

Year	Corn	Wheat	Cotton	Soybeans
1950	38.8	13.5	269	23.5
1951	38.6	16.7	331	20.0
1952	28.2	19.7	375	16.4
1953	31.8	24.4	311	9.7
1954	37.2	29.1	460	13.7
1955	37.0	26.6	457	11.7
1956	49.8	29.3	596	19.3
1957	35.0	24.0	352	21.4
1958	55.7	26.5	477	18.3
1959	56.5	32.9	585	22.2
1960	62.4	37.0	506	25.2

STODDARD COUNTY

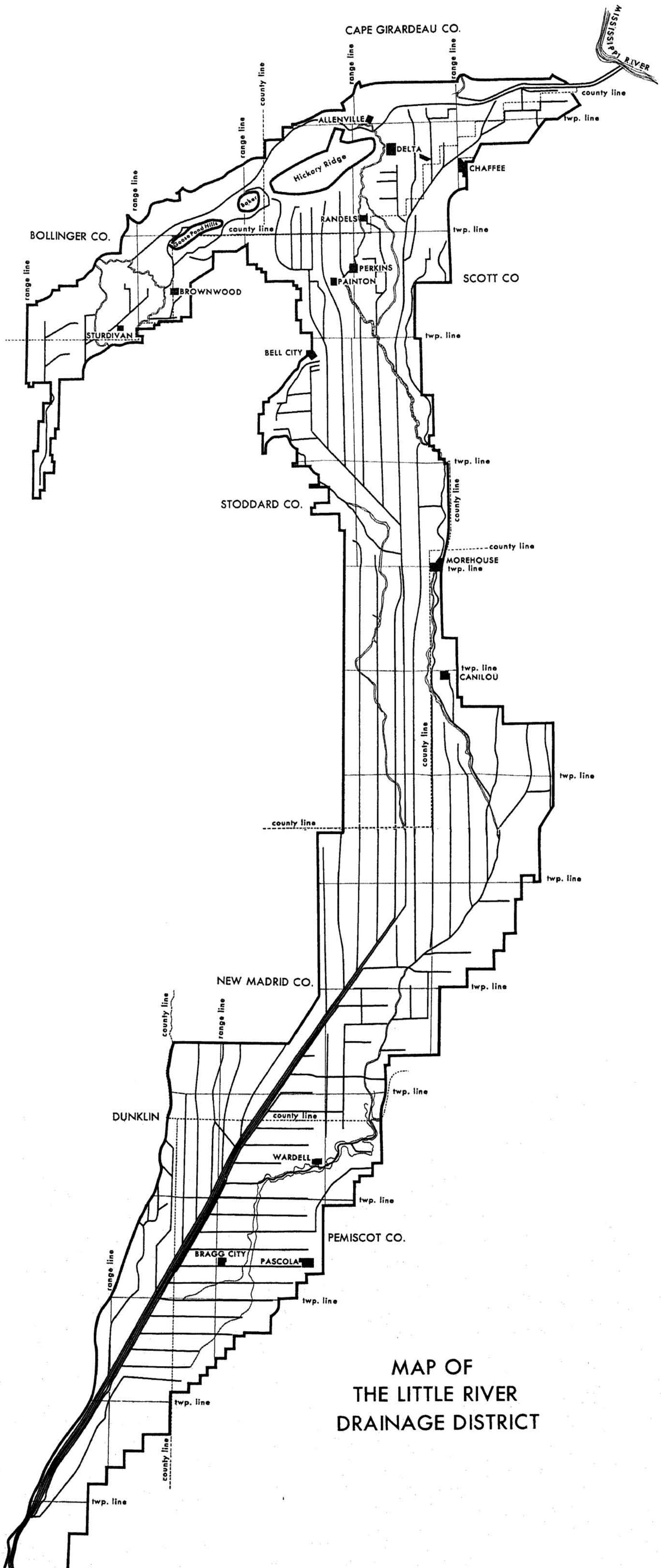
YIELD PER ACRE

Year	Corn	Wheat	Cotton	Soybeans
1950	30.7	12.5	241	22.5
1951	30.7	18.7	214	18.2
1952	25.1	19.7	351	15.9
1953	25.4	12.8	435	10.5
1954	20.5	32.6	564	14.6
1955	39.3	22.6	552	19.0
1956	49.8	37.3	660	23.3
1957	39.6	15.7	269	22.7
1958	55.7	23.3	468	27.4
1959	52.5	32.2	626	22.2
1960	59.4	37.0	565	23.2

DUNKLIN COUNTY

YIELD PER ACRE

Year	Corn	Wheat	Cotton	Soybeans
1950	37.7	16.0	345	25.2
1951	34.2	12.3	361	20.2
1952	17.4	19.1	438	21.1
1953	27.6	25.5	373	12.9
1954	14.3	33.8	443	13.9
1955	30.8	31.0	457	29.9
1956	48.6	39.3	506	17.7
1957	43.3	28.0	261	27.8
1958	52.3	24.3	477	32.6
1959	49.6	28.5	557	21.2
1960	54.4	36.1	529	20.4



MAP OF
THE LITTLE RIVER
DRAINAGE DISTRICT