SOIL SURVEY OF
Midland County, Michigan

United States Department of Agriculture
Soil Conservation Service

HOW TO USE

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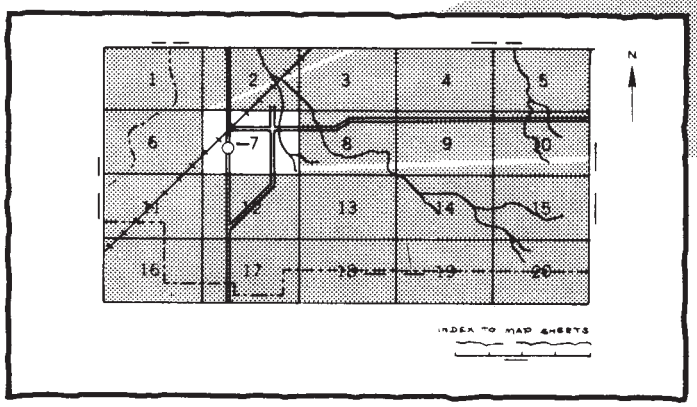

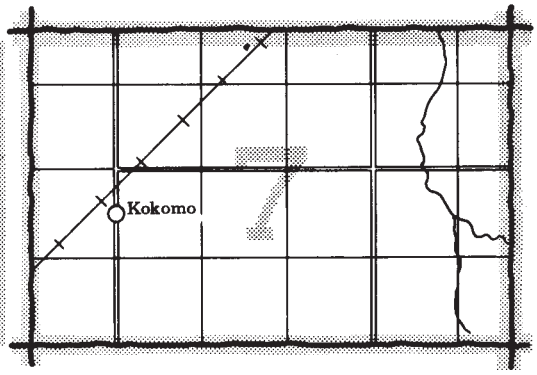

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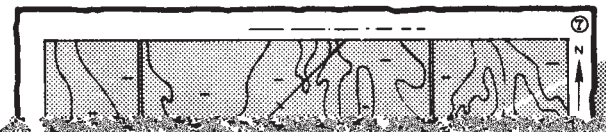

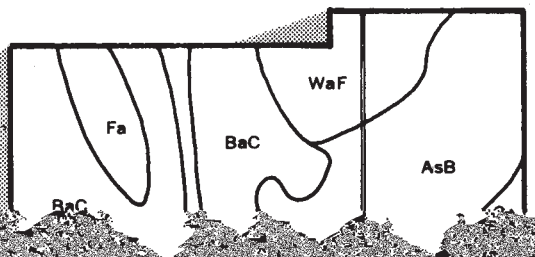

THIS SOIL SURVEY

This is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and agencies of the States, usually the Agricultural Experiment Stations. In some surveys, other Federal and local agencies also contribute. The Soil Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in the period 1971 to 1975. Soil names and descriptions were approved in May 1976. Unless otherwise indicated, statements in the publication refer to conditions in the survey area in 1976. This survey was made by the Soil Conservation Service. It is part of the technical assistance furnished to the Midland Soil Conservation District.

Soil maps in this survey may be copied without permission, but any enlargement of these maps can cause misunderstanding of the detail of mapping and result in erroneous interpretations. Enlarged maps do not show small areas of contrasting soils that could have been shown at a larger mapping scale.

Cover: The open area is part of the Lenawee-Bowers-Wixom map unit. The wooded area is in the Kingsville-Pipestone-Covert map unit. The white strip extending from the center to the lower right is an area of Aquents.

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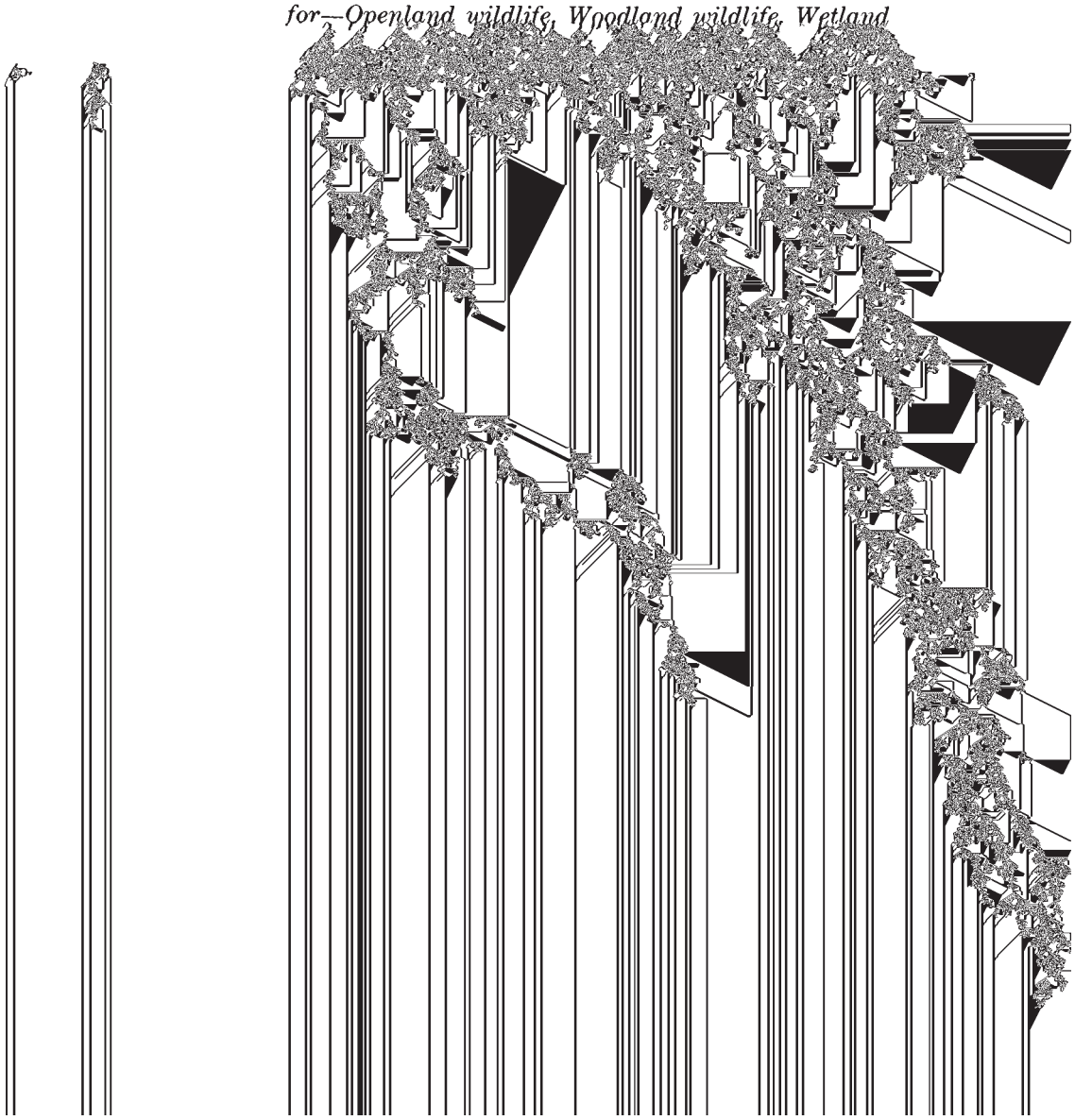
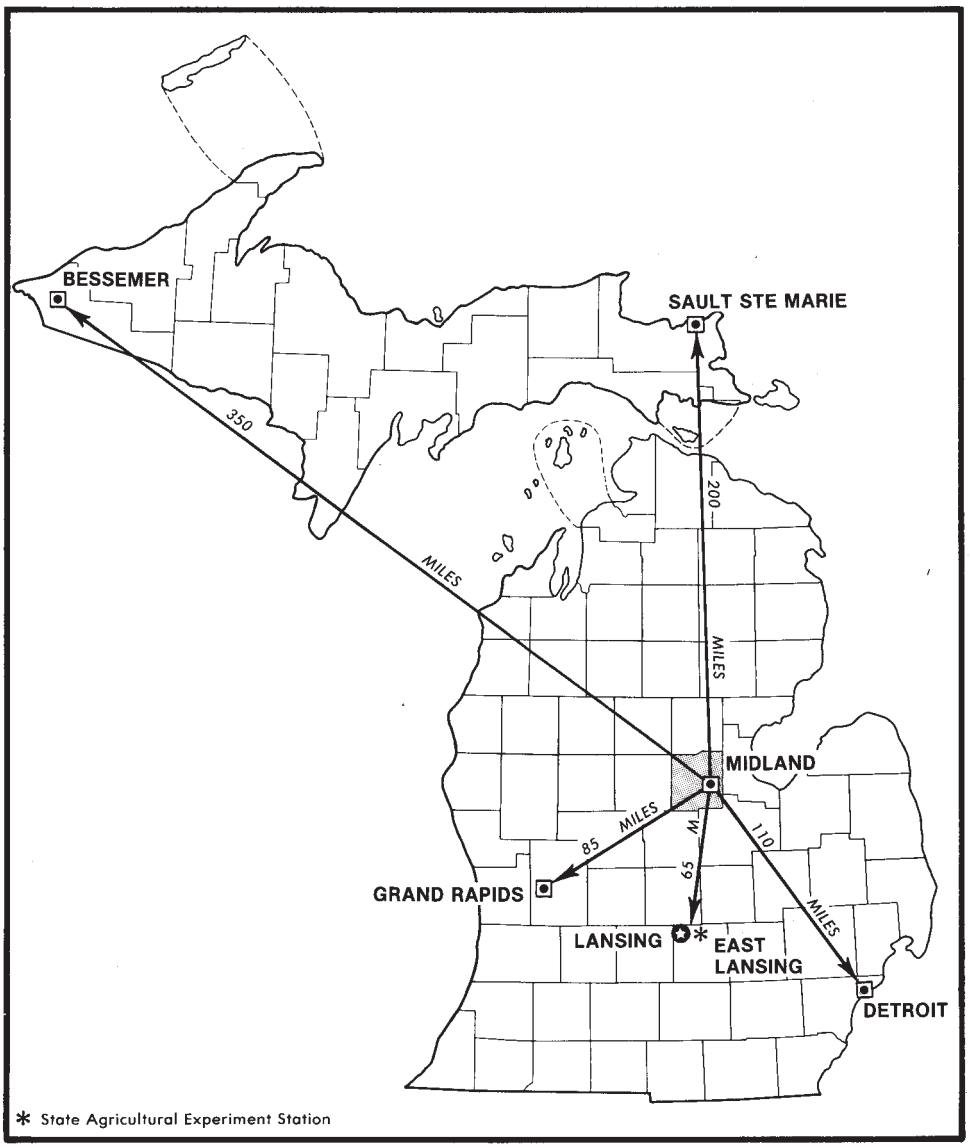


Foreword

The Soil Survey of Midland County, Michigan contains much information useful in any land-planning program. Of prime importance are the predictions of soil behavior for selected land uses. Also highlighted are limitations or



Location of Midland County in Michigan.

SOIL SURVEY OF MIDLAND COUNTY, MICHIGAN

By Dennis E. Hutchison, Soil Conservation Service

Fieldwork by Joseph R. Dumont, James E. Feenstra, Dennis E. Hutchison, Wesley K. Mettert, Ronald W. Olson, and Therman E. Sanders, Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service

MIDLAND COUNTY is in the east-central part of the lower peninsula of Michigan (see facing page). It is

Thunderstorms occur on about 33 days each year, and most occur in June, July, and August.

The areas shown on a soil map are called soil map units. Some map units are made up of one kind of soil, others are made up of two or more kinds of soil, and a few have little or no soil material at all. Map units are discussed in the sections "General soil map for broad land use planning" and "Soil maps for detailed planning."

While a soil survey is in progress, samples of soils are taken as needed for laboratory measurements and for engineering tests. The soils are field tested, and interpretations of their behavior are modified as necessary during the course of the survey. New interpretations are added to meet local needs, mainly through field observations of different kinds of soil in different uses under different levels of management. Also, data are assembled from other sources, such as test results, records, field experience, and information available from state and local specialists. For example, data on crop yields under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it is readily available to different groups of users, among them farmers, managers of rangeland and woodland, engineers, planners, developers and builders, homebuyers, and those seeking recreation.

General soil map for broad land use planning

The general soil map at the back of this publication shows, in color, map units that have a distinct pattern of soils and of relief and drainage. Each map unit is a unique natural landscape. Typically, a map unit consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in

Map unit descriptions

1. Kingsville-Pipestone-Covert

Nearly level and gently sloping, poorly drained to moderately well drained soils that have a sandy subsoil or upper substratum; formed in outwash or glacial lake deposits

Areas of this map unit are old glacial lakebeds, beach ridges, and outwash plains. Some are at the same elevation as the adjacent till plains. Some are higher.

This map unit occupies about 45 percent of the county. About 30 percent of the unit is Kingsville and similar soils, 20 percent is Pipestone and similar soils, 15 percent is Covert and similar soils, and the remaining 35 percent is soils of minor extent.

In most places Kingsville soils are lower in elevation than Pipestone and Covert soils. They are in broad flat areas and drainageways. Generally Pipestone and Covert soils occupy the slightly higher broad flat areas and the narrow convex ridgetops and side slopes. All have rapid permeability, a sandy surface layer, and a seasonal high water table.

Kingsville soils are nearly level and poorly drained. The surface layer is very dark gray loamy fine sand about 6 inches thick. The substratum to a depth of about 60 inches is multicolored fine sand.

Pipestone soils are nearly level or gently sloping and somewhat poorly drained. The surface layer is black and grayish brown sand about 6 inches thick. The subsoil is about 18 inches thick. The upper part is yellowish brown, very friable sand. The lower part and the substratum to a depth of about 60 inches are multicolored loose sand.

Covert soils are nearly level or gently sloping and moderately well drained. The surface layer is black and light brownish gray sand about 5 inches thick. The subsoil is about 23 inches thick. The upper part is dark brown and strong brown, very friable sand. The lower part and the substratum to a depth of about 60 inches are multicolored loose sand.

Minor in this unit are the excessively drained Plainfield soils and the moderately well drained Oakville soils. Oak-

Areas of this map unit are flood plains that are lower than the surrounding land.

This map unit makes up about 1 percent of the county. About 40 percent of the unit is Cohoctah and similar soils, 30 percent is Sloan and similar soils, and the remaining 30 percent is soils of minor extent (fig. 1).

In most places Cohoctah soils are slightly higher in elevation than Sloan soils. They are in nearly level alluvial areas. Generally Sloan soils are in slightly lower areas and drainageways. All have a loamy surface layer and a seasonal high water table. Permeability is moderately rapid in the upper part of Cohoctah soils and very rapid below. It is moderately slow in Sloan soils.

Cohoctah soils are nearly level and poorly drained or very poorly drained. The surface layer is very dark gray fine sandy loam about 10 inches thick. The substratum to a depth of about 60 inches is multicolored fine sandy loam, gravelly sand, and gravelly loamy sand.

Sloan soils are nearly level and very poorly drained. The surface layer is very dark brown loam about 12 inches thick. The dominantly grayish subsoil is about 28 [illegible] have a sandy surface layer and a seasonal high water table.

Belleville soils are nearly level and poorly drained or very poorly drained. The surface layer is black loamy sand about 8 inches thick. The subsurface layer is very dark grayish brown sand about 5 inches thick. The substratum to a depth of about 60 inches is pale brown and grayish brown sand in the upper part and grayish brown silty clay loam in the lower part.

Wixom soils are nearly level or gently sloping and somewhat poorly drained. The surface layer is very dark grayish brown loamy sand about 9 inches thick. The subsurface layer is grayish brown fine sand about 5 inches thick. The mottled subsoil is about 20 inches thick. The upper part is dark yellowish brown, friable fine sand; the next part is pale brown, very friable fine sand; and the lower part is brown, firm sandy clay loam. The substratum to a depth of about 60 inches is reddish brown, firm silty clay loam.

Minor in this unit are the poorly drained and very poorly drained Lenawee soils and the somewhat poorly [illegible]

loamy substratum soils are on the slightly higher broad flat areas, the narrow convex ridgetops, and the side slopes. All have a sandy surface layer and a seasonal high water table. Permeability is rapid over moderately slow or slow.

Wixom soils are nearly level or gently sloping and somewhat poorly drained. The surface layer is very dark grayish brown loamy sand about 9 inches thick. The subsurface layer is grayish brown fine sand about 5 inches thick. The mottled subsoil is about 20 inches thick. The upper part is dark yellowish brown, friable fine sand; the next part is pale brown, very friable fine sand; and the lower part is brown, firm sandy clay loam. The substratum to a depth of about 60 inches is reddish brown, firm silty clay loam.

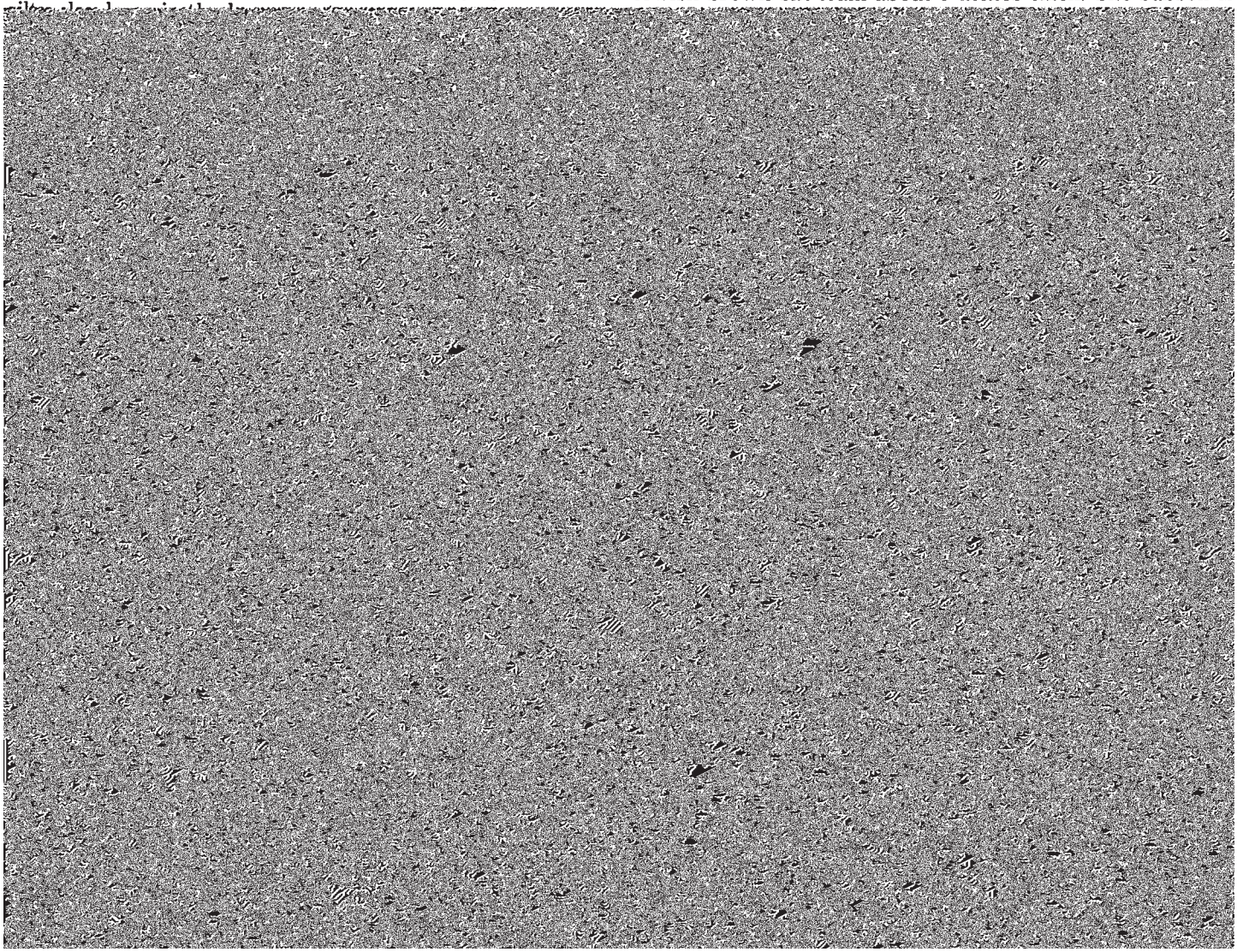
Belleville soils are nearly level and poorly drained or very poorly drained. The surface layer is black loamy sand about 8 inches thick. The subsurface layer is very dark grayish brown sand about 15 inches thick. The substratum to a depth of about 60 inches is pale brown and grayish brown sand in the upper part and grayish brown

20 percent is Bowers and similar soils, 15 percent is Wixom and similar soils, and the remaining 30 percent is soils of minor extent.

In most places Lenawee soils are lower in elevation than Bowers and Wixom soils. They are in broad flat areas and drainageways. Bowers soils are in the slightly higher broad flat areas. Wixom soils occupy the slightly higher flat areas and the low knolls and ridges. All have a seasonal high water table.

Lenawee soils are nearly level and poorly drained and very poorly drained. The surface layer is black, firm silty clay loam about 9 inches thick. The mottled subsoil is about 31 inches thick. The upper part is dark grayish brown, firm silty clay loam; the next part is light brownish gray, firm silty clay; and the lower part is grayish brown, very firm silty clay. The substratum to a depth of about 60 inches is multicolored, very firm, calcareous silty clay.

Bowers soils are nearly level to gently sloping and somewhat poorly drained. The surface layer is dark yellowish brown silt loam about 9 inches thick. The subsoil is



Areas of this map unit are till plains that are lower than surrounding beach ridges and outwash plains.

This map unit occupies about 14 percent of the county. About 40 percent of the unit is Parkhill and similar soils, 25 percent is Londo and similar soils, and the remaining 35 percent is soils of minor extent (fig. 2).

In most places Parkhill soils are lower in elevation than Londo soils. They are in broad low areas, depressions, and drainageways and along the base of ridges. Londo soils are in slightly higher broad flat areas. Both have a loamy surface layer and a seasonal high water table.

Parkhill soils are nearly level and very poorly drained or poorly drained. The surface layer is very dark brown loam about 8 inches thick. The subsoil is grayish brown and gray, friable loam about 17 inches thick. The substratum to a depth of about 60 inches is gray and grayish brown, calcareous loam.

Londo soils are nearly level or gently sloping and somewhat poorly drained. The surface layer is very dark grayish brown loam about 9 inches thick. The mottled, firm subsoil is about 10 inches thick. The upper part is brown and pale brown loam, and the lower part is dark yellowish brown clay loam. The substratum to a depth of about 60 inches is gray, mottled, firm calcareous loam.

Minor in this unit are the poorly drained or very poorly drained Belleville soils and the somewhat poorly drained Poseyville and Wixom soils. Belleville soils are in the same position on the landscape as Parkhill soils but have 20 to 40 inches of sandy material over the loamy material. Poseyville and Wixom soils are slightly higher, on low knolls and ridges, and have 15 to 40 inches of sandy material over the loamy material.

This map unit is used mainly for cultivated crops, but some areas are woodland. Most of the farmland has been drained. Wetness is the main limitation. Soil blowing is a problem in cultivated areas.

If adequately drained, this unit has good potential for cultivated farm crops, pasture, and woodland. Potential is good to fair for wildlife. Wetness is such a severe limitation and so difficult to overcome that the potential is poor for residential and most engineering uses. The potential is poor for recreational development.

7. Ingersoll-Pella

Nearly level and gently sloping, poorly drained and somewhat poorly drained soils that have a loamy subsoil; formed in glaciolacustrine and glaciofluvial deposits

Areas of this map unit are old glacial lakebeds and outwash plains. They are lower than the surrounding beach ridges.

This map unit occupies about 3 percent of the county. About 40 percent of the unit is Ingersoll and similar soils, 30 percent is Pella and similar soils, and the remaining 30 percent is soils of minor extent (fig. 3).

In most places Ingersoll soils are higher in elevation than Pella soils. They are in broad flat areas. Pella soils are in the slightly lower flat areas and drainageways. Both have moderate permeability, a loamy surface layer, and a seasonal high water table.

Ingersoll soils are nearly level or gently sloping and somewhat poorly drained. The surface layer is dark grayish brown silt loam about 9 inches thick. The subsoil is mottled, brown, friable silt loam about 3 inches thick. The substratum to a depth of about 60 inches is multicolored, friable, calcareous, stratified silt loam, very fine sand, and silty clay loam.

Pella soils are nearly level and poorly drained. The surface layer is black silt loam about 12 inches thick. The subsoil is olive gray silt loam and silty clay loam about 8 inches thick. The substratum is about 40 inches thick. The upper part is olive, friable silty clay loam, and the lower part is grayish brown, friable silt and very fine sand.

Minor in this unit are the somewhat poorly drained Poseyville and Wixom soils and the poorly drained or very poorly drained Lenawee soils. Poseyville and Wixom soils have a sandy surface layer and upper subsoil. They occupy landscape positions similar to those of Ingersoll soils. Lenawee soils have a loamy subsoil. They occupy positions similar to those of Pella soils.

This map unit is used mainly for farming, but some areas are woodland or idle grassland. Most of the farmland has been drained. Wetness is the main limitation. Flooding and ponding are common in the low areas.

If adequately drained, this unit has good potential for cultivated farm crops. Wetness is such a severe limitation and so difficult to overcome that the potential is poor for residential and most engineering uses. The potential is poor for recreation, fair for woodland, and good for wildlife.

Broad land use considerations

Deciding what land should be used for urban development is an important issue in the county. Each year a considerable acreage is developed for urban use in Midland Township and in other areas throughout the county. About 20,000 acres, or about 6 percent of the county, is urban or built-up land. The general soil map can help in broad planning, but it should not be used in selecting a site for a specific use.

All map units on the general soil map have severe limitations for most urban uses. No large areas can be developed at low cost. In addition, urban development is costly on the soft, wet, organic soils that are included in many of the map units.

The Cohoctah-Sloan unit is an alluvial area where flooding, ponding, and an almost continuous high water table are very severe problems that are very costly to overcome.

The Kingsville-Pipestone-Covert unit, although poorly suited to development, is the least costly to develop for urban use. The moderately well drained Covert soils and the included moderately well drained and excessively drained Oakville and Plainfield soils have low shrink-swell potential and low frost heave potential.

In some areas the soils have good potential for farming. A soil series commonly is named for a town or geographic

yellowish brown sand. In some places the subsoil contains more clay than is typical. In places both the subsoil and the substratum are stratified with thin bands of loamy material.

Included with this soil in mapping are small areas of somewhat poorly drained loamy soils and poorly drained or very poorly drained Cohoctah soils. These included soils are in shallow depressions and drainageways and near the base of adjacent escarpments. They make up 2 to 15 percent of the unit.

foot. Potential frost action is high. If drained, the soil is subject to blowing.

Most of the acreage is in idle wetland vegetation. The potential is good for wetland wildlife and poor for most other uses.

If adequately drained, this soil is suited to cropland, pasture, or woodland. Tile or open ditch drainage is needed. These depressional areas have very few drainage outlets. An extensive pumping system or ditches or both are needed. If drained, the soil is subject to blowing.

very slow or ponded. The available water capacity is moderate. The surface layer is friable and is easily tilled. crust or puddle after hard rains, especially in areas where the plow layer contains subsoil material.

facilities. It is poor to fair for woodland and poor for engineering uses.

This soil is not suited to cultivated crops because of the hazards of flooding and soil blowing and the wetness. Because flooding is common and prolonged, it is nearly impossible to overcome.

The use of this soil for hay and pasture depends on the degree of flood control and drainage improvement. Selection of wetland plant species, grazing [illegible]

This soil is suited to cropland or pasture but is droughty in summer and is subject to soil blowing. Irrigation is needed. Minimum tillage and a winter cover crop reduce the risk of soil blowing.

This soil is suited to woodland, but the droughtiness causes seedling mortality. Planting drought resistant varieties, mulching, and irrigating lower the mortality rate. Tree seeds, cuttings, and seedlings survive if com-

Most of the acreage is woodland or idle grassland. Potential is poor for cultivated crops, pasture, and wildlife. It is fair for woodland and fair to poor for recreation and most engineering uses.

If adequately drained, this soil is suited to cropland or pasture. It is droughty in summer and is subject to soil blowing. Irrigation is needed. Minimum tillage and a winter cover crop reduce the hazard of soil blowing.

This soil is suited to woodland. Droughtiness causes seedling mortality. Planting drought resistant varieties, mulching, and irrigating can lower the mortality rate. Tree seeds, cuttings, and seedlings survive if competing vegetation is controlled or removed. Site preparation, prescribed burning, or spraying, cutting, or girdling is needed.

This soil is poorly suited to onsite waste disposal, buildings with basements, and lagoons. The seasonal high water table is a severe limitation for onsite waste

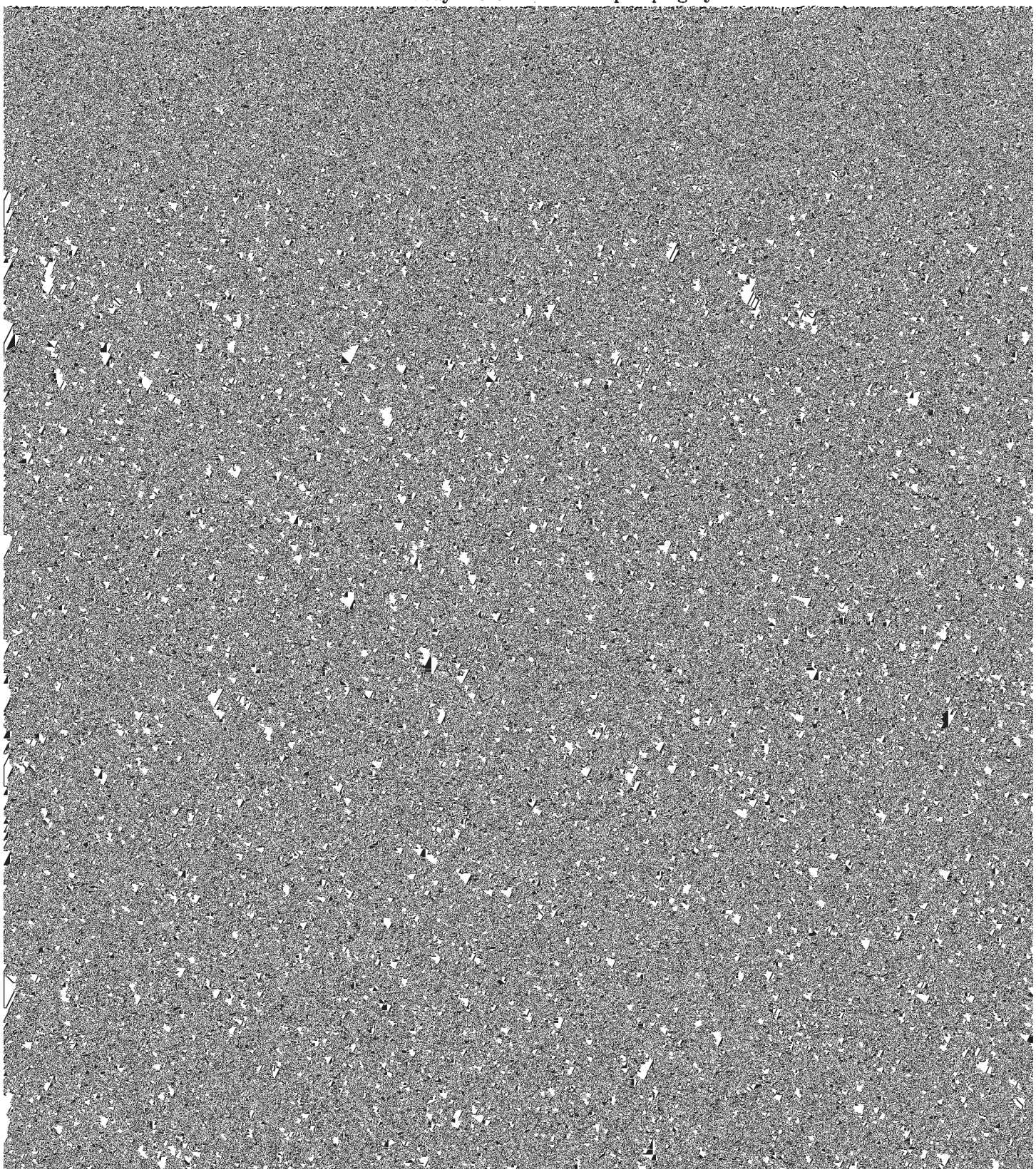
Erosion damage is a hazard if cultivated crops are grown. Minimum tillage, winter cover crops, and grassed waterways reduce the risk of erosion.

Using this soil as pasture is good erosion control. Grazing when the soil is wet causes surface compaction, poor tilth, and excessive runoff. Restricting grazing during wet periods keeps the pasture and the soil in good condition.

This soil is suited to woodland. Equipment should be kept off the site during wet periods. Site preparation should be done in the fall. Tree seeds, cuttings, and seedlings survive and grow well if competing vegetation is controlled or removed. Site preparation, prescribed burning, or spraying, cutting, or girdling is needed.

This soil is poorly suited to onsite waste disposal, building site development, and local roads and streets. The seasonal high water table can cause pollution of ground water supplies because of seepage of effluent from onsite waste disposal systems. Connecting sewage disposal facili-

This soil is suited to grass pasture or hayland. Wetness is the major problem. Ditch and tile drainage help to control the wetness. Livestock should be fenced away from woodland. Artificial drainage is needed. These depressional areas have very few drainage outlets, so that an extensive pumping system or ditches or both are needed.



This soil is poorly suited to onsite sanitary facilities and building site development. Wetness and flooding are severe limitations for septic tank absorption fields,

capacity is moderate in both soils. Surface runoff is very slow or ponded on the Lenawee soil and slow on the Wixom soil. The Lenawee soil has high potential frost ac-

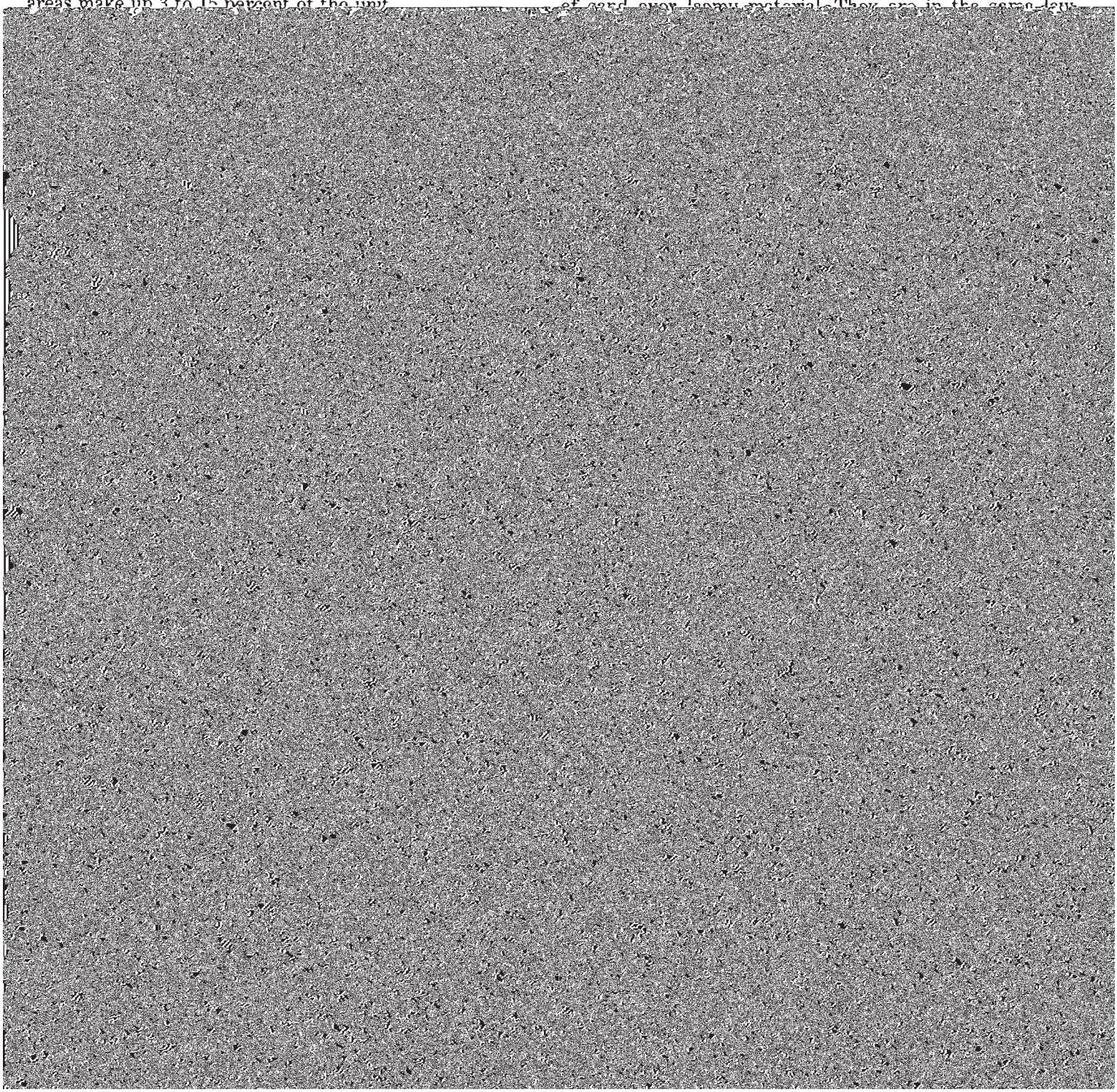
upper subsoil. The Parkhill soil is in shallow depressions and drainageways. These included areas make up 5 to 20 percent of the unit.

Permeability is moderate to moderately slow, and surface runoff is slow. Available water capacity is high. The shrink-swell potential is moderate. The surface layer is

Included with this soil in mapping are small areas of the somewhat poorly drained Wixom soils, the poorly drained Kingsville soils, and the poorly drained or very poorly drained Belleville soils. The Wixom soil is lower on the knolls and broad convex areas. The Kingsville and Belleville soils are in shallow depressions and

precipitated iron, aluminum, and organic matter have accumulated.

Included with this soil in mapping are small areas of the somewhat poorly drained Pipestone soils and poorly drained Kingsville soils. The Pipestone soil is on side slopes and the slightly lower areas of the knolls and ridgetops. The Kingsville soil is in shallow depressions and drainageways of the knolls and ridges. These included areas make up 3 to 15 percent of the unit.



have sandy surface textures or thin sandy bands in the subsoil. In places there is more clay in the substratum than is typical.

Included with this soil in mapping are small areas of the somewhat poorly drained Londo and Poseyville soils. They occupy slightly higher areas or low knolls. Also included are small areas of the poorly drained and very poorly drained Belleville soils, which have 20 to 40 inches of sand over loamy material. They are in the same low

to a depth of 60 inches is grayish brown, friable silt loam and very fine sand.

Included with this soil in mapping are small areas of the somewhat poorly drained Ingersoll, Pipestone, and Wixom soils. Ingersoll soils are in a higher position on the landscape. Pipestone soils are sandy throughout and occupy broad flat areas, low ridges, and side slopes. Wixom soils have 20 to 40 inches of sand over loamy material. They are in flat areas and on low knolls and ridges. These included areas make up 5 to 20 percent of the unit.

Permeability is moderate, and surface runoff is slow to ponded. A seasonal high water table is within a depth of 2 feet. The available water capacity is high. Potential frost action is high.

Most of the acreage is idle grassland or woodland. Potential is good for cultivated crops, hay, and pasture. It is poor for woodland, recreation, and most engineering uses.

This soil is suited to corn, soybeans, and small grain. Wetness and soil blowing are the major problems. Ditch and tile drainage are needed. Field stripcropping, minimum tillage, and winter cover crops help to prevent

places no precipitated iron, aluminum, and organic matter have accumulated.

Included with this soil in mapping are small areas of the Pipestone loamy substratum soils, the moderately well drained Covert soils, and the poorly drained Kingsville and Kinross soils. Pipestone loamy substratum soils have a loamy substratum at a depth of 40 to 60 inches. They occupy the same kind of position on the landscape as the Pipestone soils. Covert soils are on the steeper slopes and in higher positions on the ridges and low knolls of the broad flat areas. Kingsville and Kinross soils are in the shallow depressions and drainageways. These included areas make up 2 to 20 percent of the unit.

This soil has rapid permeability and low available water capacity. Surface runoff is slow or very slow. A seasonal high water table fluctuates between depths of 1/2 foot and 1 1/2 feet.

Most of the acreage is woodland or idle grassland. Potential is fair for woodland. It is poor for cultivated crops, pasture, wildlife, recreation, and most engineering uses.

If adequately drained, this soil is suited to crops or

sand, and the lower part to a depth of about 60 inches is reddish gray, firm clay loam. In some places no precipitated iron, aluminum, and organic matter have accumulated.

Included with this soil in mapping are small areas of the moderately well drained Covert soils, the somewhat poorly drained Wixom soils, and the poorly drained or very poorly drained Belleville soils. Covert soils are steeper and occupy the higher positions on the narrow convex ridgetops. Wixom soils have a loamy substratum at 20 to 40 inches. Some are lower on the side slopes. Some are in the broad, flat areas. Belleville soils are in

The areas of each soil and Urban land were so intricately mixed or so small in size that it was not practical to map them separately.

Typically, the Pipestone soil has a surface layer of black and grayish brown sand about 6 inches thick. The subsoil is about 18 inches thick. The upper part is yellowish brown, mottled, very friable sand. The lower part and the substratum to a depth of about 60 inches are multicolored, loose sand.

Typically, the Oakville soil has a surface layer of very dark grayish brown fine sand about 7 inches thick and a subsurface layer of light brownish gray fine sand about 7

The Pipestone soil is poorly suited to onsite sewage disposal, building site development, and local roads and streets because of wetness. The Oakville soil is suited to dwellings and small commercial buildings without basements and to local roads and streets. All buildings should be constructed with footing drains. When excavations are made, both soils tend to cave. Shoring cutbanks and installing tile drains are needed to overcome the problems of the caving cutbanks and the wetness.

Limitations are severe for picnic areas and playgrounds. Artificial drainage, seeding of bare areas, and irrigation during the dry season are needed to overcome the problems of wetness, excess sand, and droughtiness. Onsite investigation is essential to properly evaluate and plan the development of specific sites.

Not assigned to a capability subclass.

PwB—Plainfield sand, 0 to 6 percent slopes. This nearly level to gently sloping, excessively drained soil is on high ridges, knolls, and flat areas. Individual areas are irregular in shape and range from 2 to 120 acres.

Typically the surface layer is grayish brown [illegible]

ideal planting procedures. There is little or no problem with erosion, equipment limitation, or windthrow.

This soil is suited to recreation uses. The major problem is sandy texture. If exposed, the sand blows, which makes the soil poorly suited to playgrounds. Covering intensively used areas with such material as wood chips and planting drought-tolerant grass species help overcome these problems.

This soil is suited to septic tank absorption fields, but pollution of ground water is a hazard because of the rapid permeability. Limitations for sewage lagoons and sanitary landfill are severe because of seepage into the ground water supply. The soil is too sandy for use as landfill cover. The areas are difficult to reclaim.

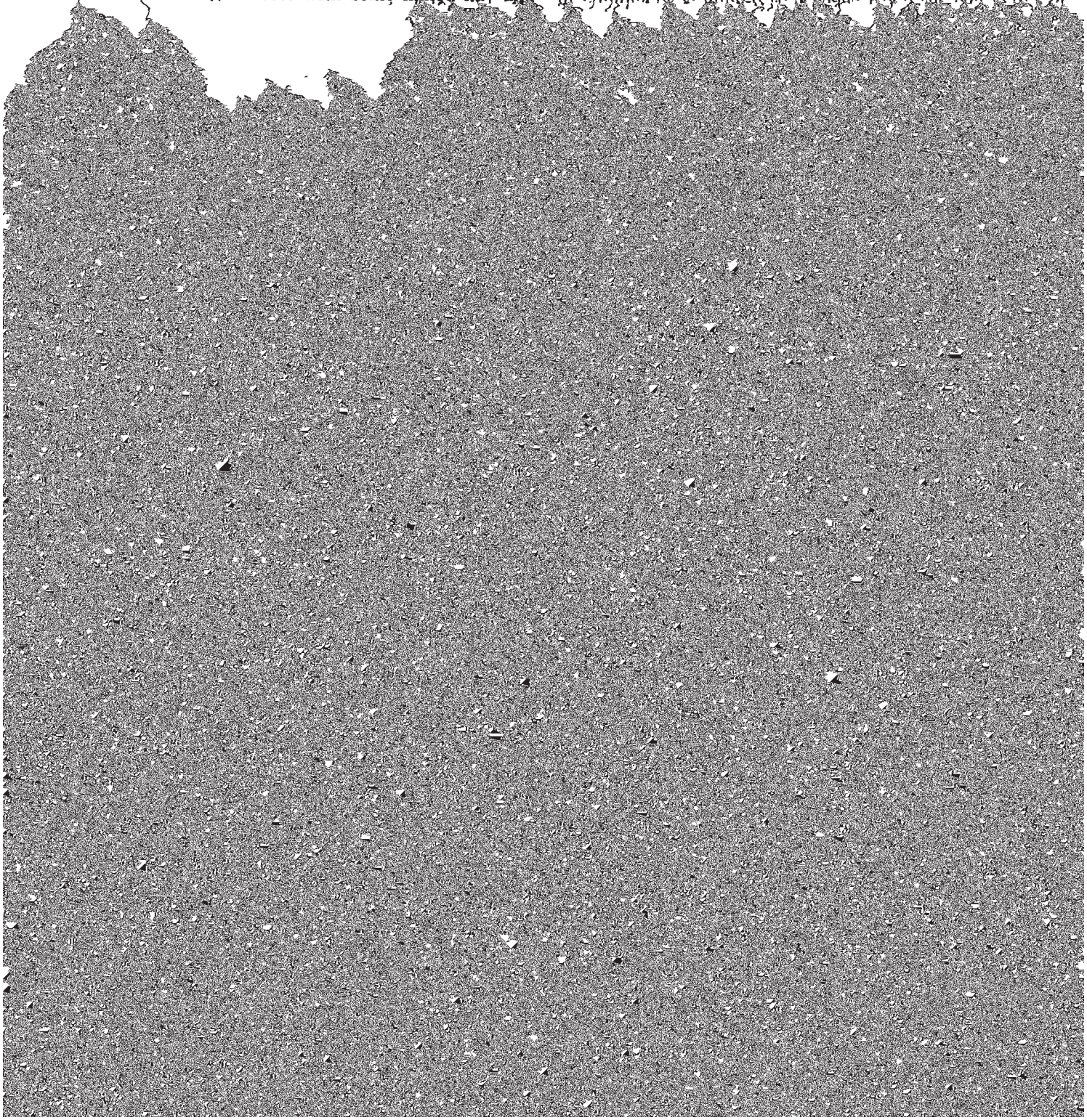
This soil is suited to building site development and local roads and streets. Limitations are slight for most uses. Excavations have severe limitations because of caving. Shoring helps to control this problem. Topsoil and irrigation are needed for lawns.

Capability subclass VIs.

Most of the acreage is cropland. Some areas are woodland. Potential is good for farming and forestry. It is poor for engineering and recreational uses.

This unit is suited to cropland. The major problem in cropland management is the seasonal high water table. Artificial drainage is needed. The main crops are corn, wheat, beans, and sugar beets with some mixed hay and

This soil is suited to trees. It has the potential for high wood yields. Flooding and wetness are the major problems. These problems can be partially overcome by removing obstructions from the natural drainageways. The wetness causes severe equipment limitations, high seedling mortality, and a severe windthrow hazard. Use of equipment is limited to seasons when the soil is dry or



Most of the acreage is idle grassland or woodland. Potential is good to fair for crops, fair for hay and pasture, and poor to fair for woodland. It is poor for recreation and for engineering uses.

This soil is suited to corn, soybeans, and small grain. Wetness and soil blowing are the major problems. Ditch and tile drainage help to control wetness. Field stripcropping, minimum tillage, and winter cover crops help to prevent excessive soil loss. Returning crop residue or regularly adding other organic matter improves fertility and increases the available water capacity.

are the poorly drained and very poorly drained Belleville and Parkhill soils. They are in narrow drainageways and depressions. These included areas make up 10 to 20 percent of the unit.

Permeability is rapid in the sandy material and moderately slow in the loamy material. Surface runoff is slow. Available water capacity is moderate. A perched high water table fluctuates between depths of 1 and 2 feet. The shrink-swell potential is low.

Most of the acreage is farmed. Potential is fair for crops, fair to good for hay and pasture, and good to fair

subsurface layer is about 5 inches of grayish brown fine sand. The mottled subsoil is about 20 inches thick. The upper part is dark yellowish brown, friable fine sand; the next part is pale brown, very friable fine sand; and the lower part is brown, firm sandy clay loam. The substratum to a depth of about 60 inches is reddish brown, firm silty clay loam.

Typically, the Belleville soil has a surface layer of black loamy sand about 8 inches thick. The subsurface layer is very dark grayish brown sand about 5 inches thick. The substratum to a depth of 60 inches is pale brown and grayish brown sand in the upper part and grayish brown silty clay loam in the lower part.

The Urban land part of the unit is covered by streets, parking lots, buildings, and other structures, and no soil identification is possible.

Approximately 75 percent of the natural surface layer of the Wixom and Belleville soils has been disturbed during the construction of buildings and streets. Most of the disturbance has resulted from the spreading of soil material excavated for basements and streets. Most of the fill is less than 18 inches thick over the original soil. In some small depressional areas the fill is thicker. Some high spots have been smoothed.

Included in mapping and making up 15 to 25 percent of the unit are small areas of the somewhat poorly drained Bowers soils and the poorly drained and very poorly drained Lenawee and Parkhill soils. The Bowers soil is in flat or slightly convex areas. It has a loamy surface layer and subsoil. The Lenawee soil is in depressional areas or drainageways and is loamy or clayey throughout. The Parkhill soil is in depressional areas or drainageways and is loamy throughout. In some included soils the substratum is more than 35 percent clay.

Wixom and Belleville soils have rapid permeability in the sandy upper part and moderately slow permeability in the loamy substratum. Surface runoff is slow on the

The Wixom and Belleville soils have severe limitations for sanitary facilities and building site development. The Belleville soil should be protected from flooding. Connecting sewage disposal facilities to a public sewerage system should be considered. Shallow excavations should be drained and shored to help in preventing cutbanks from caving. For dwellings, basements, local roads, and small commercial buildings, drainage and proper fill material are needed to overcome the problems of wetness and low strength. Construction in or on the loamy substratum should include suitable fill material or drainage to overcome the moderate shrink-swell potential. If these soils are to be used for recreation, artificial drainage and watering during dry periods are needed. Onsite investigation is essential to properly evaluate and plan the development of specific sites.

Not assigned to a capability subclass.

Use and management of the soils

The soil survey is a detailed inventory and evaluation of the most basic resource of the survey area—the soil. It is useful in adjusting land use, including urbanization, to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in uses of the land.

While a soil survey is in progress, soil scientists, conservationists, engineers, and others keep extensive notes about the nature of the soils and about unique aspects of behavior of the soils. These notes include data on erosion, drought damage to specific crops, yield estimates, flooding, the functioning of septic tank disposal systems, and other factors affecting the productivity, potential, and limitations of the soils under various uses and management. In this way field experience and measured data on

Contractors can find information about soil wetness and information that is useful in locating sources of sand and gravel, roadfill, and topsoil.

Health officials, highway officials, engineers, and many other specialists also can find useful information in this soil survey. The safe disposal of wastes, for example, is closely related to properties of the soil. Pavements, sidewalks, campsites, playgrounds, lawns, and trees and shrubs are influenced by the nature of the soil.

Crops and pasture

The major management concerns in the use of the soils for crops and pasture are described in this section. In addition, the crops or pasture plants best suited to the soil, including some not commonly grown in the survey area, are discussed; the system of land capability classification used by the Soil Conservation Service is explained (*6*); and the estimated yields of the main crops and hay and pasture plants are presented for each soil.

This section provides information about the overall agricultural potential of the survey area and about the management practices that are needed. The information is useful to equipment dealers, land improvement contractors, fertilizer companies, processing companies, planners, conservationists, and others. For each kind of soil, information about management is presented in the section "Soil maps for detailed planning." Planners of management systems for individual fields or farms should also consider the detailed information given in the description of each soil.

About 68,000 acres in the survey area was used for crops and pasture in 1974, according to Michigan Department of Agriculture statistical data updated by USDA data. Of this total, 6,000 acres was permanent pasture; 47,000 acres row crops; and 8,000 acres rotation hay and pasture. An estimated 10,000 acres was idle cropland.

The soils in Midland County have good potential for increased production of food. About 30,000 acres of potentially good cropland and 80,000 acres of fair to good cropland is currently idle grassland, wild pasture, or low grade woodland. In addition to the reserve productivity represented by this land, food production can be increased considerably by extending the latest crop production technology to all cropland in the county. This soil survey can help in applying such technology.

The acreage in cropland has been gradually decreasing. It was 98,000 acres in 1949 and 72,000 acres in 1972. This trend started in the early 1920's. Most of the decline in acreage is the result of abandonment of less efficient farms. Some cropland was taken for interstate highways, and some was converted to public utilities and industrial and community developments. Future change from cropland to other uses is expected to be very gradual. For

Soil drainage is the major management need on about four-fifths of the acreage used for crops and pasture. About half the acreage of the better cropland soils is poorly drained or very poorly drained. These are the poorly drained Pella soils and the poorly drained or very poorly drained Lenawee (fig. 11), Parkhill, and Wauseon soils. Without artificial drainage, production of the commonly grown crops is generally not possible.

Nearly half the acreage of the better cropland soils is somewhat poorly drained. These are the Bowers, Ingersoll, Londo, Poseyville, and Wixom soils. In most years, artificial drainage is needed.

Of the estimated 80,000 acres of potential cropland, three-fourths is somewhat poorly drained to poorly drained. These are the very poorly drained Adrian soils, the poorly drained Kingsville and Kinross soils, and the somewhat poorly drained Pipestone soils. Artificial drainage is needed for the commonly grown crops.

Tile drainage, ditching, and diking are mechanical measures that can help in improving drainage. In undrained areas, planting short season crops or winter grain is suggested. Planting crop species and varieties that are less subject to damage from wetness or growing wetland perennial hay or pasture species also helps to avoid the problems caused by wetness.

On most of the soils, finding drainage outlets is difficult because of the flat topography. Public drains are often used as drainage outlets. A more extensive public drainage system is needed to bring more cropland into production.

Information on the design, construction, and maintenance of the required drainage systems can be found in the Technical Guide, which is available in local offices of the Soil Conservation Service.

Soil blowing is the major problem on about one-fifth of the actively farmed acreage and on about one-third of the potential cropland. Blowing is a hazard in cropped areas of the Menominee, Poseyville and Wixom soils. It is also a problem on those Adrian, Covert, Oakville, Pipestone, and Plainfield soils that are potential cropland. Soil blowing can damage these soils in a few hours if the winds are strong and the soils are dry and bare of vegetation or surface mulch. Maintaining a plant cover or a surface mulch or leaving the surface rough through proper tillage minimizes the hazard of soil blowing.

Minimum tillage and field stripcropping at right angles to the path of the prevailing winds help in controlling soil blowing. Row crops alternated with hay or close grown crops complement the field stripcropping system. For intensive management on these soils, windbreaks of trees, shrubs, or tall growing grasses are needed to limit damage from soil blowing.

Information on designing a system of wind erosion control for each kind of soil is in the Technical Guide, availa-

in poor stands and lower yields. It decreases infiltration and the amount of available water in the loamy and clayey soils, for example the Bowers, Lenawee, Londo, Parkhill, and Pella soils. Adding organic matter improves tilth and the amount of available water in the sandy over loamy soils, for example, the Menominee, Poseyville, and Wixom soils.

Soil can be improved by increasing the supply of organic matter in the soil and limiting the time that the soil [illegible] and crop management practices were used. Hay and

of an estimated yield indicates that the crop is not suited to or not commonly grown on the soil.

The estimated yields were based mainly on the experience and records of farmers, conservationists, and extension agents. Results of field trials and demonstrations and available yield data from nearby counties were also considered.

The yields were estimated assuming that the latest soil

defined in the following paragraphs. A survey area may not have soils of all classes.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

severe are used to indicate the degree of major soil limitations.

Ratings of the *erosion hazard* indicate the risk of loss of soil in well managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if some measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special

Windbreaks and environmental plantings

Windbreaks are established to protect livestock, buildings, and yards from wind and snow. Windbreaks also help protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broad-leaved and coniferous species provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field, the interval depending on erodibility of the soil. They protect cropland and crops from wind, hold snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. A healthy planting stock of suitable species planted properly on a well prepared site and maintained in good condition can insure a high degree of plant survival.

Table 8 shows the height that locally grown trees and shrubs are expected to reach on various kinds of soil in 20 years. The estimates in table 8, based on measurements and observation of established plantings that have been given adequate care, can be used as a guide in planning windbreaks and screens. Additional information about planning windbreaks and screens and the planting and care of trees can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from a nursery.

Engineering

This section provides information about the use of soils for building sites, sanitary facilities, construction material, and water management. Among those who can benefit from this information are engineers, landowners, community planners, town and city managers, land developers, builders, contractors, and farmers and ranchers.

The ratings in the engineering tables are based on test data and estimated data in the "Soil properties" section. The ratings were determined jointly by soil scientists and engineers of the Soil Conservation Service using known relationships between the soil properties and the behavior of soils in various engineering uses.

Among the soil properties and site conditions identified by a soil survey and used in determining the ratings in this section were grain-size distribution, liquid limit, plasticity index, soil reaction, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure or aggregation, in-place soil density, and geologic origin of the soil material. Where pertinent, data about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of absorbed cations were also considered.

On the basis of information assembled about soil properties, ranges of values can be estimated for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, shear strength, compressibility, slope stability, and other factors of expected soil behavior in engineering uses. As appropriate, these values can be applied to each major horizon of each soil or to the entire profile.

These factors of soil behavior affect construction and maintenance of roads, airport runways, pipelines, foundations for small buildings, ponds and small dams, irrigation projects, drainage systems, sewage and refuse disposal systems, and other engineering works. The ranges of values can be used to (1) select potential residential, commercial, industrial, and recreational uses; (2) make preliminary estimates pertinent to construction in a particular area; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for location of sanitary landfills, onsite sewage disposal systems, and other waste disposal facilities; (5) plan detailed onsite investigations of soils and geology; (6) find sources of gravel, sand, clay, and topsoil; (7) plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; (8) relate performance of structures already built to the properties of the kinds of soil on which they are built so that performance of similar structures on the same or a similar soil in other locations can be predicted; and (9) predict the trafficability of soils for cross-country movement of vehicles and construction equipment.

Data presented in this section are useful for land-use planning and for choosing alternative practices or general designs that will overcome unfavorable soil properties and minimize soil-related failures. Limitations to the use of these data, however, should be well understood. First, the data are generally not presented for soil material below a depth of 5 or 6 feet. Also, because of the scale of the detailed map in this soil survey, small areas of soils that differ from the dominant soil may be included in mapping. Thus, these data do not eliminate the need for onsite investigations, testing, and analysis by personnel having expertise in the specific use contemplated.

The information is presented mainly in tables. Table 9 shows, for each kind of soil, the degree and kind of limitations for building site development; table 10, for sanitary facilities; and table 12, for water management. Table 11 shows the suitability of each kind of soil as a source of construction materials.

The information in the tables, along with the soil map, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations and to construct interpretive maps for specific uses of land.

Some of the terms used in this soil survey have a special meaning in soil science. Many of these terms are defined in the Glossary.

Building site development. The load supporting capacity and the stability of the

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons have a nearly level floor and cut slopes or embankments of compacted soil material. Aerobic lagoons generally are designed to hold sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water. Soils that are very high in content of organic matter and those that have cobbles, stones, or boulders are not suitable. Unless the soil has very slow permeability, contamination of ground water is a hazard where the seasonal high water table is

Where it is necessary to bring in soil material for daily or final cover, thickness of suitable soil material available and depth to a seasonal high water table in soils surrounding the sites should be evaluated. Other factors to be evaluated are those that affect reclamation of the borrow areas. These factors include slope, erodibility, and potential for plant growth.

Construction materials

The suitability of each soil as a source of roadfill, sand, gravel, and topsoil is indicated in table 11 by ratings of good, fair, or poor. The texture, thickness, and organic-

Topsoil is used in areas where vegetation is to be more above the original surface. Ratings in table 12 are

and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils for this use have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains

the soil is used for the designated purpose. A rating of *fair* means that the element of wildlife habitat or kind of habitat can be created, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* means that limitations are severe for the designated element or kind of

ty, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites, exclusive of submerged or floating aquatics. They produce food or cover for wildlife that use wetland as habitat. Major soil properties affecting wetland plants are texture of the surface layer, wetness, reaction, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wildrice, burreed, and cattail and rushes, sedges, and reeds.

Shallow water areas are bodies of water that have an average depth of less than 5 feet and that are useful to wildlife. The [illegible]

the depth of plant roots, determine the pH or reaction of the soil, and identify any free carbonates.

Samples of soil material are analyzed in the laboratory to verify the field estimates of soil properties and to determine all major properties of key soils, especially properties that cannot be estimated accurately by field observation. Laboratory analyses are not conducted for all soil series in the survey area, but laboratory data for many soil series not tested are available from nearby survey areas.

The available field and laboratory data are summarized in tables. The tables give the estimated range of engineering properties, the engineering classifications, and

The *AASHTO* system classifies soils according to those properties that affect their use in highway construction and maintenance. In this system a mineral soil is classified in one of seven basic groups ranging from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines. At the other extreme, in group A-7, are fine-grained soils. Highly organic soils are classified in group A-8 on the basis of visual inspection.

When laboratory data are available, the A-1, A-2, and A-7 groups are further classified as follows: A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, and A-7-6. The estimated classification is given in table 15. Also in table 15 the percentage, by weight, of rock fragments more than 3 inches in diameter is estimated for each major horizon. These estimates are determined mainly by observing volume percentage in the field and then converting that, by formula, to weight percentage.

Percentage of the soil material less than 3 inches in diameter that passes each of four sieves (U.S. standard) is estimated for each major horizon. The estimates are based on tests of soils that were sampled in the survey area and in nearby areas and on field estimates from many borings made during the survey.

Liquid limit and *plasticity index* indicate the effect of

tial of soils for septic tank systems and other waste disposal systems, and in many other aspects of land use and management.

Available water capacity is rated on the basis of soil characteristics that influence the ability of the soil to hold water and make it available to plants. Important characteristics are content of organic matter, soil texture, and soil structure. Shallow-rooted plants are not likely to use the available water from the deeper soil horizons. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design of irrigation systems.

Soil reaction is expressed as a range in pH values. The range in pH of each major horizon is based on many field checks. For many soils, the values have been verified by laboratory analyses. Soil reaction is important in selecting the crops, ornamental plants, or other plants to be grown; in evaluating soil amendments for fertility and stabilization; and in evaluating the corrosivity of soils.

Shrink-swell potential depends mainly on the amount and kind of clay in the soil. Laboratory measurements of the swelling of undisturbed clods were made for many soils. For others the swelling was estimated on the basis of the kind and amount of clay in the soil and on measurements of similar soils. The size of the load and the

2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible, but crops can be grown if intensive measures to control soil blowing are used.

3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible, but crops can be grown if intensive measures to control soil blowing are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible, but crops can be grown if intensive measures to control soil blowing are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible, but crops can be grown if measures to control soil blowing are used.

5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible, but crops can be grown if measures to control soil blowing are used.

6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except soils that have moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clay soils that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding is the temporary covering of soil with water from overflowing streams, with runoff from adjacent slopes, and by tides. Water standing for short periods after rains or after snow melts is not considered flooding, nor is water in swamps and marshes. Flooding is rated in general terms that describe the frequency and duration of flooding and the time of year when flooding is most likely. The ratings are based on evidence in the soil profile of the effects of flooding, namely thin strata of gravel, sand, silt, or, in places, clay deposited by floodwater; irregular decrease in organic-matter content with increasing depth; and absence of distinctive soil horizons that form in soils of the area that are not subject to flooding. The ratings are also based on local information about floodwater

several years as a result of the oxidation or compression of organic material.

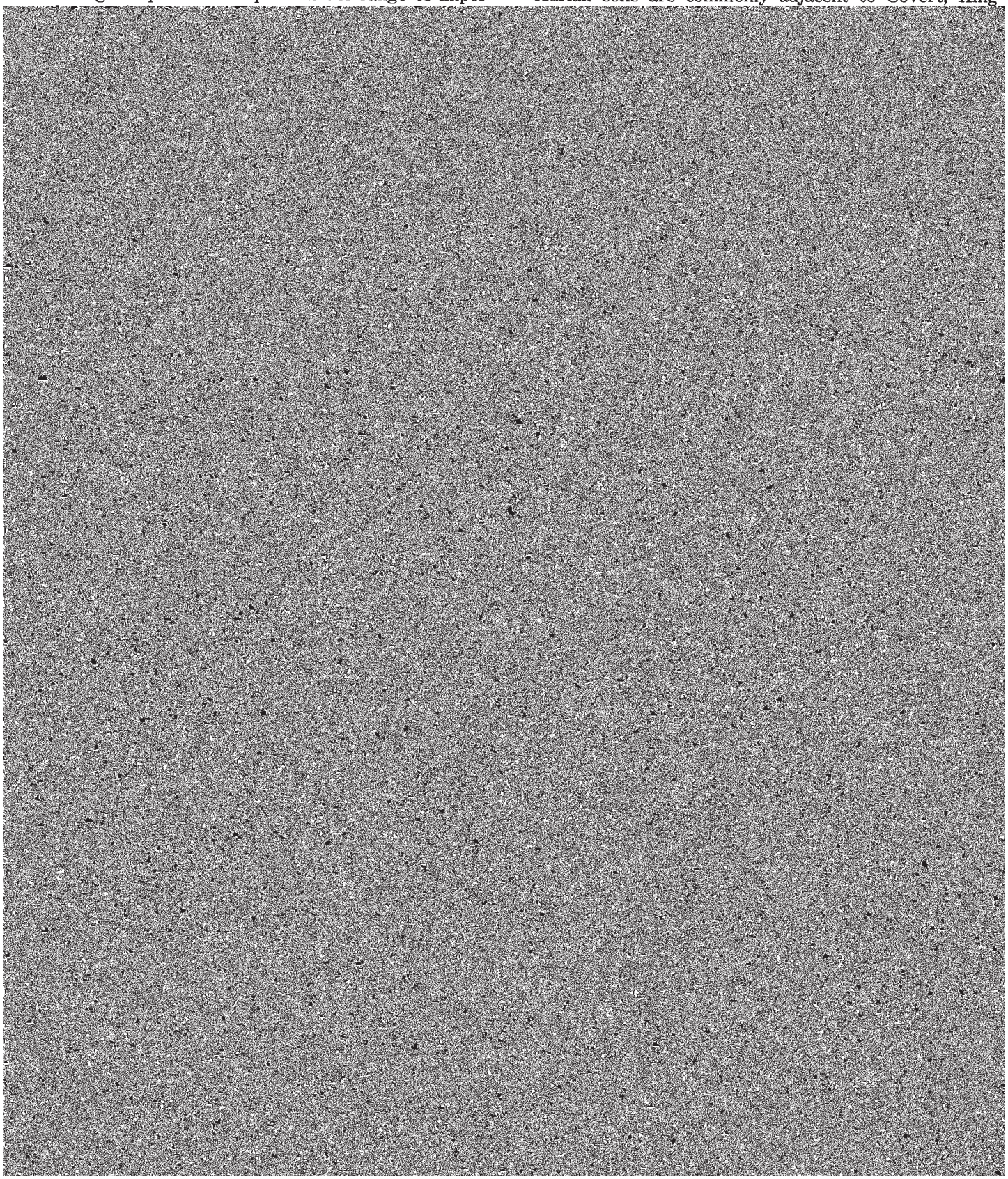
Potential frost action refers to the likelihood of damage to pavements and other structures by frost heaving and low soil strength after thawing. Frost action results from the movement of soil moisture into the freezing temperature zone in the soil, which causes ice lenses to form. Soil texture, temperature, moisture content, porosity, permeability, and content of organic matter are the most important soil properties that affect frost action. It is assumed that the soil is not covered by insulating vegetation or snow and is not artificially drained. Silty and clayey soils

reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquolls (*Aqu*, meaning water, plus *olls*, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of expression of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and a prefix that suggests something about the properties of the soil. An example is Haplaquolls (*Hapl*, meaning simple horizons, plus *aquolls*, the suborder of Mollisols that have

Following the pedon description is the range of impor-

Adrian soils are commonly adjacent to Covert, King-



C1—13 to 24 inches; pale brown (10YR 6/3) sand; single grained; loose; neutral; clear wavy boundary.

C2g—24 to 30 inches; grayish brown (10YR 5/2) sand; single grained; loose; neutral; abrupt smooth boundary.

IICg—30 to 60 inches; grayish brown (10YR 5/2) silty clay loam; common medium prominent yellowish red (5YR 5/6, 5/8) mottles; massive; firm; moderately alkaline.

Depth to the IIC horizon ranges from 20 to 40 inches.

The A11 horizon has value of 2 or 3 and chroma of 1 or 2. The A12 horizon has value of 2 or 3.

The Cg horizon has value of 4 to 6 and chroma of 1 or 2. It is sand or fine sand. In some pedons it is mottled.

The IICg horizon has chroma of 1 or 2. It is dominantly silty clay loam but in places is clay loam and loam.

Bowers series

The Bowers series consists of somewhat poorly drained, moderately slowly permeable soils on lake plains. These soils formed in silty and clayey, calcareous glaciolacustrine deposits. Slopes are 0 to 3 percent. The Bowers soils in this county are taxadjuncts to the Bowers series. They have a slightly warmer temperature than is defined as

C3—55 to 60 inches; brown (10YR 5/3) silt and very fine sand; common medium faint light brownish gray (10YR 6/2) and common medium prominent brownish yellow (10YR 6/8) mottles; single grained; loose; moderately alkaline.

The thickness of the solum ranges from 24 to 36 inches.

The Ap horizon has value of 3 or 4 and chroma of 1 to 4. It is 7 to 11 inches thick. It is dominantly silt loam but in places is loam.

The B2t horizon has chroma of 3 or 4. It is dominantly silty clay but in places is silty clay loam or clay loam and averages more than 35 percent clay.

The C horizon is stratified silty clay, silt loam, silty clay loam, silt, and very fine sand. Reaction is moderately alkaline to neutral. Some pedons have no stratification in the substratum.

Cohoctah series

The Cohoctah series consists of poorly drained and very poorly drained, moderately rapidly permeable over very rapidly permeable soils on flood plains. These soils formed in loamy over sandy alluvium. Slopes are 0 to 2 percent.

Cohoctah soils are commonly adjacent to Abscota and

Covert series

The Covert series consists of moderately well drained, rapidly permeable soils on sandy beach ridges and lake and outwash plains. Slope ranges from 0 to 6 percent.

Covert soils are similar to Oakville soils and are commonly adjacent to Pipestone and Plainfield soils. Oakville soils have a fine sand profile and lack a spodic horizon. Pipestone soils are on foot slopes and in adjacent low areas and are somewhat poorly drained. Plainfield soils

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam; moderate medium granular structure; friable; many fine and medium roots; mildly alkaline; abrupt smooth boundary.

B2t—9 to 12 inches; brown (7.5YR 5/4) silt loam; common medium prominent gray (10YR 5/1) mottles; weak fine angular blocky structure; firm; many fine roots; few dark yellowish brown (10YR 3/4) organic stains; few thin clay films; mildly alkaline; clear wavy boundary.

C1—12 to 15 inches; pale brown (10YR 6/3) silt loam; many medium distinct gray (10YR 5/1) and common medium distinct yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; friable; many fine roots; slight effervescence; moderately alkaline;

C3g—20 to 32 inches; gray (10YR 6/1) fine sand; single grained; loose; neutral; gradual wavy boundary.

C4g—32 to 36 inches; brown (7.5YR 5/2) fine sand; common medium granules yellowish brown (10YR 5/6); and few fine faint gray

The A1 horizon has value of 2 or 3 and chroma of 1 or 2. It is dominantly mucky sand but in places is sand.

The B2ir horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 2 to 6. Some pedons have faint or distinct mottling. Some

Londo series

The Londo series consists of somewhat poorly drained, moderately permeable or moderately slowly permeable soils. These soils formed in loamy, calcareous till on till plains. Slopes are 0 to 3 percent.

Londo soils are commonly adjacent to Parkhill, Poseyville, and Wixom soils. Parkhill soils are in shallow depressions and drainageways and are poorly drained or layer more than 40 inches thick. They are in shallow depressions and drainageways and are poorly drained. Wixom soils are on foot slopes of low knolls and are somewhat poorly drained.

Typical pedon of Menominee sand, 2 to 6 percent slopes, 700 feet east and 900 feet south of northwest corner sec. 1, T. 16 N., R. 1 W.

Ap—0 to 6 inches; very dark grayish brown (10YR 3/2) sand, light brownish gray (10YR 6/2) dry; single grained; loose; many fine

A2—7 to 14 inches; light brownish gray (10YR 6/2) fine sand; single grained; loose; few roots; slightly acid; clear wavy boundary.

B21—14 to 20 inches; dark brown (7.5YR 4/4) fine sand; single grained; loose; neutral; abrupt wavy boundary.

Pella series

The Pella series consists of poorly drained, moderately

Typical pedon of Pipestone sand, 0 to 3 percent slopes, 1,300 feet north and 200 feet west of southeast corner

A1—0 to 4 inches; very dark brown (10YR 2/2) sand, dark grayish brown (10YR 4/2) dry; weak fine granular structure; very friable;

The Ap horizon has value of 2 or 3 and chroma of 1 or 2. It is domi- difference, however, does not alter the use or behavior

B2ir—14 to 22 inches; dark yellowish brown (10YR 4/4) fine sand; few fine distinct yellowish brown (10YR 5/6 and 5/8) mottles; weak fine subangular blocky structure; friable; common fine roots; slightly acid; gradual wavy boundary.

A'2—22 to 29 inches; pale brown (10YR 6/3) fine sand; common medium distinct yellowish brown (10YR 5/6) and light gray (10YR 7/1) mottles; weak medium subangular blocky structure; very friable; few fine roots; slightly acid; abrupt wavy boundary.

IIB'2t—29 to 34 inches; brown (7.5YR 4/4) sandy clay loam; few fine faint pinkish gray (7.5YR 6/2) and common medium distinct strong brown (7.5YR 5/6 and 5/8) mottles; moderate medium angular blocky structure; firm; few fine roots; neutral; abrupt smooth boundary.

IIC—34 to 60 inches; reddish brown (5YR 4/4) silty clay loam; common medium distinct yellowish red (5YR 5/6 and 5/8) and light reddish brown (5YR 6/4) mottles; massive; firm; slight effervescence; moderately alkaline.

The thickness of the solum ranges from 24 to 45 inches, and the depth to the IIB2't horizon ranges from 23 to 40 inches. The sandy part of the solum ranges from strongly acid to neutral.

The Ap horizon is 7 to 11 inches thick. It has value of 3 or 4 and chroma of 1 or 2. The A2 horizon has value of 5 to 7 and chroma of 1 or 2. The A horizon is dominantly loamy sand but in places is fine sand or sand.

The B2 horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6. It is dominantly fine sand but in places is loamy sand or sand. Some pedons have a B1, B3, or Bh horizon. In places the B horizon is 5 to 15 percent ortstein by volume. The A'2 horizon has value of 5 or 6 and chroma of 2 to 4. It is fine sand or sand. The IIB'2t horizon has hue of 7.5YR, 10YR, and 5YR; value of 4 or 5; and chroma of 2 to 4. The texture is dominantly sandy clay loam but in places is silty clay loam, loam, or clay loam. Reaction is neutral to mildly alkaline.

The IIC horizon has hue of 5YR, 7.5YR, and 10YR; value of 4 to 6; and chroma of 1 to 4. The texture is dominantly silty clay loam but in places is clay loam or loam. Reaction is moderately alkaline to mildly alkaline. Some pedons have strata of silty clay or clay.

Formation of the soils

The following paragraphs describe the factors of soil formation and relate them to the formation of soils in Midland County. They also explain the processes of soil formation.

Factors of soil formation

Soil forms through the interaction of five major factors: (1) the physical, chemical, and mineral composition of the parent material; (2) the climate under which the soil material has accumulated and existed since accumulation; (3) the plant and animal life on and in the soil; (4) the relief, or lay of the land; and (5) the length of time the processes of soil formation have acted on the parent material (*3*).

Climate and plant and animal life are the active forces in soil formation. They slowly change the parent material into a natural body of soil that has genetically related layers, called horizons. The effects of climate and plant and animal life are conditioned by relief. The nature of the parent material also affects the kind of soil profile that is formed and, in extreme cases, determines it almost entirely. Finally, time is needed for changing the parent material into a soil profile. It may be a long or a short time, but some time is required for differentiation of soil horizons. Generally, a long time is needed for the development of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made about the effect of any one factor unless conditions are specified for the other four. Many of the processes of soil formation are unknown.

Parent material

Parent material is the unconsolidated mass from which a soil forms. The parent materials of the soils of Midland County were deposited by glaciers or by melt water from the glaciers. Some of these materials were subsequently reworked and redeposited by water and wind. Parent material determines the limits of the chemical and mineralogical composition of the soil. Although the parent materials are of common glacial origin, their properties vary greatly, sometimes within small areas, depending on how the materials were deposited. The dominant parent materials in Midland County were deposited as outwash material, lacustrine materials, alluvium, glacial till, and organic material.

Outwash material is deposited by running water from melting glaciers. The size of the particles that make up outwash material varies according to the speed of the stream that carried them. When the water slows down, the coarser particles are deposited. Finer particles, such as very fine sand, silt, and clay, can be carried by slowly moving water. Outwash deposits generally consist of layers of particles of similar size, such as sand, gravel, and other coarse particles. The Covert soils, for example, formed in deposits of outwash material.

Lacustrine material is deposited from still, or ponded, glacial melt water. Because the coarser fragments drop out of moving water as outwash, only the finer particles, such as very fine sand, silt, and clay, remain to settle out in still water. In Midland County, soils formed in lacustrine deposits are typically medium textured and moderately fine textured. Pella soils, for example, formed in lacustrine material.

Alluvium is deposited by floodwaters of present streams in recent time. The texture of this material depends on the speed of the water from which it was deposited. The alluvium deposited along a swift stream is coarser textured than that deposited along a slow, sluggish stream. Cohoctah and Sloan soils, for example, are alluvial soils.

Glacial till is material laid down directly by glaciers with a minimum of water action. It is a mixture of particles of different sizes. The small pebbles in glacial till have sharp corners, indicating that they have not been worn by water washing. The glacial till is loam, silt loam, silty clay loam, clay loam, silty clay, or clay. Parkhill soils, for example, formed in glacial till. Typically they are medium textured and have well developed structure.

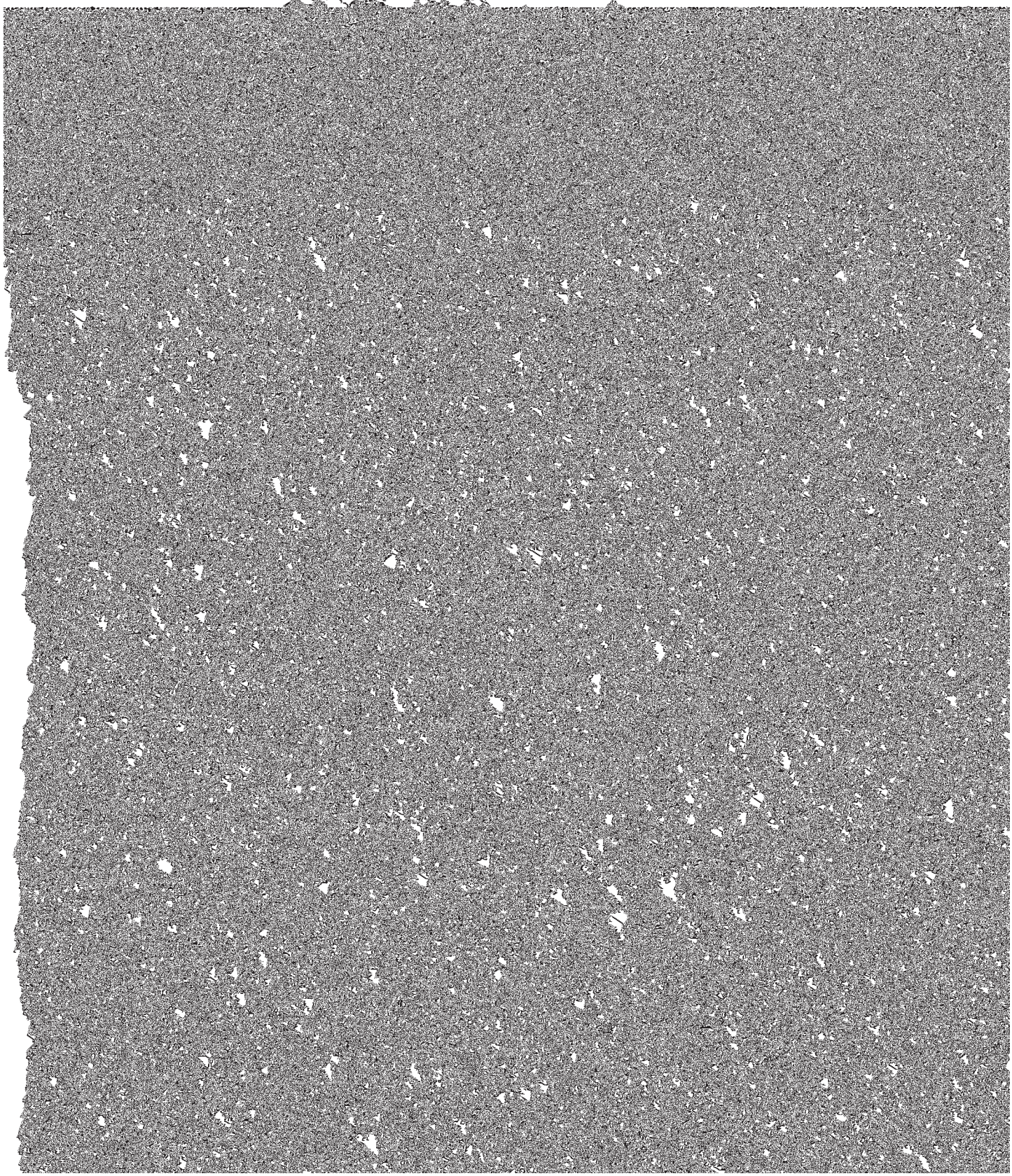
Organic material is a deposit of plant remains. After the glaciers withdrew from the area, water was left standing in depressions in outwash plains, lake plains, and till plains. As the grasses and sedges growing around the edges of these lakes died, the plant remains did not decompose but remained around the edges of the lakes. Later, water-tolerant trees grew on the areas. As these trees died, their residue became a part of the organic accumulation. In this way, the lakes were eventually filled

plant cover, and soil temperature. Slopes range from 0 to 6 percent. There are a few very steep escarpments. Natural soil drainage ranges from excessively drained on the ridgetops to very poorly drained in the depressions.

Relief influences the formation of soils by affecting runoff and drainage. Drainage in turn, through its effect on aeration of the soil, determines the color of the soil. In low areas, water is temporarily ponded. Water and air

Leaching of carbonates and other bases has occurred in most of the soils. Soil scientists generally agree that

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are



Climax vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse fragments. Mineral or rock particles up to 3 inches (2 millimeters to 7.5 centimeters) in diameter.

Coarse textured (light textured) soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures is difficult.

Complex, soil. A map unit of two or more kinds of soil occurring in such an intricate pattern that they cannot be shown separately on a

season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically for long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Fine textured (heavy textured) soil. Sandy clay, silty clay, and clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flooding. The temporary covering of soil with water from overflowing streams, runoff from adjacent slopes, and tides. Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; *November-May*, for example, means that flooding can occur during the period November through May. Water standing for short periods after rainfall or commonly covering swamps and marshes is not considered flooding.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forage. Plant material used as feed by domestic animals. Forage can be grazed or cut for hay.

Forb. Any herbaceous plant not a grass or a sedge.

Frost action. Freezing and thawing of soil moisture. Frost action can damage structures and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also the assorted and unassorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by melt water as it flows from glacial ice.

ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Habitat. The natural abode of a plant or animal; refers to the kind of environment in which a plant or animal normally lives, as opposed to the range or geographical distribution.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. The major horizons of mineral soil are as follows:

O horizon.—An organic layer, fresh and decaying plant residue, at the surface of a mineral soil.

A horizon.—The mineral horizon, formed or forming at or near the surface, in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon most of which was originally part of a B horizon.

A2 horizon.—A mineral horizon, mainly a residual concentration of sand and silt high in content of resistant minerals as a result of the loss of silicate clay, iron, aluminum, or a combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or a combination of these; (2) by prismatic or blocky structure; (3) by redder or browner colors than those in the A horizon; or (4) by a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that from which the

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Large stones. Rock fragments 10 inches (25 centimeters) or more across. Large stones adversely affect the specified use.

Leaching. The removal of soluble material from soil or other material by percolating water.

Light textured soil. Sand and loamy sand.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. Inadequate strength for supporting loads.

Outwash, glacial. Stratified sand and gravel produced by glaciers and carried, sorted, and deposited by water that originated mainly from the melting of glacial ice. Glacial outwash is commonly in valleys on landforms known as valley trains, outwash terraces, eskers, kame terraces, kames, outwash fans, or deltas.

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

Pan. A compact, dense layer in a soil. A pan impedes the movement of water and the growth of roots. The word "pan" is commonly combined with other words that more explicitly indicate the nature of the layer; for example, *hardpan*, *fragipan*, *claypan*, *plowpan*, and *traffic pan*.

Parent material. The great variety of unconsolidated organic and mineral material in which soil forms. Consolidated bedrock is not yet parent material by this concept.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly. The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality that enables the soil to transmit water or air,

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock. Soil scientists regard as soil only the part of the regolith that is modified by organisms and other soil-building forces. Most engineers describe the whole regolith, even to a great depth, as "soil."

Relief. The elevations or inequalities of a land surface, considered collectively.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth. Shallow root zone. The soil is shallow over a layer that greatly restricts roots. See Root zone.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slow intake. The slow movement of water into the soil.

Slow refill. The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones. Rock fragments 3 to 10 inches (7.5 to 25 centimeters) in diameter. Small stones adversely affect the specified use.

Soil. A natural, three-dimensional body at the earth's surface that is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows: *very coarse sand* (2.0 millimeters to 1.0 millimeter); *coarse sand* (1.0 to 0.5 millimeter); *medium sand* (0.5 to 0.25 millimeter); *fine sand* (0.25 to 0.10 millimeter); *very fine sand* (0.10 to 0.05 millimeter); *silt* (0.05 to 0.002 millimeter); and *clay* (less than 0.002 millimeter).

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in mature soil consists of the A and B horizons. Generally, the characteristics of

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea. A stream terrace is frequently called a second bottom, in contrast with a flood plain, and is seldom subject to overflow. A marine terrace, generally wide, was deposited by the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt, silt loam, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer. Otherwise suitable soil material too thin for the specified use.

Till plain. An extensive flat to undulating area underlain by glacial till.

Tilth, soil. The condition of the soil, especially the soil structure, as related to the growth of plants. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil (engineering). Presumably a fertile soil or soil material, or one that responds to fertilization, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

Trace elements. The chemical elements in soils, in only extremely small amounts, essential to plant growth. Examples are zinc, cobalt, manganese, copper, and iron.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Unstable fill. Risk of caving or sloughing in banks of fill material.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but the limited geographic soil area does not justify creation of a new series.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve. A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within 1 year; specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by melt water streams, in a glacial lake or other body of still water in front of a glacier.

Water table. The upper limit of the soil or underlying rock material that is wholly saturated with water.

Water table, apparent. A thick zone of free water in the soil. An apparent water table is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil.

Water table, artesian. A water table under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole.

Water table, perched. A water table standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to a soil or soil material consisting of particles well distributed over a wide range in size or diameter. Such a soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Illustrations

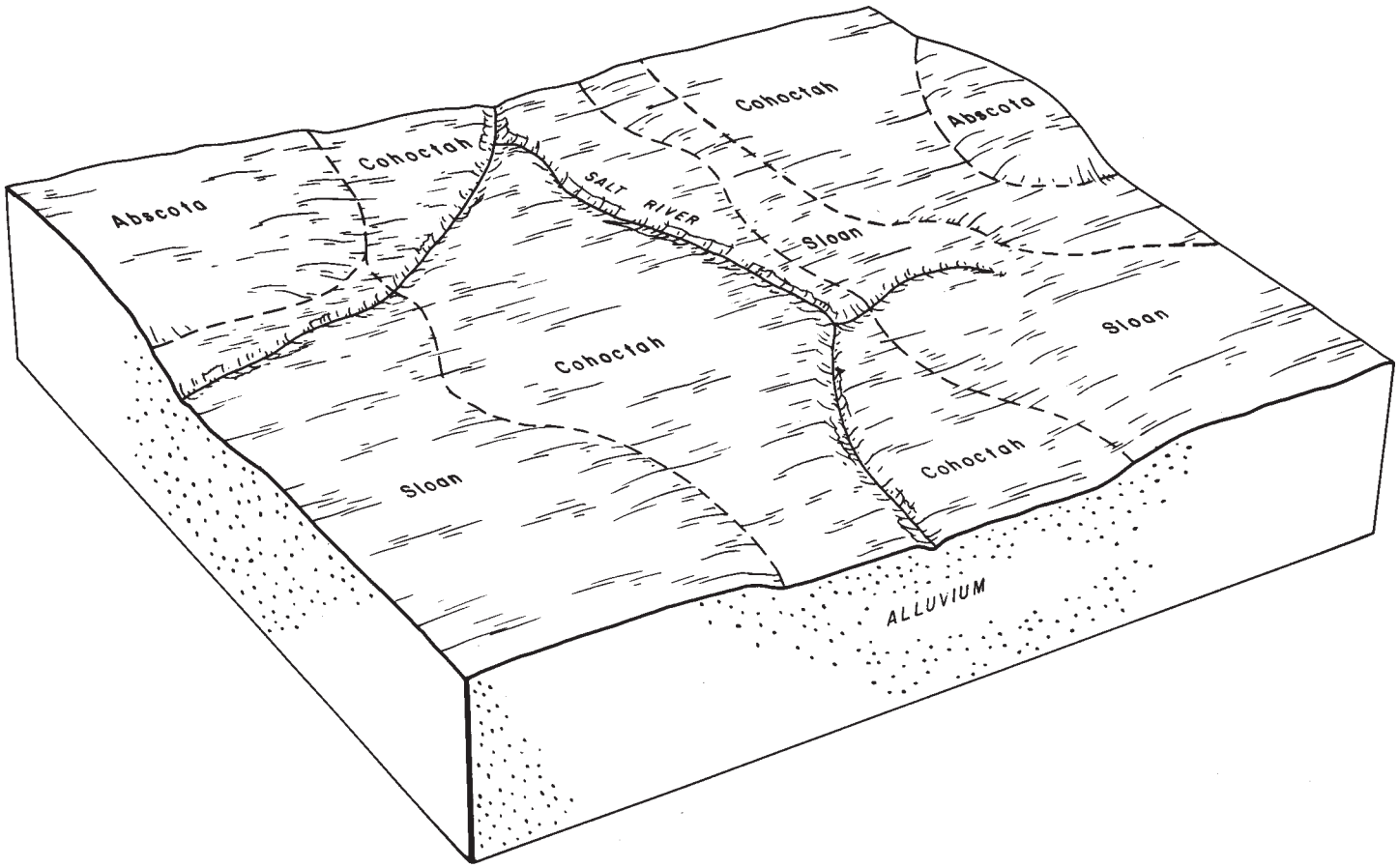


Figure 1.—Pattern of soils and underlying material in the Cohoctah-Sloan map unit.

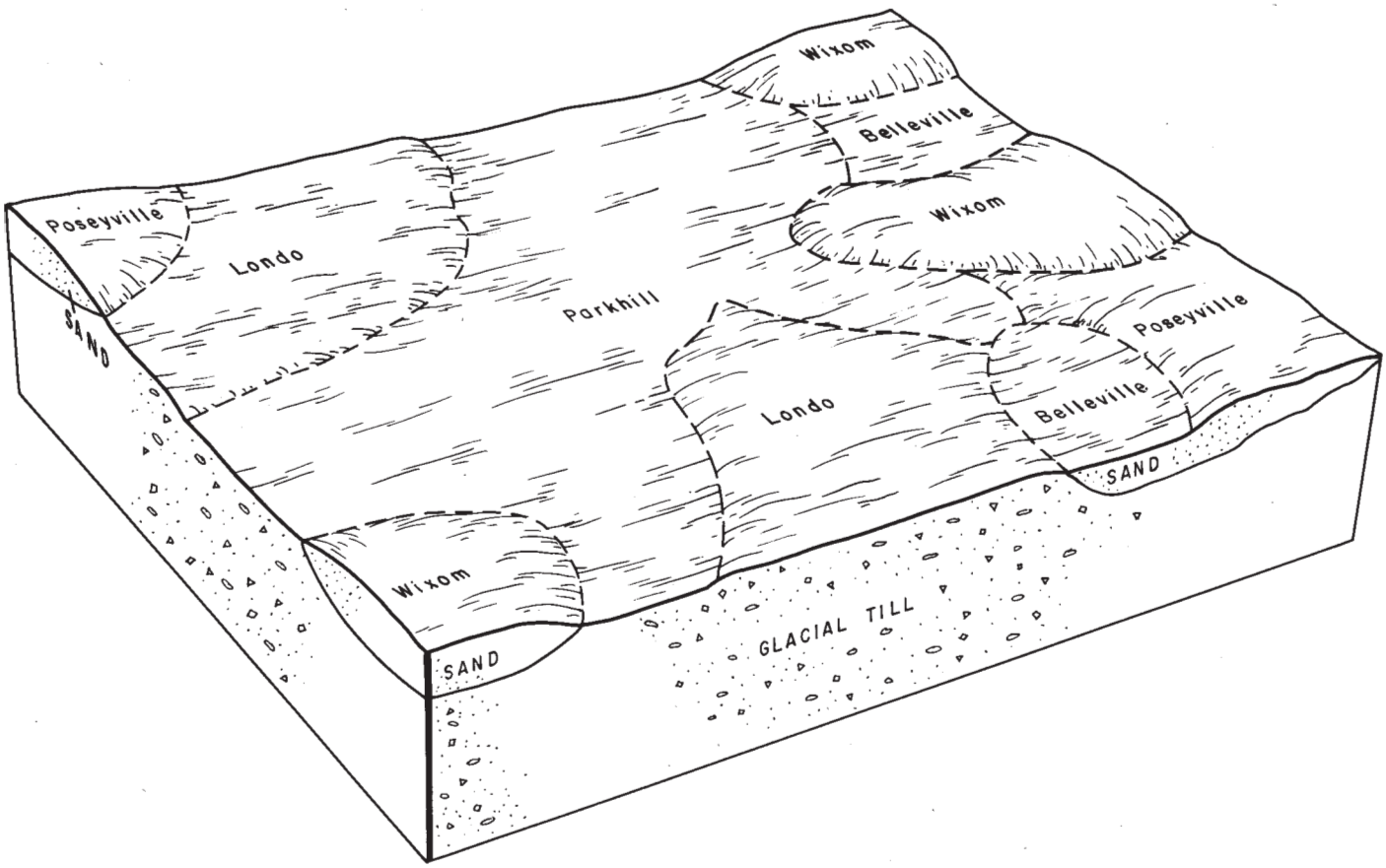


Figure 2.—Pattern of soils and underlying material in the Parkhill-Londo map unit.

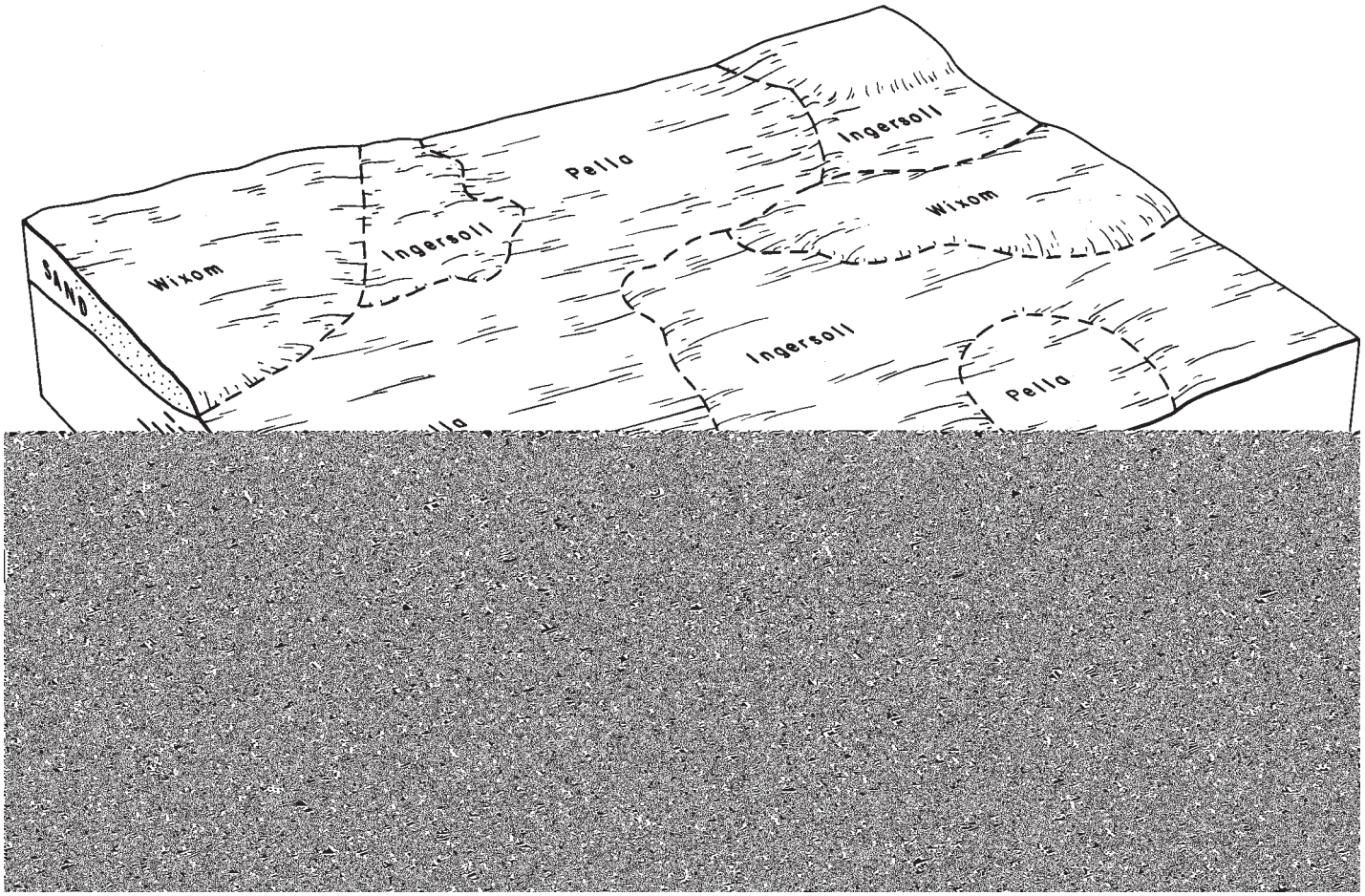

Wixom
Ingersoll
Pella
Ingersoll
Wixom
SAND
Ingersoll
Pella

Figure 4.—An area of the Lenawee-Bowers-Wixom map unit. These drained areas are used extensively for crops. The dark areas are Lenawee soils, and the light areas are Wixom soils.

Figure 5.—Typical woodland of birch, aspen, hemlock, and maple in an area of the Wixom-Belleville-Pipestone map unit.

Figure 6.—A recreation area on the Kingsville-Pipestone-Covert map unit. The soil is too wet for community development.

Figure 7.—Open drainage ditch in an area of Kingsville soils. Clogging of the drains by vegetation is a serious problem.

Figure 8.—Ponded area of Kingsville loamy fine sand. This poorly drained soil is poorly suited to community development.

Figure 9.—Soybeans on Londo loam, 0 to 3 percent slopes. Tile and open ditches drain the area.

Figure 10.—Tile-drained area of Wixom loamy sand, 0 to 3 percent slopes. Most tile drains outlet into open ditches. This open ditch is overgrown with trees, a common problem.

Figure 11.—Drained area of Lenawee-Wixom complex, 0 to 4 percent slopes. If drained, these soils are well suited to crops. The dark areas are Lenawee soils, and the light areas are Wixom soils.

Figure 12.—A ridge of Oakville fine sand, 0 to 6 percent slopes. Pine, oak, and fern, the typical vegetation, are along a sand road. These ridges are commonly used as borrow areas and left idle.

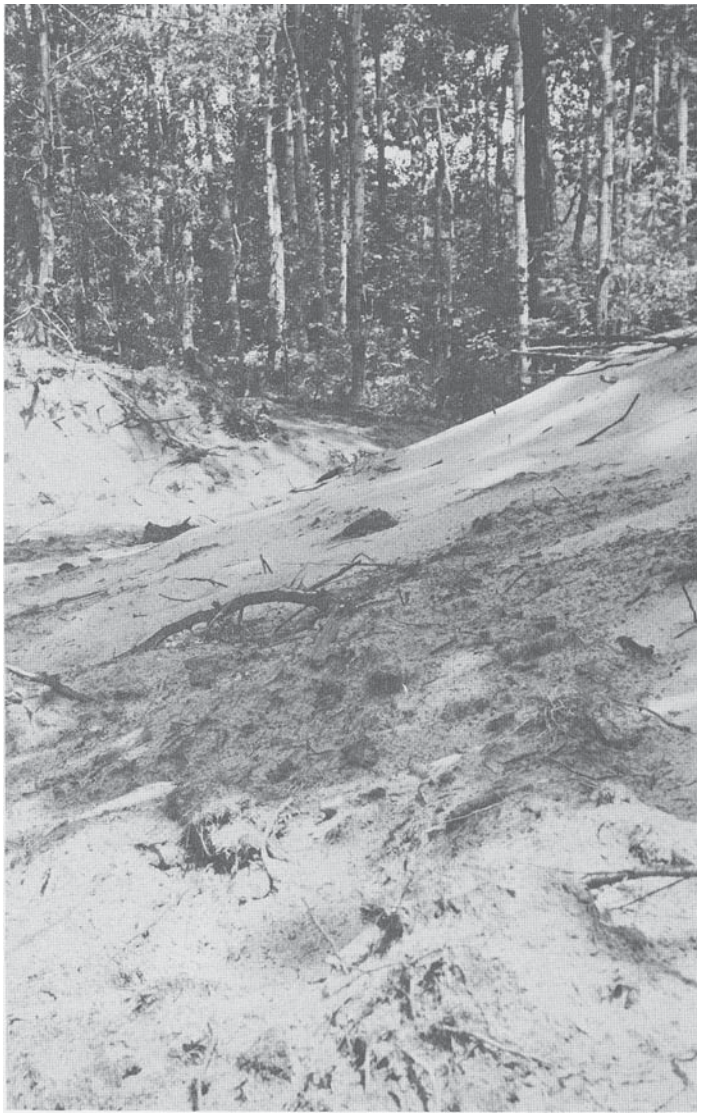


Figure 13.—Borrow area on a ridge of Covert sand, 0 to 6 percent slopes. Once the vegetation is removed, stabilizing and revegetating the

Figure 14.—An area of Cohoctah soils. Using the flood plain for a playground was a wise decision. Homes or businesses would have

Figure 15.—An area of Adrian muck. This soil is well suited to ponds and wetland wildlife.

Figure 16.—An area of Pipestone sand. This soil has a high water table. Microrelief is small knolls and depressions.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION DATA

Month	Temperature[1]						Precipitation[1]				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[2]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	30.4	16.0	23.2	53	-11	0	1.64	0.9	2.3	5	9.5
February---	32.1	16.2	24.1	50	-10	0	1.51	0.7	2.2	4	8.7
March------	41.0	24.4	32.7	70	0	10	2.14	1.3	2.9	6	6.9
April------	56.5	36.0	46.2	81	17	73	2.83	1.8	3.7	7	1.5
May--------	68.5	45.9	57.2	88	28	259	2.64	1.5	3.7	6	T[3]
June-------	78.8	56.2	67.5	96	38	533	3.00	1.7	4.2	6	0
July-------	82.7	60.2	71.4	94	44	672	2.67	1.3	3.9	5	0
August-----	80.8	58.6	69.7	95	43	619	3.07	1.4	4.5	6	0
September--	72.8	51.3	62.1	92	31	376	2.82	1.7	3.8	6	T[3]
October----	62.9	42.4	52.6	84	23	162	2.47	1.0	3.7	5	0.3
November---	46.5	32.1	39.3	70	9	18	2.27	1.6	2.9	6	3.2
December---	34.4	21.4	27.9	60	-4	0	2.21	1.1	3.2	5	8.0
Year-----	57.3	38.4	47.8	97	-12	2,716	29.28	25.6	32.9	67	38.2

[1]Recorded in the period 1946-75 at Midland.
[2]A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50° F).
[3]Trace.

TABLE 2.--FREEZE DATES IN SPRING AND FALL

Probability	Temperature[1]		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	April 21	May 8	May 26
2 years in 10 later than--	April 17	May 3	May 19
5 years in 10 later than--	April 9	April 24	May 8
First freezing temperature in fall:			
1 year in 10 earlier than--	October 20	October 6	September 22
2 years in 10 earlier than--	October 25	October 13	September 26
5 years in 10 earlier than--	November 6	October 24	October 6

[1]Recorded in the period 1930-74 at Midland.

TABLE 3.--GROWING SEASON LENGTH

Probability	Daily minimum temperature during growing season[1]		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	187	160	128
8 years in 10	196	168	136
5 years in 10	211	182	150
2 years in 10	227	197	165
1 year in 10	234	204	172

[1]Recorded in the period 1930-74 at Midland.

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
AbB	Abscota loamy sand, 0 to 6 percent slopes	815	0.3
Ad	Adrian muck	2,340	0.7
AeB	Aquents	2,370	0.7
Be	Belleville loamy sand	29,625	8.9
BoB	Bowers silt loam, 0 to 3 percent slopes	7,790	2.3
Ch	Cohoctah fine sandy loam, gravelly substratum	7,130	2.1
CoB	Covert sand, 0 to 6 percent slopes	25,275	7.6
CsB	Covert sand, loamy substratum, 0 to 6 percent slopes	3,720	1.1
InB	Ingersoll silt loam, 0 to 3 percent slopes	6,645	2.0
Kg	Kingsville loamy fine sand	50,760	15.3
Kn	Kinross mucky sand	6,980	2.1
Le	Lenawee silty clay loam	17,860	5.4
LrB	Lenawee-Wixom complex, 0 to 4 percent slopes	1,660	0.5
LxA	Londo loam, 0 to 3 percent slopes	7,735	2.3
MeB	Menominee sand, 2 to 6 percent slopes	1,580	0.5
OaB	Oakville fine sand, 0 to 6 percent slopes	7,085	2.1
Pa	Parkhill loam	19,195	5.8
Pe	Pella silt loam	4,115	1.2
PsB	Pipestone sand, 0 to 3 percent slopes	49,290	14.8
PtB	Pipestone sand, loamy substratum, 0 to 3 percent slopes	17,420	5.2
PuB	Pipestone-Oakville-Urban land complex, 0 to 6 percent slopes	3,730	1.1
PwB	Plainfield sand, 0 to 6 percent slopes	3,315	1.0
PxB	Poseyville-Londo complex, 0 to 4 percent slopes	5,395	1.6
Sz	Sloan loam	2,950	0.9
Ur	Urban land	4,660	1.4
Wa	Wauseon sandy loam	1,755	0.5
WxB	Wixom loamy sand, 0 to 3 percent slopes	35,820	10.8
WzB	Wixom-Belleville-Urban land complex, 0 to 3 percent slopes	2,530	0.8
	Water	3,255	1.0
	Total	332,800	100.0

TABLE 5.--YIELDS PER ACRE OF CROPS

[All yields were estimated for a high level of management in 1977. Absence of a yield figure indicates the crop is seldom grown or is not suited]

Soil name and map symbol	Corn	Corn silage	Winter wheat	Oats	Soybeans	Grass-legume hay	Sugar beets
	Bu	Ton	Bu	Bu	Bu	Ton	Ton
AbB---------- Abscota	70	13	28	60	---	3.0	---
Ad. Adrian							
AeB*. Aquents							
Be---------- Belleville	80	13	38	60	33	2.7	17
BoB---------- Bowers	95	18	50	90	40	4.0	20
Ch---------- Cohoctah	---	---	---	---	---	3.0	---
CoB---------- Covert	50	10	20	30	---	2.0	---
CsB---------- Covert	65	11	30	55	---	2.8	---
InB---------- Ingersoll	115	20	60	100	40	4.5	20
Kg---------- Kingsville	75	12	30	70	30	3.0	---
Kn---------- Kinross	---	---	---	---	---	---	---
Le---------- Lenawee	105	17	48	75	38	3.0	20
LrB---------- Lenawee	101	17	47	77	36	3.4	20
LxA---------- Londo	115	18	60	100	45	5.0	20
MeB---------- Menominee	85	15	42	70	30	3.5	---
OaB---------- Oakville	60	12	30	55	20	2.5	---
Pa---------- Parkhill	120	17	55	80	40	4.2	23
Pe---------- Pella	116	18	55	90	40	4.5	23
PsB---------- Pipestone	60	12	30	60	25	3.0	13
PtB---------- Pipestone	80	14	35	65	25	3.5	14
PuB---------- Pipestone	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS--Continued

Soil name and map symbol	Corn	Corn silage	Winter wheat	Oats	Soybeans	Grass-legume hay	Sugar beets
	Bu	Ton	Bu	Bu	Bu	Ton	Ton
PwB---------- Plainfield	40	6	20	25	---	1.5	---
PxB---------- Poseyville	103	17	52	92	38	4.3	19
Sz---------- Sloan	120	---	45	---	42	5.0	---
Ur*. Urban land							
Wa---------- Wauseon	100	16	40	70	30	4.0	18
WxB---------- Wixom	95	16	45	80	35	3.8	15
WzB---------- Wixom	---	---	---	---	---	---	---

* See map unit description for the composition and behavior of the map unit.

TABLE 6.--CAPABILITY CLASSES AND SUBCLASSES

[Miscellaneous areas excluded. Absence of an entry means no acreage]

Class	Total acreage	Major management concerns (Subclass)			
		Erosion (e)	Wetness (w)	Soil problem (s)	Climate (c)
		Acres	Acres	Acres	Acres
I	---	---	---	---	---
II	70,395	---	70,395	---	---
III	86,200	---	84,620	1,580	---
IV	136,945	---	100,050	36,895	---
V	12,420	---	12,420	---	---
VI	10,295	---	6,980	3,315	---
VII	---	---	---	---	---
VIII	---	---	---	---	---

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry means the information was not available]

Soil name and map symbol	Management concerns					Potential productivity		Trees to plant
	Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index	
AhB	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Management concerns					Potential productivity		Trees to plant
	Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index	
Le---------- Lenawee	Slight	Severe	Severe	Moderate	Severe	Red maple----------	51	White spruce,
						White ash----------	51	Norway spruce,
						American basswood---	51	eastern white pine,
						Silver maple--------	78	northern white-cedar.
LrB*:								
Lenawee----------	Slight	Severe	Severe	Moderate	Severe	Red maple----------	51	White spruce,
						White ash----------	51	Norway spruce,
						American basswood---	51	eastern white pine,
						Silver maple--------	78	northern white-cedar.
Wixom----------	Slight	Moderate	Severe	Slight	Slight	Quaking aspen-------	56	Eastern white pine,
						American beech------	---	Norway spruce,
						White oak----------	51	black cherry,
						Red maple----------	51	Austrian pine,

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Management concerns					Potential productivity		Trees to plant
	Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index	
PtB---------- Pipestone	Slight	Moderate	Moderate	Slight	Slight	Northern red oak----	61	White spruce,
						White ash----------	61	eastern cottonwood,
						Shagbark hickory----	---	eastern white pine,
						Red maple----------	61	Norway spruce,
						American basswood---	61	white ash,
						Black ash----------	---	red maple,
						Pin oak----------	61	American basswood.
						Eastern cottonwood--	96	
PuB*:								
Pipestone---------	Slight	Moderate	Severe	Slight	Slight	Quaking aspen-------	56	White spruce,
						Bigtooth aspen------	56	eastern cottonwood,
						Eastern cottonwood--	86	eastern white pine,
						Northern red oak----	51	Norway spruce,
						Shagbark hickory----	---	black spruce,
						White ash----------	51	Austrian pine,
						Sugar maple---------	50	northern red oak,
						Swamp white oak-----	51	white ash.
Oakville----------	Slight	Slight	Severe	Slight	Moderate	Northern red oak----	66	Red pine,
						White oak----------	61	eastern white pine,
						Red pine----------	58	jack pine,
						Quaking aspen-------	66	Norway spruce,
						Black oak----------	---	black walnut,
						Sugar maple---------	58	black cherry.
						Black cherry--------	---	
						White ash----------	61	

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Management concerns					Potential productivity		Trees to plant
	Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index	
WxB---------- Wixom	Slight	Moderate	Severe	Slight	Slight	Quaking aspen------- American beech------ White oak---------- Red maple---------- Sugar maple--------- Black cherry-------- American basswood---	66 --- 61 61 58 --- 61	Eastern white pine, Norway spruce, black cherry, Austrian pine, red maple, silver maple, Austrian pine, northern white-cedar.
WzB*:								
Wixom----------	Slight	Moderate	Severe	Slight	Slight	Quaking aspen------- American beech------ White oak---------- Red maple---------- Sugar maple--------- Black cherry-------- American basswood---	66 --- 61 61 58 --- 61	Eastern white pine, Norway spruce, black cherry, Austrian pine.
Belleville--------	Slight	Severe	Moderate	Moderate	Severe	Quaking aspen------- Red maple---------- Tamarack---------- Pin oak---------- Black ash----------	44 40 35 40 40	Black spruce.
Urban land.								

* See map unit description for the composition and behavior of the map unit.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

[The symbol < means less than; the symbol > means greater than. Absence of an entry means that trees of the height class do not normally grow on this soil]

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--			
	8-15	16-25	26-35	>35
AbB---------- Abscota	Tatarian honeysuckle, white spruce, autumn-olive, Amur privet, lilac.	Black spruce, northern white-cedar, American mountainash.	Eastern white pine, red pine, Scotch pine, green ash, jack pine.	Carolina poplar.
Ad---------- Adrian	Silky dogwood, American cranberry-bush, white spruce.	Austrian pine, eastern white pine, tamarack.	Northern white-cedar, Scotch pine, Norway spruce, green ash.	Carolina poplar.
AeB*. Aquents				
Be---------- Belleville	Silky dogwood, hawthorn, white spruce, Amur privet, arrowwood.	Black spruce, northern white-cedar, eastern white pine, Norway spruce, tamarack.	---	Carolina poplar.
BoB---------- Bowers	White spruce, silky dogwood, blue spruce, Amur privet.	Northern white-cedar, black spruce, European larch, eastern white pine.	Red pine, Norway spruce.	Carolina poplar, white ash, green ash.
Ch---------- Cohoctah	Silky dogwood, hawthorn, white spruce, arrowwood.	Northern white-cedar, black spruce, eastern white pine, Norway	---	Carolina poplar.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--			
	8-15	16-25	26-35	>35
LxA---------- Londo	White spruce, Amur privet, American cranberrybush, blue spruce, silky dogwood.	Northern white-cedar, black spruce, Austrian pine, European larch, tamarack, eastern white pine.	Norway spruce, red pine.	Carolina poplar, green ash, white ash.
MeB---------- Menominee	Arrowwood, lilac, white spruce, blue spruce, staghorn sumac.	Red pine, jack pine, Scotch pine, northern pin oak.	---	Red maple, Carolina poplar.
OaB---------- Oakville	Tatarian honeysuckle, autumn-olive, lilac.	Black spruce, northern white-cedar, American mountainash.	Eastern white pine, jack pine, Scotch pine.	Carolina poplar, yellow-poplar.
Pa---------- Parkhill	Amur privet, arrowwood, hawthorn, Siberian crabapple, silky dogwood, white spruce.	Northern white-cedar, eastern white pine, Norway spruce, tamarack.	---	Carolina poplar.
Pe---------- Pella	Silky dogwood, Amur privet, hawthorn, white spruce.	Northern white-cedar, Norway spruce, eastern white pine, tamarack.	---	Carolina poplar.
PsB---------- Pipestone	Blue spruce, American cranberrybush, late lilac, silky dogwood, white spruce.	Austrian pine, eastern white pine, European larch, northern white-cedar.	Norway spruce, red pine.	Green ash, Carolina poplar, white ash.
PtB---------- Pipestone	White spruce, American cranberrybush, blue spruce, silky dogwood.	Austrian pine, northern white-cedar, eastern white pine.	Norway spruce, red pine.	Green ash, Carolina poplar, white ash.
PuB*:				
Pipestone---------	Blue spruce, American cranberrybush, late lilac, white spruce, silky dogwood.	Austrian pine, eastern white pine, northern white-cedar.	Norway spruce, red pine.	Green ash, Carolina poplar, white ash.
Oakville---------	Tatarian honeysuckle, autumn-olive, lilac.	Black spruce, American mountainash, northern white-cedar.	Eastern white pine, jack pine, Scotch pine.	Carolina poplar, yellow-poplar.
Urban land.				
PwB---------- Plainfield	Lilac, Tatarian honeysuckle, autumn-olive.	Norway spruce, Siberian crabapple.	Eastern white pine, red pine, jack pine, Scotch pine.	Carolina poplar.
PxB*:				
Poseyville--------	American cranberrybush, blue spruce, Tatarian honeysuckle.	Austrian pine, northern white-cedar, eastern white pine, European larch.	Norway spruce, red pine.	White ash, Carolina poplar, green ash.
Londo----------	White spruce, Amur privet, American cranberrybush, blue spruce, silky dogwood.	Northern white-cedar, black spruce, Austrian pine, European larch, tamarack, Siberian crabapple, eastern white pine.	Norway spruce, red pine.	Carolina poplar, green ash, white ash.

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--			
	8-15	16-25	26-35	>35
Sz---------- Sloan	Amur privet, hawthorn, silky dogwood, white spruce, arrowwood.	Northern white-cedar, eastern white pine, Norway spruce, tamarack.	---	Carolina poplar.
Ur*. Urban land				
Wa---------- Wauseon	Silky dogwood, hawthorn, Douglas-fir, European larch.	Eastern white pine, Norway spruce, tamarack.	---	Carolina poplar.
WxB---------- Wixom	Silky dogwood, white spruce, arrowwood, Amur privet, hawthorn.	Eastern white pine, Austrian pine, northern white-cedar, Norway spruce, tamarack.	Norway spruce, red pine.	Carolina poplar, green ash, white ash.
WzB*:				
Wixom----------	Silky dogwood, white spruce, blue spruce, American cranberry-bush.	Eastern white pine, Austrian pine, northern white-cedar.	Norway spruce, red pine.	Green ash, Carolina poplar, white ash.
Belleville--------	Silky dogwood, hawthorn, white spruce, Amur privet, arrowwood.	Black spruce, northern white-cedar, eastern white pine, Norway spruce, tamarack.	---	Carolina poplar.
Urban land.				

* See map unit description for the composition and behavior of the map unit.

TABLE 9.--BUILDING SITE DEVELOPMENT

[Some of the terms used in this table to describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry means soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basaments	Small commercial buildings	Local roads and streets
AbB---------- Abscota	Severe: floods, wetness, cutbanks cave.	Severe: floods.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods.
Ad---------- Adrian	Severe: wetness, floods, cutbanks cave.	Severe: wetness, floods, low strength.	Severe: wetness, floods, low strength.	Severe: wetness, floods, low strength.	Severe: wetness, floods, low strength.
AeB*. Aquents					
Be---------- Belleville	Severe: wetness, cutbanks cave, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Seveve: wetness, floods.	Severe: wetness, frost action, floods.
BoB---------- Bowers	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action, low strength.
Ch---------- Cohoctah	Severe: wetness, floods, cutbanks cave.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: floods, frost action, wetness.
CoB---------- Covert	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
CsB---------- Covert	Severe: cutbanks cave, wetness, too clayey.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Moderate: wetness.
InB---------- [illegible]	Severe: wetness [illegible]	Severe: wetness [illegible]	Severe: wetness [illegible]	Severe: wetness [illegible]	Severe: frost action [illegible]

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
LxA---------- Londo	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.
MeB---------- Menominee	Moderate: wetness.	Slight----------	Moderate: wetness.	Moderate: slope.	Slight.
OaB---------- Oakville	Severe: cutbanks cave.	Slight----------	Moderate: wetness.	Slight----------	Slight.
Pa---------- Parkhill	Severe: wetness, floods	Severe: floods, wetness	Severe: wetness, floods,	Severe: floods, wetness,	Severe: low strength, floods,

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
WzB*:					
Wixom	Severe: wetness, cutbanks cave.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness, frost action.
Belleville	Severe: wetness, cutbanks cave, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, frost action, floods.
Urban land.					

* See map unit description for the composition and behavior of the map unit.

TABLE 10.--SANITARY FACILITIES

[Some of the terms used in this table to describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms used to rate soils. Absence of an entry means soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
AbB---------- Abscota	Severe: floods	Severe: floods	Severe: floods	Severe: floods	Poor: too sandy

TABLE 10.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill

TABLE 10.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Wa---------- Wauseon	Severe: percs slowly, wetness, floods.	Severe: seepage, wetness.	Severe: wetness, too clayey, floods.	Severe: wetness, seepage, floods.	Poor: wetness.
WxB---------- Wixom	Severe: wetness, percs slowly.	Severe: wetness, seepage.	Severe: wetness.	Severe: wetness, seepage.	Fair: too clayey.
WzB*:					
Wixom----------	Severe: wetness, percs slowly.	Severe: wetness, seepage.	Severe: wetness.	Severe: wetness, seepage.	Fair: too clayey.
Belleville----------	Severe: wetness,	Severe: wetness,	Severe: wetness,	Severe: wetness,	Poor: wetness.

TABLE 11.--CONSTRUCTION MATERIALS

[Some of the terms used in this table to describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," and "unsuited." Absence of an entry means soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
AbB Abscota	Good	Good	Unsuited: excess fines.	Fair: too sandy.
Ad Adrian	Poor: excess humus, wetness.	Unsuited: excess humus.	Unsuited: excess fines, excess humus.	Poor: wetness, excess humus.
AeB*. Aquents				
Be Belleville	Poor: wetness, low strength.	Poor: excess fines, thin layer.	Unsuited: excess fines.	Poor: wetness.
BoB Bowers	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Ch Cohoctah	Poor: wetness.	Good	Good	Poor: wetness.
CoB Covert	Fair: wetness.	Fair: excess fines.	Unsuited: excess fines.	Poor: too sandy.
CsB Covert	Fair: thin layer, wetness.	Fair: thin layer.	Unsuited: excess fines.	Poor: too sandy.
InB Ingersoll	Poor: wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Kg Kingsville	Poor: wetness.	Fair: excess fines.	Unsuited: excess fines.	Poor: wetness.
Kn Kinross	Poor: wetness.	Good	Unsuited: excess fines.	Poor: wetness, too sandy.
Le Lenawee	Poor: wetness, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
LrB*:				
Lenawee	Poor: wetness, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
Wixom	Poor: low strength.	Poor: thin layer.	Unsuited: excess fines.	Fair: too sandy.
LxA Londo	Fair: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
MeB Menominee	Fair: shrink-swell.	Poor: thin layer.	Unsuited: excess fines.	Poor: too sandy.
OaB Oakville	Good	Good	Unsuited: excess fines.	Poor: too sandy.
Pa Parkhill	Poor: wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Pe: Pella	Poor: wetness, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
PsB, PtB: Pipestone	Poor: wetness.	Good	Unsuited: excess fines.	Poor: too sandy, wetness.
PuB*:				
Pipestone	Poor: wetness.	Good	Unsuited: excess fines.	Poor: too sandy, wetness.
Oakville	Good	Good	Unsuited: excess fines.	Poor: too sandy.
Urban land.				
PwB: Plainfield	Good	Good	Unsuited: excess fines.	Poor: too sandy.
PxB*:				
Poseyville	Poor: low strength.	Poor: thin layer.	Unsuited: excess fines.	Fair: too sandy.
Londo	Fair: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Sz: Sloan	Poor: wetness, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
Ur*. Urban land				
Wa: Wauseon	Poor: wetness, low strength, shrink-swell.	Poor: excess fines, thin layer.	Unsuited: excess fines.	Poor: wetness.
WxB: Wixom	Poor: low strength.	Poor: thin layer.	Unsuited: excess fines.	Fair: too sandy.
WzB*:				
Wixom	Poor: low strength.	Poor: thin layer.	Unsuited: excess fines.	Fair: too sandy.
Belleville	Poor: wetness, low strength.	Poor: excess fines, thin layer.	Unsuited: excess fines.	Poor: wetness.
Urban land.				

* See map unit description for the composition and behavior of the map unit.

TABLE 12.--WATER MANAGEMENT

[Some of the terms used in this table to describe restrictive soil features are defined in the Glossary. Absence of an entry means soil was not evaluated]

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Grassed waterways
AbB---------- Abscota	Seepage--------	Seepage--------	Deep to water	Not needed-----	Fast intake, droughty, soil blowing.	Droughty.
Ad---------- Adrian	Seepage--------	Seepage, wetness.	Favorable------	Floods, frost action.	Wetness, fast intake, soil blowing.	Wetness.
AeB*. Aquents						
Be---------- Belleville	Favorable------	Wetness--------	Slow refill----	Floods, frost action.	Wetness, fast intake, soil blowing.	Wetness.
BoB---------- Bowers	Favorable------	Unstable fill, low strength.	Slow refill----	Frost action---	Wetness--------	Wetness.
Ch---------- Cohoctah	Seepage--------	Piping, seepage, wetness.	Favorable------	Floods, frost action.	Wetness, floods, soil blowing.	Wetness.
CoB---------- Covert	Seepage--------	Seepage--------	Deep to water	Favorable------	Droughty, fast intake, wetness.	Droughty.
CsB---------- Covert	Seepage--------	Seepage--------	Slow refill----	Favorable------	Wetness, droughty, soil blowing.	Droughty, percs slowly.
InB---------- Ingersoll	Seepage--------	Piping, wetness.	Slow refill----	Frost action---	Wetness, erodes easily.	Wetness, erodes easily.

TABLE 12.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Grassed waterways
Pe: Pella	Seepage	Wetness	Slow refill	Floods, frost action.	Wetness, floods.	Wetness.
PsB: Pipestone	Seepage	Seepage, piping.	Favorable	Favorable	Fast intake, wetness, droughty.	Droughty, wetness.
PtB: Pipestone	Seepage	Seepage, piping.	Slow refill, cutbanks cave.	Favorable	Fast intake, wetness, droughty.	Droughty, wetness.
PuB*:						
Pipestone	Seepage	Seepage, piping.	Favorable	Favorable	Fast intake, wetness, droughty.	Droughty, wetness.
Oakville	Seepage	Piping, seepage.	Deep to water	Not needed	Fast intake, droughty, soil blowing.	Droughty.
Urban land.						
PwB: Plainfield	Seepage	Seepage	No water	Not needed	Droughty, fast intake, soil blowing.	Droughty.
PxB*:						
Poseyville	Seepage	Wetness	Slow refill	Frost action	Wetness, fast intake, soil blowing.	Wetness, erodes easily.
Londo	Favorable	Wetness	Slow refill	Frost action	Wetness	Wetness.
Sz: Sloan	Favorable	Piping	Favorable	Wetness, floods, poor outlets.	Wetness, floods.	Wetness.
Ur*. Urban land						
Wa: Wauseon	Seepage	Wetness, hard to pack.	Slow refill	Percs slowly, frost action, floods.	Wetness, droughty, soil blowing.	Wetness, percs slowly, droughty.
WxB: Wixom	Seepage	Wetness	Slow refill	Favorable	Fast intake, soil blowing, wetness.	Wetness, erodes easily.
WzB*:						
Wixom	Seepage	Wetness	Slow refill	Favorable	Fast intake, soil blowing, wetness.	Wetness, erodes easily.
Belleville	Favorable	Wetness	Slow refill	Floods, frost action.	Wetness, fast intake, soil blowing.	Wetness.
Urban land.						

* See map unit description for the composition and behavior of the map unit.

TABLE 13.--RECREATIONAL DEVELOPMENT

[Some of the terms used in this table to describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry means soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
AbB---------- Abscota	Severe: floods	Moderate: too sandy	Moderate: too sandy	Moderate: too sandy

TABLE 13.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Pe---------- Pella	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, floods.	Severe: wetness.
PsB, PtB---------- Pipestone	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: too sandy, wetness.	Severe: too sandy.
PuB*:				
Pipestone----------	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: too sandy, wetness.	Severe: too sandy.
Oakville----------	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
Urban land.				
PwB---------- Plainfield	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
PxB*:				
Poseyville----------	Severe: wetness.	Moderate: wetness, too sandy.	Severe: wetness.	Moderate: wetness, too sandy.
Londo----------	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.
Sz---------- Sloan	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, floods.	Severe: wetness.
Ur*. Urban land				
Wa---------- Wauseon	Severe: wetness, percs slowly, floods.	Severe: wetness.	Severe: wetness, percs slowly, floods.	Severe: wetness.

TABLE 14.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates the soil was not rated]

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
AbB---------- Abscota	Poor	Fair	Good	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
Ad---------- Adrian	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Very poor.	Poor	Good.
AeB*. Aquents										
Be---------- Belleville	Poor	Fair	Fair	Fair	Fair	Fair	Good	Fair	Fair	Fair.
BoB---------- Bowers	Fair	Good	Good	Good	Fair	Good	Fair	Good	Good	Fair.
Ch---------- Cohoctah	Poor	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
CoB, CsB---------- Covert	Poor	Poor	Fair	Poor	Poor	Poor	Poor	Poor	Poor	Poor.
InB---------- Ingersoll	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Kg---------- Kingsville	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Kn---------- Kinross	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Very poor.	Poor	Good.
Le---------- Lenawee	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
LrB*:										
Lenawee----------	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Wixom----------	Poor	Fair	Good	Good	Good	Fair	Fair	Fair	Good	Fair.
LxA---------- Londo	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
MeB---------- Menominee	Poor	Poor	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
OaB---------- Oakville	Poor	Poor	Fair	Fair	Fair	Poor	Very poor.	Poor	Fair	Very poor.
Pa---------- Parkhill	Good	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Pe---------- Pella	Good	Good	Good	Fair	Poor	Fair	Fair	Good	Fair	Fair.
PsB---------- Pipestone	Fair	Poor	Fair	Poor	Poor	Poor	Fair	Poor	Poor	Poor.
PtB---------- Pipestone	Poor	Poor	Fair	Poor	Poor	Poor	Very poor.	Poor	Poor	Very poor.
PuB*:										

TABLE 14.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
PuB*:										
Oakville	Poor	Poor	Fair	Fair	Fair	Poor	Very poor.	Poor	Fair	Very poor.
Urban land.										
PwB Plainfield	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
PxB*:										
Poseyville	Poor	Fair	Good	Good	Good	Fair	Poor	Fair	Good	Poor.

TABLE 15.--ENGINEERING PROPERTIES AND CLASSIFICATIONS

[The symbol < means less than; > means greater than. Absence of an entry means data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
AbB---------- Abscota	0-5	Loamy sand------	SM	A-2-4, A-1	0	95-100	95-100	50-75	15-30	---	NP
	5-22	Sand----------	SP, SM	A-2-4, A-1, A-3	0	95-100	95-100	45-65	0-15	---	NP
	22-60	Sand, coarse sand.	SM, SP-SM	A-1, A-3, A-2-4	0	95-100	95-100	45-60	0-10	---	NP
Ad---------- Adrian	0-24	Sapric material	Pt	A-8	---	---	---	---	---	---	---
	24-60	Sand, loamy sand	SP, SM	A-2, A-3, A-1	0	80-100	60-100	35-75	0-30	---	NP
AeB*. Aquents											
Be---------- Belleville	0-8	Loamy sand------	SM	A-2	0	100	95-100	70-85	20-35	<20	NP-4
	8-30	Sand, loamy sand, loamy fine sand.	SM	A-2	0-3	95-100	90-100	50-85	15-30	<20	NP-4
	30-60	Clay loam, silty clay loam.	CL	A-6, A-7	0-3	95-100	90-100	90-100	70-90	25-50	10-25
BoB---------- Bowers	0-9	Silt loam-------	ML, CL-ML	A-4	0	100	100	85-95	60-95	25-37	4-10
	9-55	Silty clay loam, silty clay.	CL	A-6	0	100	100	95-100	85-95	27-37	11-16
	55-60	Stratified silty clay to silt loam.	CL	A-6, A-4, A-7	0	100	100	90-100	70-95	27-45	9-25
Ch---------- Cohoctah	0-10	Fine sandy loam	ML, SM	A-4, A-2	0	100	100	65-95	30-75	20-30	NP-6
	10-38	Loam, fine sandy loam, sandy loam.	ML, SM, CL, SC	A-4, A-2	0	100	100	70-90	30-70	20-30	NP-10
	38-60	Sand, gravelly loamy sand, gravelly sand.	SP-SM, SP, GP, GP-GM	A-1, A-3, A-2-4	0-10	40-90	35-85	30-60	0-10	---	NP
CoB---------- Covert	0-5	Sand----------	SP-SM, SM	A-3, A-2-4	0	95-100	90-100	50-75	5-15	---	NP
	5-28	Sand----------	SP-SM, SM	A-3, A-2-4	0	95-100	90-100	50-70	5-15	---	NP
	28-60	Sand----------	SP-SM, SM	A-3, A-2-4	0	95-100	90-100	50-70	5-15	---	NP
CsB---------- Covert	0-8	Sand----------	SM, SP-SM	A-2-4, A-3	0	95-100	90-100	50-75	5-25	---	NP
	8-43	Sand----------	SP-SM, SM	A-3, A-2-4	0	95-100	90-100	50-75	5-15	---	NP
	43-60	Clay loam, loam, silty clay.	CL, CL-ML, CH, ML	A-4, A-6, A-7	0-5	90-100	90-100	75-100	50-90	17-60	3-34
InB---------- Ingersoll	0-9	Silt loam-------	CL-ML, ML	A-4	0	95-100	95-100	95-100	75-95	25-38	4-10
	9-12	Silt loam, silty clay loam, clay loam.	CL, CL-ML	A-4, A-6	0	95-100	95-100	90-100	70-95	20-38	6-20
	12-60	Stratified very fine sand to silty clay loam.	ML, SM, CL, SC	A-4	0	95-100	95-100	75-95	36-90	<30	NP-10
Kg---------- Kingsville	0-6	Loamy fine sand	SM	A-2	0	100	90-100	80-95	20-35	---	NP
	6-60	Fine sand, loamy fine sand.	SM	A-2	0	100	90-100	80-95	20-35	---	NP

See footnote at end of table.

TABLE 15.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Kn---------- Kinross	5-0	Muck----------	Pt	A-8	0	---	---	---	---	---	
	0-3	Mucky sand------	SP	A-3	0	100	100	80-95	0-5	---	NP
	3-60	Sand--------	SP	A-3	0	100	95-100	80-95	0-5		

TABLE 15.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
PtB---------- Pipestone	0-8	Sand----------	SP-SM, SM	A-1, A-2-4, A-3	0	95-100	90-100	40-75	5-30	---	NP
	8-52	Sand, fine sand, loamy fine sand.	SP, SP-SM, SM	A-1, A-2-4, A-3	0	95-100	90-100	40-75	2-30	---	NP
	52-60	Clay loam, loam, silty clay.	CL, CH, ML	A-4, A-6, A-7	0-5	90-100	90-100	75-100	50-90	25-60	3-34
PuB*:											
Pipestone---------	0-6	Sand----------	SP, SM, SP-SM	A-2-4, A-3	0	95-100	90-100	60-80	0-20	---	NP
	6-24	Sand, loamy sand, fine sand.	SP-SM, SP, SM	A-2-4, A-3	0	95-100	90-100	60-80	0-15	---	NP
	24-60	Sand, fine sand	SP-SM, SP	A-3, A-2-4	0	95-100	90-100	50-80	0-10	---	NP
Oakville----------	0-14	Fine sand-------	SM, SP, SP-SM	A-2, A-3	0	100	100	50-85	0-35	---	NP
	14-60	Fine sand-------	SM, SP, SP-SM	A-2, A-3	0	100	95-100	65-95	0-25	---	NP
Urban land.											
PwB---------- Plainfield	0-6	Sand----------	SP-SM, SM	A-3, A-2	0	100	100	50-80	5-35	---	NP
	6-60	Sand----------	SP	A-3	0	100	100	55-65	1-4	---	NP
PxB*:											
Poseyville--------	0-16	Loamy sand, sand	SM	A-2-4, A-1	0-2	95-100	90-100	45-75	10-30	---	NP
	16-23	Sandy loam, fine sandy loam.	SM, SM-SC	A-2-4, A-4	0-2	95-100	90-100	55-85	25-50	<25	NP-5
	23-60	Loam, clay loam	CL	A-4, A-6	0-2	95-100	90-100	80-100	60-80	25-36	8-18
Londo----------	0-9	Loam----------	ML, CL-ML, CL	A-4	0	95-100	90-100	75-95	50-75	20-30	2-10
	9-19	Clay loam, loam	CL	A-6	0	95-100	90-100	85-95	65-80	25-40	11-25
	19-60	Loam, clay loam	CL-ML, CL	A-4, A-6	0-2	90-100	85-100	80-90	55-75	25-35	5-15
Sz---------- Sloan	0-30	Loam----------	CL, ML	A-6, A-4, A-7	0	100	95-100	85-100	70-95	30-45	8-15
	30-40	Silty clay loam, clay loam, silt loam.	CL, ML	A-6, A-7, A-4	0	100	90-100	85-100	75-95	30-45	8-18
	40-60	Stratified sandy loam to silty clay loam.	ML, CL SM, SC	A-4, A-6	0	95-100	90-100	60-95	35-90	15-40	NP-15
Ur*. Urban land											
Wa---------- Wauseon	0-8	Sandy loam	SM, ML	A-2, A-4	0	100	95-100	70-85	25-55	<35	NP-8
	8-35	Sandy loam, loamy fine sand, very fine sand.	SM	A-2, A-4	0	100	95-100	65-95	20-45	---	NP
	35-60	Clay, silty clay, silty clay loam.	CH, CL, MH, ML	A-7	0	100	95-100	90-100	80-95	42-70	18-36

See footnote at end of table.

TABLE 15.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
WxB---------- Wixom	0-9	Loamy sand------	SM	A-2-4	0	95-100	95-100	50-70	15-30	---	NP
	9-29	Loamy sand, fine sand.	SM, SP-SM	A-2-4, A-3	0	95-100	95-100	50-75	5-30	<20	NP-4
	29-60	Silty clay loam, sandy clay loam, loam.	CL, CL-ML	A-4, A-6	0	95-100	95-100	85-100	51-95	20-40	5-25
WzB*:											
Wixom----------	0-9	Loamy sand------	SM	A-2-4	0	95-100	95-100	50-70	15-30	---	NP
	9-29	Loamy sand, fine sand.	SM, SP-SM	A-2-4, A-3	0	95-100	95-100	50-75	5-30	<20	NP-4
	29-60	Silty clay loam, sandy clay loam, loam.	CL, CL-ML	A-4, A-6	0	95-100	95-100	85-100	51-95	20-40	5-25
Belleville--------	0-8	Loamy sand------	SM	A-2	0	100	95-100	70-85	20-35	<20	NP-4
	8-30	Sand, loamy sand, loamy fine sand.	SM	A-2	0-3	95-100	90-100	50-85	15-30	<20	NP-4
	30-60	Clay loam, silty clay loam.	CL	A-6, A-7	0-3	95-100	90-100	90-100	70-90	25-50	10-25
Urban land.											

* See map unit description for the composition and behavior of the map unit.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[The symbol < means less than; > means greater than. The erosion tolerance factor (T) is for the entire profile. Wind erodibility group is for the surface layer. Absence of an entry means data were not available or were not estimated]

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group
	In	In/hr	In/in	pH				
AbB---------- Abscota	0-5	6.0-20	0.08-0.12	6.1-6.5	Low----------	0.17	5	2
	5-22	6.0-20	0.05-0.07	6.1-7.8	Low----------	0.17		
	22-60	6.0-20	0.05-0.07	6.1-8.4	Low----------	0.17		
Ad---------- Adrian	0-24	0.2-6.0	0.35-0.45	5.1-7.8	----------	0.10	5	3
	24-60	6.0-20	0.03-0.08	6.1-8.4	Low----------	---		
AeB*. Aquents								
Be---------- Belleville	0-8	6.0-20	0.10-0.12	6.1-7.8	Low----------	0.17	5	2
	8-30	6.0-20	0.06-0.10	6.1-8.4	Low----------	0.17		
	30-60	0.2-0.6	0.14-0.20	7.4-8.4	Moderate------	0.32		
BoB---------- Bowers	0-9	0.6-2.0	0.20-0.22	5.6-7.8	Low----------	0.32	5	5
	9-55	0.2-0.6	0.18-0.20	6.1-7.8	Moderate------	0.32		
	55-60	0.2-0.6	0.18-0.22	7.9-8.4	Moderate------	0.32		
Ch---------- Cohoctah	0-10	2.0-6.0	0.13-0.22	6.1-7.8	Low----------	0.28	5	3
	10-38	2.0-6.0	0.12-0.20	6.1-8.4	Low----------	0.28		
	38-60	>20	0.02-0.07	7.9-8.4	Low----------	0.10		
CoB---------- Covert	0-5	6.0-20	0.06-0.09	4.5-7.3	Low----------	0.15	5	1
	5-28	6.0-20	0.05-0.08	4.5-7.3	Low----------	0.15		
	28-60	>20	0.04-0.07	5.6-7.3	Low----------	0.15		
CsB---------- Covert	0-8	6.0-20	0.06-0.09	4.5-7.3	Low----------	0.15	5	1
	8-43	6.0-20	0.05-0.08	4.5-7.3	Low----------	0.15		
	43-60	0.06-0.6	0.10-0.18	7.4-8.4	Moderate------	0.32		
InB---------- Ingersoll	0-9	0.6-6.0	0.20-0.24	6.1-7.8	Low----------	0.37	5	5
	9-12	0.6-2.0	0.15-0.22	6.1-7.8	Low----------	0.37		
	12-60	0.6-2.0	0.14-0.20	7.4-8.4	Low----------	0.37		
Kg---------- Kingsville	0-6	6.0-20	0.07-0.12	6.1-8.4	Low----------	0.17	5	1
	6-60	6.0-20	0.07-0.12	6.5-8.4	Low----------	0.17		
Kn---------- Kinross	5-0	0.2-6.0	0.35-0.45	4.5-5.5	----------	---		
	0-3	>20	0.04-0.06	4.5-5.5	Low----------	---	5	3
	3-60	>20	0.04-0.06	5.1-6.0	Low----------	---		
Le---------- Lenawee	0-9	0.6-2.0	0.17-0.22	5.6-6.0	Moderate------	0.28	4	7
	9-40	0.2-0.6	0.18-0.20	6.6-7.8	Moderate------	0.28		
	40-60	0.6-2.0	0.18-0.22	7.4-7.8	Low----------	0.28		
LrB*:								
Lenawee---------	0-9	0.6-2.0	0.17-0.22	5.6-6.0	Moderate------	0.28	4	7
	9-40	0.2-0.6	0.18-0.20	6.6-7.8	Moderate------	0.28		
	40-60	0.6-2.0	0.18-0.22	7.4-7.8	Low----------	0.28		
Wixom----------	0-9	6.0-20	0.10-0.12	5.1-6.5	Low----------	0.15	3	2
	9-29	6.0-20	0.06-0.11	5.1-6.5	Low----------	0.15		
	29-60	0.2-0.6	0.14-0.20	6.1-7.8	Moderate------	0.43		
LxA---------- Londo	0-9	0.6-2.0	0.18-0.24	6.1-7.8	Low----------	0.32	5	6
	9-19	0.2-2.0	0.14-0.19	6.6-7.8	Moderate------	0.32		
	19-60	0.2-2.0	0.12-0.19	7.9-8.4	Moderate------	0.32		
MeB---------- Menominee	0-8	6.0-20	0.08-0.12	5.1-6.5	Low----------	0.17	5	2
	8-26	6.0-20	0.04-0.10	5.1-6.5	Low----------	0.17		
	26-60	0.2-0.6	0.14-0.18	5.6-7.8	Moderate------	0.32		
OaB---------- Oakville	0-14	>20.0	0.07-0.09	5.6-7.3	Low----------	0.15	5	1
	14-60	>20.0	0.06-0.08	5.6-7.3	Low----------	0.15		

See footnote at end of table

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group
	In	In/hr	In/in	pH				
Pa---------- Parkhill	0-14	0.6-2.0	0.20-0.22	6.1-7.3	Low----------	0.28	5	5
	14-25	0.2-0.6	0.15-0.19	6.1-7.8	Low----------	0.28		
	25-60	0.6-2.0	0.17-0.19	7.4-8.4	Low----------	0.28		
Pe---------- Pella	0-12	0.6-2.0	0.22-0.24	6.1-7.8	Moderate------	0.28	5	6
	12-30	0.6-2.0	0.21-0.24	7.4-8.4	Moderate------	0.28		
	30-60	0.6-2.0	0.10-0.22	7.4-8.4	Low----------	0.28		
PsB---------- Pipestone	0-6	6.0-20	0.07-0.10	4.5-7.3	Low----------	0.17	5	1
	6-24	6.0-20	0.06-0.09	4.5-7.3	Low----------	0.17		
	24-60	>20	0.05-0.07	5.1-7.3	Low----------	0.17		
PtB---------- Pipestone	0-8	6.0-20	0.06-0.10	4.5-7.3	Very low------	0.17	5	1
	8-52	6.0-20	0.04-0.08	4.5-7.3	Very low------	0.17		
	52-60	0.06-0.6	0.16-0.18	7.4-8.4	Moderate------	0.32		
PuB*:								
Pipestone-------	0-6	6.0-20	0.07-0.10	4.5-7.3	Low----------	0.17	5	1
	6-24	6.0-20	0.06-0.09	4.5-7.3	Low----------	0.17		
	24-60	>20	0.05-0.07	5.1-7.3	Low----------	0.17		
Oakville--------	0-14	>20.0	0.07-0.09	5.6-7.3	Low----------	0.15	5	1
	14-60	>20.0	0.06-0.08	5.6-7.3	Low----------	0.15		
Urban land.								
PwB---------- Plainfield	0-6	6.0-20	0.06-0.09	4.5-6.0	Low----------	0.17	5	1
	6-60	6.0-20	0.05-0.07	4.5-6.0	Low----------	0.17		
PxB*:								
Poseyville------	0-16	6.0-20	0.04-0.12	6.1-7.3	Very low------	0.17	5	2
	16-23	6.0-20	0.06-0.14	6.6-7.8	Low----------	0.17		
	23-60	0.2-2.0	0.12-0.19	7.9-8.4	Moderate------	0.37		
Londo----------	0-9	0.6-2.0	0.18-0.24	6.1-7.8	Low----------	0.32	5	6
	9-19	0.2-2.0	0.14-0.19	6.6-7.8	Moderate------	0.32		
	19-60	0.2-2.0	0.12-0.19	7.9-8.4	Moderate------	0.32		
Sz---------- Sloan	0-30	0.6-2.0	0.20-0.24	6.1-7.8	Moderate------	0.37	5	6
	30-40	0.2-2.0	0.11-0.19	6.1-8.4	Moderate------	0.37		
	40-60	0.2-2.0	0.11-0.18	6.6-8.4	Low----------	0.37		
Ur*. Urban land								
Wa---------- Wauseon	0-8	2.0-6.0	0.12-0.18	6.1-7.3	Low----------	0.20	5	3
	8-35	6.0-20	0.06-0.10	6.6-7.8	Low----------	0.20		
	35-60	<0.06	0.06-0.10	7.4-7.8	High----------	0.20		
WxB---------- Wixom	0-9	6.0-20	0.10-0.12	5.1-6.5	Low----------	0.15	3	2
	9-29	6.0-20	0.06-0.11	5.1-6.5	Low----------	0.15		
	29-60	0.2-0.6	0.14-0.20	6.1-7.8	Moderate------	0.43		
WzB*:								
Wixom----------	0-9	6.0-20	0.10-0.12	5.1-6.5	Low----------	0.15	3	2
	9-29	6.0-20	0.06-0.11	5.1-6.5	Low----------	0.15		
	29-60	0.2-0.6	0.14-0.20	6.1-7.8	Moderate------	0.43		
Belleville------	0-8	6.0-20	0.10-0.12	6.1-7.8	Low----------	0.17	5	2

TABLE 17.--SOIL AND WATER FEATURES

[Absence of an entry indicates the feature is not a concern. See text for descriptions of symbols and such terms as "rare," "brief," and "perched." The symbol < means less than; > means greater than]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Subsidence		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Initial	Total		Uncoated steel	Concrete
					Ft			In	In			
AbB---------- Abscota	A	Common------	Brief-----	Mar-Jun	2.5-5.0	Apparent	Dec-May	---	---	Moderate	Low------	Low.
Ad---------- Adrian	A/D	Frequent----	Long------	Nov-May	0-1.0	Apparent	Nov-May	---	25-30	High-----	High-----	Moderate.
AeB*. Aquents												
Be---------- Belleville	B/D	Frequent----	Brief-----	Mar-Apr	0-1.0	Apparent	Mar-May	---	---	High-----	High-----	Low.
BoB---------- Bowers	C	None--------	---	---	1.0-2.0	Apparent	Nov-Apr	---	---	High-----	High-----	Low.
Ch---------- Cohoctah	B/D	Common------	Long------	Jan-Dec	0-1.0	Apparent	Sep-May	---	---	High-----	High-----	Low.
CoB---------- Covert	A	None--------	---	---	1.5-3.5	Apparent	Nov-Apr	---	---	Low------	Low------	Moderate.
CsB---------- Covert	A	None--------	---	---	1.5-3.5	Apparent	Nov-May	---	---	Low------	High-----	Moderate.
InB---------- Ingersoll	B	None--------	---	---	1.0-2.0	Apparent	Nov-May	---	---	High-----	High-----	Low.
Kg---------- Kingsville	C	Frequent----	Brief-----	Oct-May	0-1.0	Apparent	Jan-Apr	---	---	Moderate	High-----	High.
Kn---------- Kinross	A/D	Frequent----	Brief-----	Sep-May	0-1.0	Apparent	Sep-Jun	---	4-6	Moderate	High-----	Low.
Le---------- Lenawee	B/D	Frequent----	Brief-----	Mar-May	0-1.0	Apparent	Nov-May	---	---	High-----	High-----	Low.
LrB*:												
Lenawee----------	B/D	Frequent----	Brief-----	Mar-May	0-1.0	Apparent	Nov-May	---	---	High-----	High-----	Low.
Wixom----------	B	None--------	---	---	1.0-2.0	Perched	Nov-Jun	---	---	Moderate	High-----	Moderate.
LxA---------- Londo	C	None--------	---	---	1.0-2.0	Apparent	Nov-May	---	---	High-----	High-----	Low.
MeB---------- Menominee	A	None--------	---	---	>2.5	Apparent	Dec-Apr	---	---	Low------	Low------	Moderate.
OaB---------- Oakville	A	None--------	---	---	>3.0	Apparent	Nov-Apr	---	---	Low------	Low------	Moderate.

See footnote at end of table.

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Subsidence		Potential frost action	Risk of corrosion	
Initial	Total		Uncoated steel	Concrete
In	In			
---	---	High-----	High-----	Low.
---	---	High-----	High-----	Moderate.
---	---	Moderate	Low------	Moderate.
---	---	Moderate	High-----	Moderate.
---	---	Moderate	Low------	Moderate.
---	---	Low------	Low------	Moderate.
---	---	Low------	Low------	High.
---	---	High-----	High-----	Moderate.
---	---	High-----	High-----	Low.
---	---	High-----	High-----	Low.
---	---	High-----	High-----	Low.
---	---	Moderate	High-----	Moderate.
---	---	Moderate	High-----	Moderate.
---	---	High-----	High-----	Low.

TABLE 18.--CLASSIFICATION OF THE SOILS

[An asterisk in the first column indicates a taxadjunct to the series. See text for a description of those characteristics of this taxadjunct that are outside the range of the series]

Soil name	Family or higher taxonomic class
Abscota	Mixed, mesic Typic Udipsamments
Adrian	Sandy or sandy-skeletal, mixed, euic, mesic Terric Medisaprists
Belleville	Sandy over loamy, mixed, mesic Typic Haplaquolls
*Bowers	Fine, mixed Aquic Eutroboralfs
Cohoctah	Coarse-loamy, mixed, mesic Fluvaquentic Haplaquolls
Covert	Sandy, mixed, mesic Entic Haplorthods
Ingersoll	Fine-silty, mixed, mesic Aquic Hapludalfs
*Kingsville	Mixed, mesic Mollic Psammaquents
*Kinross	Sandy, mixed, frigid Typic Haplaquods
Lenawee	Fine, mixed, nonacid, mesic Mollic Haplaquepts
Londo	Fine-loamy, mixed, mesic Aeric Glossaqualfs
*Menominee	Sandy over loamy, mixed, frigid Alfic Haplorthods
Oakville	Mixed, mesic Typic Udipsamments
Parkhill	Fine-loamy, mixed, nonacid, mesic Mollic Haplaquepts
*Pella	Fine-silty, mixed, mesic Typic Haplaquolls
Pipestone	Sandy, mixed, mesic Entic Haplaquods
Plainfield	Mixed, mesic Typic Udipsamments
Poseyville	Coarse-loamy, mixed, mesic Aquollic Hapludalfs