SOIL SURVEY OF

Portage County, Wisconsin

United States Department of Agriculture
Soil Conservation Service
In cooperation with
Research Division of the College of
Agricultural and Life Sciences,
University of Wisconsin

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 who need the information, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in the period 1966–71. Soil names and descriptions were approved in 1972. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1971. This survey was made cooperatively by the Soil Conservation Service and the Research Division of the College of Agricultural and Life Sciences, University of Wisconsin. It is part of the technical assistance furnished to the Portage County Soil and Water Conservation District.

The fieldwork that is the basis for this soil survey was partly financed by Portage County; by the City of Stevens Point; and by Chapter 511 of the Wisconsin Statutes.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY contains information that can be applied in managing farms and woodlands; in selecting sites for roads, ponds, buildings, and other structures; and in judging the suitability of tracts of land for farming, industry, and recreation.

Locating Soils

All the soils of Portage County are shown on the detailed map at the back of this publication. This map consists of many sheets made from aerial photographs. Each sheet is numbered to correspond with a number on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbols. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information. This guide lists all the soils of the county in alphabetical order by map symbol and gives the capability classification of each. It also shows the page where each soil is described and the page for various groupings in which the soil has been placed.

Individual colored maps showing the relative suitability or degree of limitation of soils for many purposes can be developed by using the soil map and the information in the text. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils from the soil descriptions and from the discussions of the capability units and the woodland groups.

Foresters and others can refer to the section "Woodland," where the soils of the county are grouped according to their suitability for trees.

Game managers, sportsmen, and others can find information about soils and wildlife in the section "Wildlife."

Community planners and others can read about soil properties that affect the choice of sites for dwellings and shallow excavations in the section "Engineering Uses of the Soils" and for recreation areas in "Recreation."

Engineers and builders can find, under "Engineering Uses of the Soils," tables that contain test data, estimates of soil properties, and information about soil features that affect engineering practices.

Scientists and others can read about how the soils formed and how they are classified in the section "Formation and Classification of Soils."

Newcomers in Portage County will be especially interested in the section "General Soil Map," where broad patterns of soils are described. They will also be interested in the information given in the section "General Nature of the County."

Cover: Conservation practices help to control water erosion and soil blowing on soils in the Wyocena-Rosholt association. Contour strips and diversions shown in the upper center lead water to a sodded waterway. A windbreak is to the west of the buildings. Trees are planted in the steep areas, shown in the lower right, because the areas are not suited to crops.

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SOIL SURVEY OF PORTAGE COUNTY, WISCONSIN

BY AUGUSTINE J. OTTER AND WILLIAM D. FIALA,[1] SOIL CONSERVATION SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH THE RESEARCH DIVISION OF THE COLLEGE OF AGRICULTURAL AND LIFE SCIENCES, UNIVERSITY OF WISCONSIN

PORTAGE COUNTY is in the central part of Wisconsin (fig. 1). It is bordered on the north by Marathon County, on the east by Waupaca County, on the south by Waushara and Adams Counties, and on the west by Wood County. The total land area is 806 square miles, or 515,840 acres. Stevens Point, the county seat, is located near the center of the county, along the Wisconsin River. Approximately one-half of the population of the county is in Stevens Point.

The soils in Portage County range from sandy to loamy, from shallow to deep, and from excessively drained to very poorly drained. Glaciation is chiefly responsible for the properties of many of the soils that formed in the eastern part of the county. These soils are sandy to loamy. The soils of the southwestern part of the county are nearly level sandy soils that formed in the basin of Glacial Lake Wisconsin. The loamy soils in the northwestern part of the county formed in material weathered from the underlying igneous rocks. Hard igneous and metamorphic bedrock underlies this part of the county within a depth of 20 feet.

The soils of Portage County are suitable for many crops. Corn, small grain, and clover-timothy hay or alfalfa hay are the main crops. Potatoes are an important crop on many of the nearly level irrigated soils. Portage County is one of Wisconsin's leading potato-producing counties, but dairying is a larger producer of income.

Manufacturing provides more jobs than farming and forestry.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in Portage County, where they are located, and how they can be used. The soil scientists went into the county knowing they likely would find many soils they had already seen and perhaps some they had not. They observed the steepness, length, and shape of slopes, the size of streams, the kinds of native plants or crops, the kinds of rock, and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material that has not been changed much by leaching or by the action of plant roots.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. The soil series and the soil phase are the categories of soil classification most used in a local survey.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important

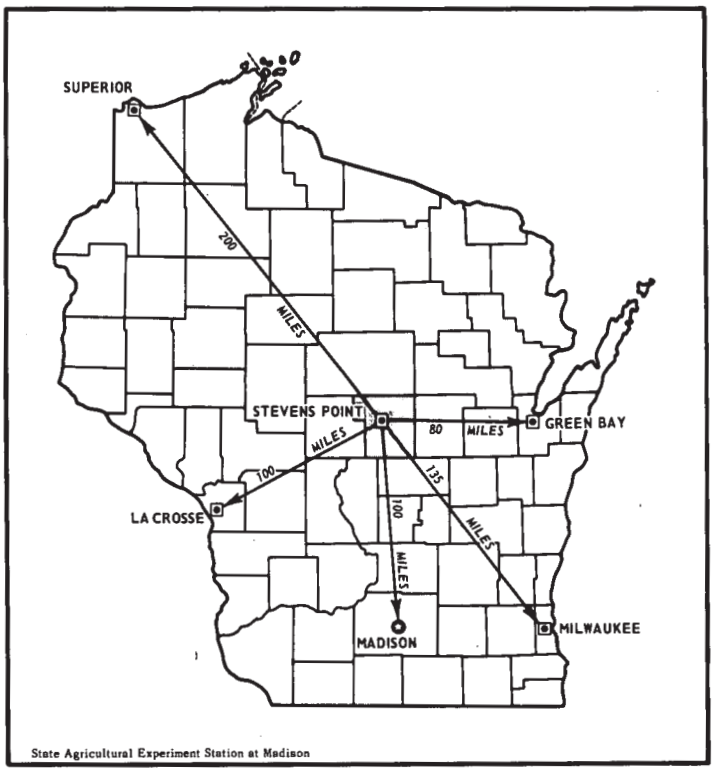

Figure 1.—Location of Portage County in Wisconsin.

[1] Soils surveyed by ROBERT J. BARTELME, WILLIAM D. FIALA, DENNIS E. HUTCHINSON, PETER D. LINDGREN, DAVID L. OMERNIK, AUGUSTINE J. OTTER, HARVEY V. STRELOW, and MARVIN C. SUHR, Soil Conservation Service.

characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Rosholt and Meehan, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

Soils of one series can differ in texture of the surface layer and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Rosholt sandy loam, 2 to 6 percent slopes, is one of several phases within the Rosholt series.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that help in drawing boundaries accurately. The soil map at the back of this publication was prepared from aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning the management of farms and fields, a mapping unit is nearly equivalent to a soil phase. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some kind that have been seen within an area that is dominantly of a recognized soil phase.

Some mapping units are made up of soils of different series, or of different phases within one series. Two such kinds of mapping unit are shown on the soil map of Portage County: soil complexes and undifferentiated groups.

A soil complex consists of areas of two or more soils, so intricately mixed or so small in size that they cannot be shown separately on the soil map. Each area of a complex contains some of each of the two or more dominant soils, and the pattern and relative proportions are about the same in all areas. Generally, the name of a soil complex consists of the names of the dominant soils, joined by a hyphen. Roscommon-Meehan complex, 0 to 3 percent slopes, is an example.

An undifferentiated group is made up of two or more soils that could be delineated individually but are shown as one unit because, for the purpose of the soil survey, there is little value in separating them. The pattern and proportion of soils are not uniform. An area shown on the map may be made up of only one of the dominant soils, or of two or more. Plainfield and Kranski soils are an undifferentiated soil group in this county.

In most areas surveyed there are places where the soil material is so rocky, so shallow, so severely eroded, or so variable that it has not been classified by soil series. These places are shown on the soil map and are described in the survey, but they are called land types and are given descriptive names. In Portage County, Alluvial land, wet, is a land type.

While a soil survey is in progress, soil scientists take soil samples needed for laboratory measurements and for engineering tests. Laboratory data from the same kind of soil in other places are also assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kind of soil. Yields under defined management are estimated for all the soils.

Soil scientists observe how soils behave when used as a growing place for native and cultivated plants and as material for structures, foundations for structures, or covering for structures. They relate this behavior to properties of the soils. For example, they observe that filter fields for onsite disposal of sewage fail on a given kind of soil, and they relate this to the slow permeability of the soil or a high water table. They see that streets, road pavements, and foundations for houses are cracked on a named kind of soil and they relate this failure to the high shrink-swell potential of the soil material. Thus, they use observation and knowledge of soil properties, together with available research data, to predict limitations or suitability of soils for present and potential uses.

After data have been collected and tested for the key, or benchmark, soils in a survey area, the soil scientists set up trial groups of soils. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others. They then adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under current methods of use and management.

The names, descriptions, and delineations of soils in this published soil survey do not always agree or join fully with soil maps of adjoining counties published at an earlier date. Differences are brought about by better knowledge about soils or modification and refinements in soil series concepts. In addition, the correlation of a recognized soil is based upon the acreage of that soil and the dissimilarity to adjacent soils within the survey area. Frequently, it is more feasible to include soils, small in extent, with similar soils, where management and response are much the same, rather than set them apart as individuals. The soil descriptions reflect these combinations. Other differences are brought about by the predominance of different soils in taxonomic units made up of two or three series. Still another difference may be caused by the range in slope allowed within the mapping unit for each survey.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in Portage County. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of land use. Such a map is a useful general guide in managing a watershed, a wooded tract, or a wildlife area, or in planning engi-

neering works, recreational facilities, and community developments. It is not a suitable map for planning the management of a farm or field, or for selecting the exact location of a road, building, or similar structure, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect their management.

The 11 associations in Portage County are placed in four main groups, according to their parent materials.

The groups and the soil associations in them are discussed in the following pages.

Soils Formed in Loamy or Silty Materials and the Underlying Residuum from Bedrock

This group is made up of three soil associations. The soils in these associations formed in loamy or silty material and in the underlying residuum weathered from sandstone, shale, or igneous rock. The soils are underlain by bedrock at a depth of 4 to 20 feet.

1. Kert-Norgo variant association

Well-drained to somewhat poorly drained, nearly level to sloping soils that formed in silty deposits and the underlying sandy to clayey residuum from sandstone and shale

This association is on uplands. The soils are on ridges and plains that are dissected by drainageways. The soils are nearly level to sloping.

This association occupies about 1 percent of the county (fig. 2). About 33 percent of this association is Kert soils, 20 percent is Norgo variant soils, and 47 percent is minor soils.

The nearly level, somewhat poorly drained Kert soils are on plains. Their surface layer is 6 inches of dark-brown silt loam. The mottled subsoil is silt loam in the upper part and sandy loam in the lower part. The substratum is banded sand, loamy sand, and clay. Depth to consolidated sandstone bedrock ranges from 4 to 15 feet.

The gently sloping and sloping, well-drained Norgo variant soils are on ridges. Their surface layer is 5 inches of dark-brown silt loam. The subsoil is silt loam in the upper part, loam in the middle part, and loamy sand in the lower part. It is underlain by cemented sandstone bedrock at a depth of 2 to 3 feet.

Minor soils in this association are in the Plainbo and Vesper series. Plainbo soils are excessively drained and are on ridges that lack silty deposits. Vesper soils are poorly drained and are in drainageways.

Some areas of this association are used for crops. Many areas are used for pasture or for woodland. Kert soils are saturated with water at a depth of less than 3 feet during periods of wetness. Norgo variant soils

***Figure 2.*—Area of Kert-Norgo variant association. Kert soils in foreground, and Norgo variant soils on ridge in background.**

are droughty during dry periods. Sloping areas are subject to water erosion.

This association has severe limitations for septic tank absorption fields.

2. *Meadland-Rozellville-Dolph association*

Well-drained to somewhat poorly drained, nearly level to gently sloping soils that formed in loamy and silty deposits and the underlying loamy residuum from igneous rocks

This association is on uplands. The soils are on broad ridges and plains that are dissected by drainageways. They are nearly level to gently sloping.

This association occupies about 6 percent of the county. About 30 percent is Meadland soils, 29 percent is Rozellville soils, 24 percent is Dolph soils, and 17 percent is minor soils.

The nearly level, somewhat poorly drained Meadland soils are on plains. Their surface layer is 6 inches of very dark grayish-brown loam. The mottled subsoil is loam in the upper part and sandy loam in the lower part. The substratum is loam. Depth to igneous bedrock ranges from 5 to 20 feet.

The gently sloping, well drained and moderately well drained Rozellville soils are on broad uplands. Their surface layer is 4 inches of very dark grayish-brown loam. The subsoil is loam in the upper part, sandy clay loam in the middle part, and loam in the lower part. The substratum is stony loam. Depth to igneous bedrock ranges from 5 to 20 feet.

The nearly level, somewhat poorly drained Dolph soils are on plains. Their surface layer is 8 inches of very dark grayish-brown silt loam. The mottled subsoil is silty clay loam in the upper part and clay in the lower part. The substratum is clay loam. Depth to bedrock ranges from 8 to 20 feet.

Minor soils in this association are in the Altdorf and Sherry series. These soils are nearly level and poorly drained and are in drainageways.

This association in Portage County lacks the thin silt mantle that it has in Wood County. This silt mantle was recognized on the county line, but it comprises only a small acreage in Portage County. In other characteristics the soils of the two counties are similar.

Most areas of this association are used for crops. Corn, small grain, and clover are the principal crops. In areas that are drained, alfalfa replaces clover in the rotation. Meadland and Dolph soils are saturated with water at a depth of less than 3 feet during wet periods. Rozellville soils are subject to water erosion when cropped.

Meadland and Dolph soils have severe limitations for septic tank absorption fields, and Rozellville soils have moderate limitations for septic tank absorption fields and basements.

3. *Point-Dancy-Mosinee association*

Well-drained to poorly drained, nearly level to gently sloping soils that formed in loamy deposits and the underlying loamy residuum from igneous rocks

This association is on uplands. The soils are on broad ridges and plains that are dissected by drainageways. They are nearly level to gently sloping.

This association occupies about 9 percent of the county. About 38 percent of this association is Point soils, 20 percent is Dancy soils, 14 percent is Mosinee soils, and 28 percent is minor soils.

The nearly level, somewhat poorly drained Point soils are on plains. Their surface layer is 10 inches of dark-brown sandy loam. The mottled subsoil is loam. The substratum is loam. Depth to igneous bedrock ranges from 4 to 20 feet.

The nearly level, poorly drained Dancy soils are in drainageways and depressions. Their surface layer is 8 inches of black sandy loam. The mottled subsoil is sandy loam in the upper part and loam in the lower part. The substratum is loam. Depth to igneous bedrock ranges from 5 to 20 feet.

The gently sloping, well-drained Mosinee soils are on broad ridges. Their surface layer is 7 inches of dark-brown sandy loam. The subsoil is sandy loam in the upper part and gravelly sandy loam in the lower part. It is underlain by shattered granite bedrock. Depth to bedrock ranges from 4 to 10 feet. Outcrops are common.

Minor soils in this association are in the Plainfield, Roscommon, and Rockers series. The gently sloping, excessively drained Plainfield soils are in thick sandy deposits on ridges and plains. The nearly level, somewhat poorly drained Rockers soils are in moderately thick sandy deposits on ridges and plains. The poorly drained Roscommon soils are in thick sandy deposits in drainageways.

Most areas of this association are used for pasture or woodland. Some areas are used for crops. Corn, small grain, and clover are the principal crops. In areas of Point soils that are drained, alfalfa replaces clover in the rotation. Stones and outcrops are hazards to cultivation in this association. Point soils are saturated with water at a depth of less than 3 feet and Dancy soils at a depth of less than 1 foot during periods of wetness. Mosinee soils are well drained and are subject to erosion.

Point soils have severe limitations and Mosinee soils have moderate limitations for septic tank absorption fields and basements. Dancy soils have very severe limitations for septic tank absorption fields and severe limitations for basements.

Soils Formed in Sandy Glacial Drift

This group is made up of two soil associations. The soils in these associations formed in sandy or loamy material and are underlain by sandy glacial till, outwash sand, or sand and gravel.

4. *Wyocena-Rosholt association*

Well-drained, gently sloping to very steep soils that formed in loamy deposits and sandy glacial till or outwash sand and gravel

This association is in areas of glacial drift. It is on hills and plains that are dissected by drainageways and have depressions. The soils are gently sloping to very steep.

This association occupies about 14 percent of the county (fig. 3). About 51 percent of this association is Wyocena soils, 34 percent is Rosholt soils, and 15 percent is minor soils.

Figure 3.—Soils in the Wyocena-Rosholt association. Rosholt soils are in the foreground, and Wyocena soils in the background surrounding a depressional area.

The gently sloping to steep, well-drained Wyocena soils are on hills. Their surface layer is 7 inches of dark-brown sandy loam. The subsoil is sandy loam. The substratum is loamy sand.

The gently sloping to very steep, well-drained Rosholt soils are on plains, hills, and escarpments. Their surface layer is 6 inches of dark-brown sandy loam. The subsoil is gravelly sandy loam in the upper part and gravelly loamy sand in the lower part. The substratum is sand and gravel.

Minor in this association are the Oesterle, Rosholt variant, and Roscommon variant soils. The moderately steep to very steep Rosholt variant soils are on hills and escarpments in intricate patterns with Rosholt soils. The nearly level, somewhat poorly drained Oesterle soils are in broad depressions and drainageways. The nearly level, poorly drained Roscommon variant soils are in drainageways and depressions and in areas adjacent to lakes and streams.

Many of the less sloping areas of this association are used for crops. Steeper areas are used for pasture or woodland. Corn, small grain, and alfalfa are the principal crops. If the soils are cultivated, water erosion is a hazard. Stones are a hazard in some areas.

The gently sloping and sloping soils in this association have moderate limitations and the steeper soils have severe limitations for septic tank absorption fields.

5. *Kranski-Coloma-Mecan association*

Excessively drained and well-drained, gently sloping to very steep soils that formed in sandy glacial till or in deep sandy deposits

This association is on hills in areas of glacial drift. The soils are gently sloping to very steep.

This association occupies about 8 percent of the county. About 41 percent of this association is Kranski soils, 21 percent is Coloma soils, 18 percent is Mecan soils, and 20 percent is minor soils.

The gently sloping to very steep, excessively drained Kranski soils are on hilly moraines. Their surface layer is 5 inches of dark-brown loamy sand. The subsoil is loamy sand in the upper part, sandy loam in the middle part, and loamy sand in the lower part. The substratum is loamy sand.

The gently sloping and sloping, excessively drained Coloma soils are in hilly areas of glacial drift. Their

surface layer is 2 inches of very dark brown loamy sand. The subsoil is loamy sand in the upper part, sand in the middle part, and banded sand and loamy sand in the lower part. The substratum is banded sand and fine sand.

The gently sloping to moderately steep, well-drained Mecan soils are on moraines in hilly areas. Their surface layer is 15 inches of very dark brown sandy loam. The subsoil is sandy loam and loamy sand. The substratum is loamy sand.

Minor soils in this association are in the Plainfield and Richford series. The nearly level to very steep, excessively drained Plainfield soils are on sandy hills. The nearly level to sloping, well-drained Richford soils are on outwash plains.

Most of this association is used for pasture or woodland. A few less sloping areas are used for crops. Corn, small grain, and alfalfa are the principal crops. Stones are a hazard to cultivation in some places. The soils in this association are droughty and are subject to soil blowing and water erosion when cropped.

The gently sloping and sloping soils in this association have moderate limitations for septic tank absorption fields.

Soils Formed Mainly in Outwash Sand and Gravel or Sand

Four soil associations are in this group. The soils in these associations formed in sandy, loamy, or organic material. The soils are underlain by outwash sand and gravel or sand.

6. *Richford-Rosholt-Billett association*

Well-drained, nearly level to gently sloping soils that formed in sandy and loamy deposits and outwash sand and gravel

This association is on glacial outwash plains. The soils are nearly level to gently sloping.

This association occupies about 18 percent of the county (fig. 4). About 39 percent of this association is Richford soils, 28 percent is Rosholt soils, 25 percent is Billett soils, and 8 percent is minor soils.

The nearly level to sloping Richford soils are on sandy outwash plains. Their surface layer is 7 inches of dark-brown loamy sand. The subsoil is loamy sand in the upper part, sandy loam in the middle part, and loamy sand in the lower part. The substratum is sand.

The nearly level and gently sloping Rosholt soils are on outwash plains. Their surface layer is 6 inches of dark-brown sandy loam. The subsoil is gravelly sandy loam in the upper part and gravelly loamy sand in the lower part. The substratum is sand and gravel.

The nearly level Billett soils are on outwash plains. Their surface layer is 9 inches of black sandy loam. The subsoil is gravelly sandy loam in the upper part and sandy loam in the lower part. The substratum is sand and gravel.

Minor in this association are the Leola, Oesterle, Pearl, and Roscommon variant soils. The nearly level, somewhat poorly drained Leola and Oesterle soils are in broad drainageways. The nearly level, moderately well drained Pearl soils are on plains. The nearly level, poorly drained Roscommon variant soils are in depressions and drainageways.

Most areas of this association are used for crops. Corn, small grain, and alfalfa are the principal crops. Many areas are irrigated and used for specialty crops. The soils in this association are slightly droughty during dry periods. They are also subject to soil blowing and water erosion.

This association has moderate limitations for septic tank absorption fields and slight limitations for basements.

7. *Plainfield-Friendship association*

Excessively drained and moderately well drained, nearly level to sloping soils that formed in deep sandy deposits

This association is on the sand plain. The soils are nearly level to sloping.

This association occupies about 13 percent of the county. About 52 percent of this association is Plainfield soils, 39 percent is Friendship soils, and 9 percent is minor soils.

The nearly level to sloping, excessively drained Plainfield soils are on sand plains. Their surface layer is 5 inches of very dark grayish-brown loamy sand. The subsoil is loamy sand in the upper part and sand in the lower part. The substratum is sand.

The nearly level, moderately well drained Friendship soils are on sandy plains and are saturated with water at a depth of 3 to 5 feet during periods of wetness. Their surface layer is 7 inches of very dark grayish-brown loamy sand. The subsoil is loamy sand in the upper part and sand in the lower part. The substratum is mottled sand.

Minor soils in this association are in the Meehan, Richford, and Roscommon series. The nearly level, somewhat poorly drained Meehan soils and poorly drained Roscommon soils are in drainageways and depressions. The nearly level to sloping, well-drained Richford soils are on the edges of sand plains adjacent to outwash plains.

Irrigated areas of this association are used for specialty crops. Areas not irrigated are used for pasture, Christmas trees, or woodland. Cultivated areas are subject to soil blowing if not protected.

This association has moderate limitations for septic tank absorption fields.

8. *Leola-Pearl association*

Moderately well drained and somewhat poorly drained, nearly level soils that formed in outwash sand

This association is on outwash plains. The soils are nearly level and have a high water table during periods of wetness.

This association occupies about 2 percent of the county. About 52 percent of this association is Leola soils, 33 percent is Pearl soils, and 15 percent is minor soils.

The nearly level, somewhat poorly drained Leola soils are in drainageways and depressions. The surface layer is 8 inches of very dark brown loamy sand. The subsoil is mottled loamy sand in the upper part, sandy loam in the middle part, and mottled loamy sand in the lower part. The substratum is mottled sand.

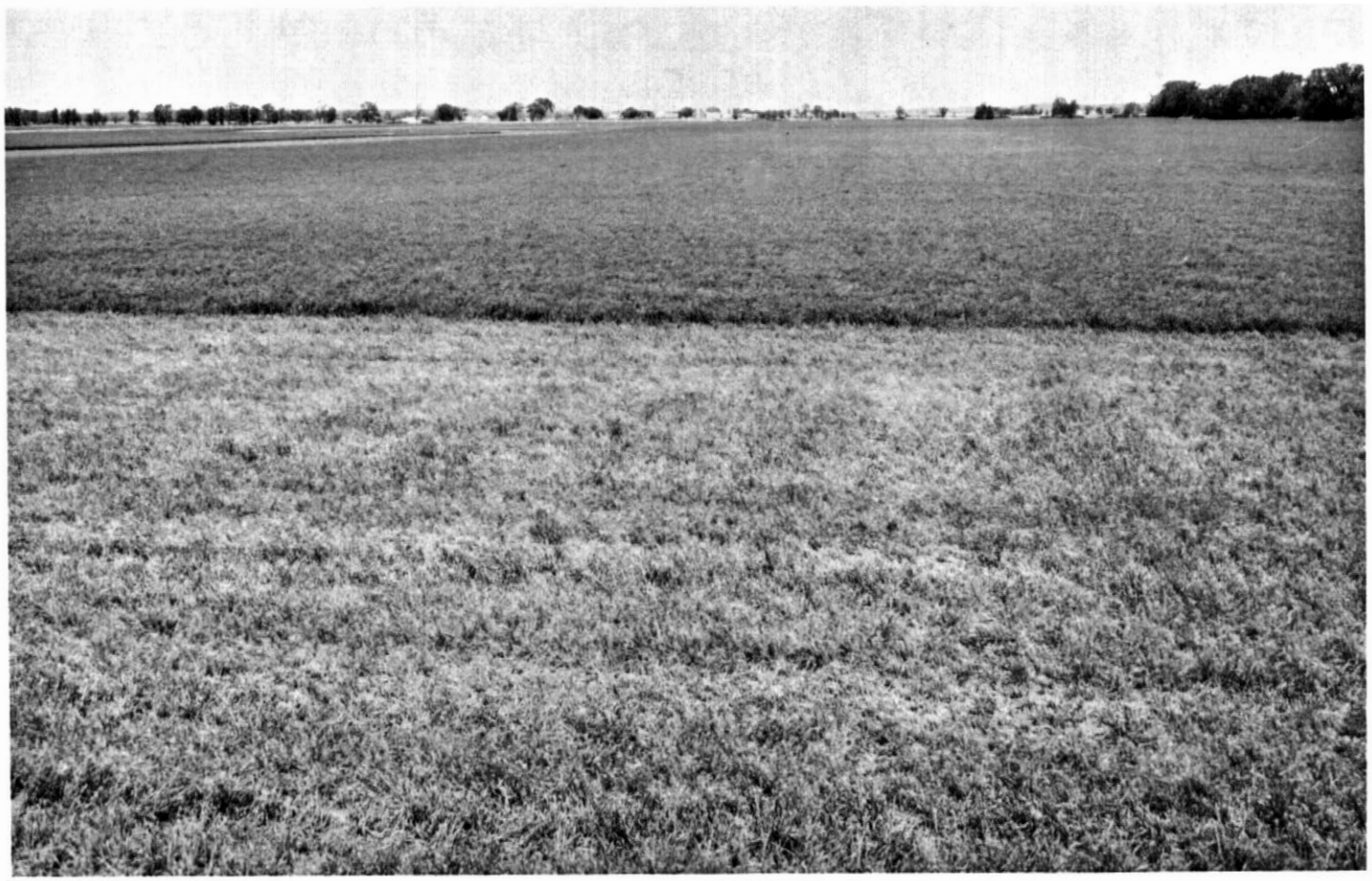

Figure 4.—Area of Richford-Rosholt-Billett association on a nearly level plain.

The nearly level, moderately well drained Pearl soils are on plains. Their surface layer is 8 inches of very dark grayish-brown loamy sand. The subsoil is mottled sandy loam in the upper part and mottled loamy sand in the lower part. The substratum is mottled sand.

Minor in this association are the Richford soils and the Roscommon variant soils. The gently sloping, well-drained Richford soils are on rises on the outwash plain. The nearly level, poorly drained Roscommon variant soils are in depressions and drainageways.

Many areas of this association are irrigated and used for specialty crops. Leola soils are saturated with water at a depth of less than 3 feet and Pearl soils at a depth of less than 5 feet during periods of wetness. These soils are droughty during dry periods. Corn, small grain, and clover are the principal crops in areas that are not irrigated. Cultivated areas are subject to soil blowing if not protected.

Leola soils have severe limitations and Pearl soils have moderate limitations for septic tank absorption fields and basements.

9. *Roscommon-Meehan-Markey association*

Somewhat poorly drained to very poorly drained, nearly level soils that formed in deep sandy deposits or, in places, in organic deposits that overlie the sand

This association is on sand plains. The soils are nearly level and have a very high water table during periods of wetness.

This association occupies about 19 percent of the county (fig. 5). About 43 percent of this association is Roscommon soils, 35 percent is Meehan soils, 10 percent is Markey soils, and 12 percent is minor soils.

The poorly drained Roscommon soils are in shallow depressions. Their surface layer is 9 inches of black muck. The subsoil is mottled sand. The substratum is sand.

The somewhat poorly drained Meehan soils are on the slight rises. Their surface layer is 7 inches of very dark brown loamy sand. The subsoil is mottled loamy sand. The substratum is sand.

The very poorly drained Markey soils are in broad depressions. They have 16 to 51 inches of black to dark-brown muck over a substratum of sand.

Minor in this association are the Friendship and Seelyeville soils. The moderately well drained Friendship soils are on tops of rises. The very poorly drained Seelyeville soils are in broad depressions where the organic deposit is more than 51 inches thick.

This association is less acid and is saturated with water at a shallower depth in Portage County than in Wood County, although the soils formed in similar materials.

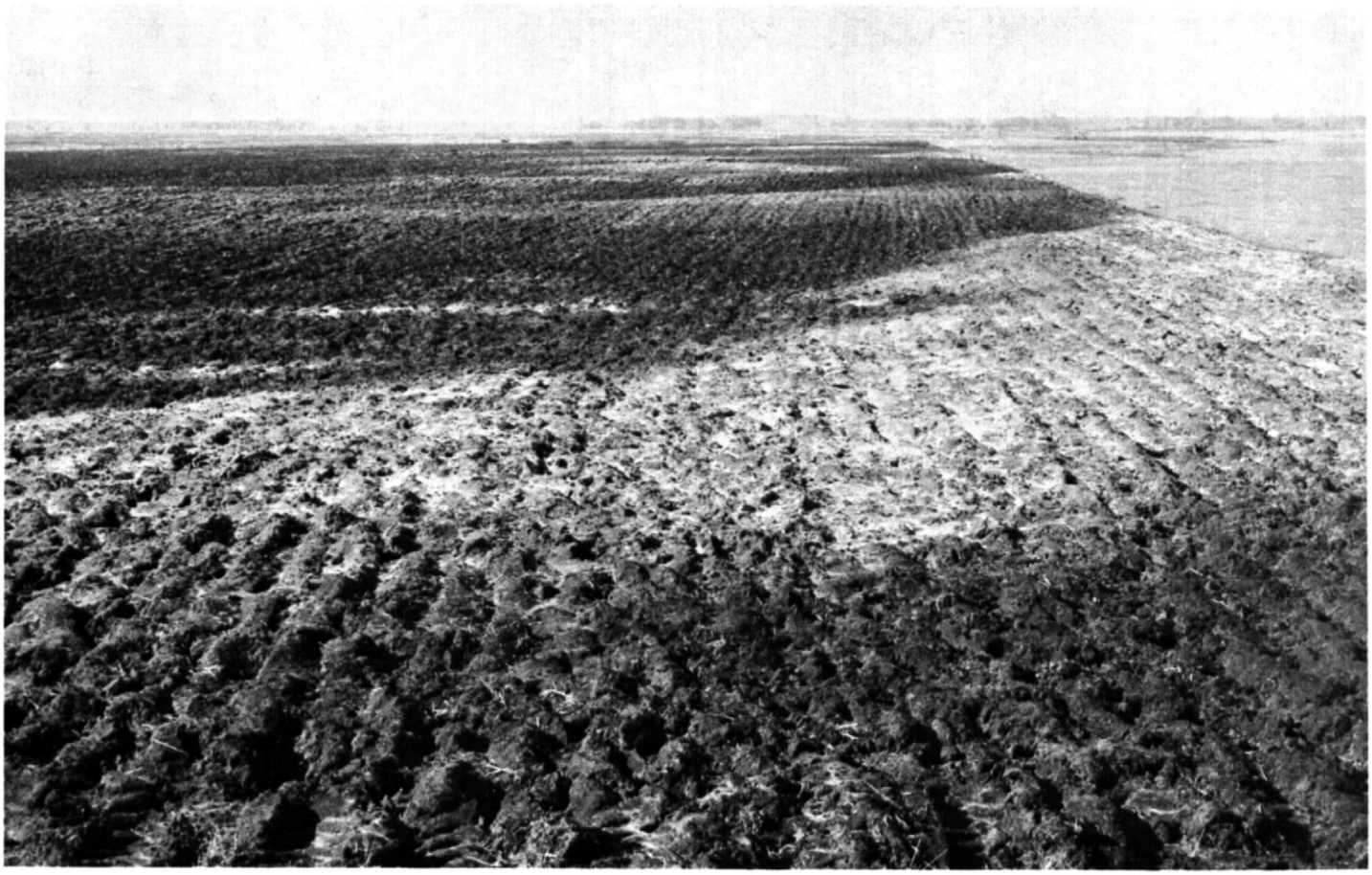

Figure 5.—Areas of Roscommon-Meehan-Markey association. Roscommon soils in foreground. Meehan soils in light-colored areas and Markey soils in depressions in background.

Most areas of this association are used for pasture. A few areas are drained and used for such crops as small grain and clover. Some areas are drained and irrigated for specialty crops. The soils are saturated with water at a depth of less than 3 feet during periods of wetness. Ponding is common in undrained areas. Frost is also a hazard to slow-maturing crops.

This association has severe and very severe limitations for septic tank absorption fields and basements.

Soils Formed in Alluvial or Organic Deposits

Two soil associations are in this group. The soils in these associations formed in sandy, loamy, or organic material. These soils are underlain by sandy or loamy alluvial or lacustrine deposits.

10. Alluvial land, wet-Dunnville association

Well-drained to very poorly drained, nearly level to gently sloping soils that formed in alluvial deposits

This association is on river terraces, benches, islands, and flood plains of active rivers and streams. The soils are nearly level to gently sloping.

This association occupies about 2 percent of the county. About 48 percent of this association is Alluvial land, wet, 20 percent is Dunnville soils, and 32 percent is minor soils.

Alluvial land, wet, is nearly level and is poorly drained to very poorly drained. It is on flood plains and islands along active rivers and streams. It consists of water-deposited materials of mixed origin that range in texture from sand to silt loam. It is subject to recurring floods.

The gently sloping, well-drained Dunnville soils are on river terraces and benches. Their surface layer is 12 inches of dark-brown very fine sandy loam. The subsoil is very fine sandy loam. The substratum is fine sand.

Minor in this association are the Dunnville variant, Meehan variant, and Plainfield variant soils. The nearly level, somewhat poorly drained Dunnville variant soils are in oxbows and drainageways that lead to the river or stream. The nearly level, somewhat poorly drained Meehan variant soils are within the present flood plain. The gently sloping, excessively drained Plainfield variant soils are on terraces above the present flood plain.

Many areas of this association are not suited to crops. Areas of Alluvial land, wet, remain in native vegetation. Some areas of Dunnville soils are used for crops. The areas used for crops are protected from flooding by flood-control structures. Corn, small grain, and alfalfa are the principal crops.

Areas of Dunnville soils that are not subject to flooding have moderate limitations for septic tank absorption fields and basements. Areas of Dunnville soils that are subject to flooding and areas of Alluvial land, wet, have very severe limitations for septic tank absorption fields and low buildings.

11. Markey-Seelyeville-Cathro association

Very poorly drained, nearly level soils that formed in organic deposits over sandy and loamy deposits

This association is in broad depressions and drainageways. The soils are nearly level.

This association occupies about 8 percent of the county. About 44 percent of this association is Markey soils, 31 percent is Seelyeville soils, 17 percent is Cathro soils, and 8 percent is minor soils.

The very poorly drained Markey soils are in broad depressions and drainageways. These soils have 16 to 51 inches of black to dark-brown muck over a sand substratum.

The very poorly drained Seelyeville soils are in former glacial lake basins and drainageways. These soils have more than 51 inches of black or very dark grayish-brown muck.

The very poorly drained Cathro soils are in broad depressions and drainageways. These soils have 16 to 51 inches of black to dark reddish-brown muck over loamy deposits.

Minor in this association are the Dancy, Lupton, and Roscommon soils. The nearly level, poorly drained Dancy soils are in drainageways. The nearly level, poorly drained Roscommon soils are in depressions and drainageways. The nearly level, very poorly drained Lupton soils are in broad depressions and are mainly covered with woody vegetation.

Most areas of this association are used for pasture or wildlife habitat. A few areas have been drained and are used for such specialty crops as cranberries and mint. The soils are subject to flooding or ponding. The growing season is short.

This association has very severe limitations for septic tank absorption fields, basements, and low buildings.

Descriptions of the Soils

This section describes the soil series and mapping units in Portage County. Each soil series is described in detail, and then, briefly, each mapping unit in that series. Unless it is specifically mentioned otherwise, it is to be assumed that what is stated about the soil series holds true for the mapping units in that series. Thus, to get full information about any one mapping unit, it is necessary to read both the description of the mapping unit and the description of the soil series to which it belongs.

An important part of the description of each soil series is the soil profile, that is, the sequence of layers from the surface downward to rock or other underlying material. Each series contains two descriptions of this profile. The first is brief and in terms familiar to the layman. The second is much more detailed and is for those who need to make thorough and precise studies of soils. Color terms are for moist soil unless otherwise stated. The profile described in the series is representative for mapping units in that series. If the profile of a given mapping unit is different from the one described for the series, these differences are stated in describing the mapping unit, or they are differences that are apparent in the name of the mapping unit.

As mentioned in the section "How This Survey Was Made," not all mapping units are members of a soil series. Rock land, for example, does not belong to a soil series, but nonetheless, is listed in alphabetic order along with the soil series.

Following the name of each mapping unit is a symbol in parentheses. This symbol identifies the mapping unit on the detailed soil map. Listed at the end of each description of a mapping unit is the capability unit, recreation group, wildlife group, and woodland group in which the mapping unit has been placed. The page for the description of each capability unit can be found by referring to the "Guide to Mapping Units" at the back of this survey.

The acreage and proportionate extent of each mapping unit are shown in table 1. Many of the terms used in describing soils can be found in the Glossary at the end of this survey, and more detailed information about the terminology and methods of soil mapping can be obtained from the Soil Survey Manual (*20*).[2]

In this survey the permeability is based on the slowest permeable layer within a depth of 60 inches, exclusive of the surface layer. If the permeability within different layers of soil varies by two or more classes, the permeability is given for each layer.

Alluvial Land, Wet

Alluvial land, wet (Ab) is poorly drained and very poorly drained and is nearly level. It is on flood plains of active streams and rivers. Areas are adjacent to and are dissected by watercourses. The water-deposited materials are of mixed origin. They have not been subject to soil-forming processes, because of recent and recurring deposition by floods. Texture ranges from sand to silt loam. Also, there are thin layers of organic matter.

Included with this land type in mapping are small areas of Dunnville very fine sandy loam, mottled subsoil variant; Meehan fine sandy loam, gravelly variant; and Markey soils.

During periods of wetness this land type is saturated with water at a depth of less than 1 foot. Most areas are subject to frequent flooding.

Most areas of this land type remain in native vegetation. A few areas are used for pasture or as woodland and wildlife habitat. Capability unit Vw–14; recreation group 6; wildlife group 7; woodland group 4w5.

Altdorf Series

The Altdorf series consists of deep, nearly level, poorly drained soils. These soils are in major drainageways on uplands. They formed in silty deposits and the underlying residuum from micaceous schist.

Italic numbers in parentheses refer to Literature Cited, p. 94.

TABLE 1.—*Approximate acreage and proportionate extent of the soils*

Soil	Acres	Percent	Soil	Acres	Percent
Alluvial land, wet	6,000	1.1	Plainfield loamy sand, 2 to 6 percent slopes	12,100	2.3
Altdorf silt loam	4,150	.8	Plainfield loamy sand, 6 to 12 percent slopes	700	.1
Billett sandy loam, 0 to 2 percent slopes	27,500	5.3	Plainfield loamy sand, granite substratum, 2 to 6 percent slopes	3,050	.6
Cathro muck	7,200	1.4	Plainfield and Kranski soils	4,500	.9
Coloma loamy sand, 2 to 6 percent slopes	2,900	.6	Plainfield sandy loam, gravelly variant, 2 to 6 percent slopes	1,350	.3
Coloma loamy sand, 6 to 12 percent slopes	5,900	1.2	Point sandy loam, 1 to 3 percent slopes	17,600	3.4
Dancy sandy loam	9,900	1.9	Richford loamy sand, 0 to 2 percent slopes	27,000	5.2
Dolph silt loam, 1 to 3 percent slopes	9,000	1.7	Richford loamy sand, 2 to 6 percent slopes	14,200	2.8
Dunnville very fine sandy loam, 2 to 6 percent slopes	2,400	.5	Richford loamy sand, 6 to 12 percent slopes	2,100	.4
Dunnville very fine sandy loam, mottled subsoil variant, 1 to 3 percent slopes	1,750	.3	Richford loamy fine sand, 2 to 6 percent slopes	500	.1
Friendship loamy sand, 0 to 3 percent slopes	26,300	5.1	Rockers loamy sand, 1 to 3 percent slopes	5,400	1.0
Kert silt loam, 1 to 3 percent slopes	1,400	.3	Rock land	330	.1
Kranski loamy sand, 2 to 6 percent slopes	3,600	.7	Roscommon muck	43,250	8.4
Kranski loamy sand, 6 to 12 percent slopes	9,900	1.9	Roscommon-Meehan complex, 0 to 3 percent slopes	2,950	.6
Kranski loamy sand, 12 to 20 percent slopes	4,250	.8	Roscommon sandy loam, loamy variant	3,500	.7
Leola loamy sand, 0 to 3 percent slopes	7,600	1.5	Roscommon sandy loam, loamy variant, loamy substratum	300	.1
Lupton muck	1,150	.2	Rosholt sandy loam, 0 to 2 percent slopes	2,200	.4
Markey muck	18,300	3.6	Rosholt sandy loam, 2 to 6 percent slopes	13,400	2.6
Markey muck, shallow	12,700	2.5	Rosholt sandy loam, 6 to 12 percent slopes, eroded	10,700	2.1
Marsh	2,150	.4	Rosholt loam, 2 to 6 percent slopes	13,200	2.6
Meadland loam, 1 to 3 percent slopes	11,300	2.2	Rosholt loam, 6 to 12 percent slopes, eroded	4,300	.8
Mecan loamy sand, 2 to 6 percent slopes	420	.1	Rosholt loam, loamy substratum, 0 to 2 percent slopes	670	.1
Mecan loamy sand, 6 to 12 percent slopes	3,600	.7	Rosholt complex, 12 to 20 percent slopes	2,700	.5
Mecan loamy sand, 12 to 20 percent slopes	1,300	.3	Rosholt complex, 20 to 40 percent slopes	4,100	.8
Mecan sandy loam, 2 to 6 percent slopes	680	.1	Rozellville loam, 2 to 6 percent slopes	11,000	2.1
Mecan sandy loam, 6 to 12 percent slopes	1,250	.2	Seelyeville muck	13,100	2.6
Mecan sandy loam, 12 to 20 percent slopes	430	.1	Sherry silt loam	560	.1
Meehan loamy sand, 0 to 3 percent slopes	34,500	6.7	Vesper silt loam	730	.1
Meehan loamy sand, sandstone substratum, 0 to 3 percent slopes	580	.1	Wyocena sandy loam, 2 to 6 percent slopes	14,800	2.9
Meehan sandy loam, red surface, 0 to 3 percent slopes	230	(1)	Wyocena sandy loam, 6 to 12 percent slopes	17,500	3.4
Meehan fine sandy loam, gravelly variant	1,050	.2	Wyocena sandy loam, 12 to 20 percent slopes	5,600	1.1
Mosinee sandy loam, 2 to 6 percent slopes	7,000	1.4	Wyocena sandy loam, 20 to 30 percent slopes	330	.1
Norgo silt loam, moderately deep variant, 2 to 6 percent slopes	610	.1	Total	515,840	100.0
Norgo silt loam, moderately deep variant, 6 to 12 percent slopes	440	.1			
Oesterle sandy loam	7,200	1.4			
Oesterle loam, silty subsoil variant	800	.1			
Pearl loamy sand, 1 to 3 percent slopes	4,800	.9			
Plainbo loamy sand, 2 to 6 percent slopes	810	.1			
Plainfield loamy sand, 0 to 2 percent slopes	21,000	4.1			

[1] Less than 0.05 percent.

In a representative profile the surface layer is silt loam about 7 inches thick. The subsurface layer is silt loam about 10 inches thick. The upper part is grayish brown and has dark yellowish-brown and yellowish-red mottles, and the lower part is light gray and has yellowish-red mottles. The subsoil is silty clay loam about 25 inches thick. The upper part is gray and has yellowish-red mottles; the middle part is reddish brown and gray and has yellowish-red mottles; and the lower part is dusky red and has dark yellowish-brown and gray mottles. The substratum is very dark grayish-brown and dusky-red silt loam that has strong-brown mottles.

Permeability is slow, and available water capacity is very high. The soils are saturated with water at a depth of less than 1 foot during periods of wetness. Bedrock is at a depth of 5 to 20 feet.

Most areas of these soils are used as woodland or for pasture. A few areas are drained and are used for crops. Some areas are subject to ponding.

Representative profile of Altdorf silt loam (0 to 2 percent slopes), 1,500 feet east and 75 feet north of the southwest corner of sec. 31, T. 24 N., R. 6 E.:

Ap—0 to 7 inches, very dark brown (10YR 2/2) silt loam, grayish brown (10YR 5/2) dry; few, fine, distinct, dark yellowish-brown (10YR 4/4) mottles; moderate, medium, granular structure; friable; many roots; medium acid; abrupt, smooth boundary.

A2—7 to 11 inches, grayish-brown (10YR 5/2) silt loam; few, fine, prominent, yellowish-red (5YR 5/8) and dark yellowish-brown (10YR 4/4) mottles; weak, thick, platy structure to moderate, very fine, subangular blocky; friable; few roots; slightly acid; clear, wavy boundary.

A&Bg—11 to 17 inches, 70 percent, by volume, light-gray (10YR 6/1) silt loam (A2); many, coarse, promi-

nent, yellowish-red (5YR 5/8) mottles; A2 part surrounds remnants of dark yellowish-brown (10YR 4/4) heavy silt loam (B); B part makes up 30 percent of mass, by volume; weak, very thick, platy structure to moderate, medium, subangular blocky; firm; few roots; slightly acid; clear, wavy boundary.

B&Ag—17 to 21 inches, gray (10YR 5/1) silty clay loam (Bt part); many, coarse, prominent, yellowish-red (5YR 5/8) mottles; moderate, fine, subangular blocky structure; firm; few roots; few, patchy clay films in Bt part; tongues of light-gray (10YR 6/1) heavy silt loam (A2) more than 15 millimeters in diameter throughout make up 40 percent of the mass, by volume; neutral; clear, wavy boundary.

IIB2t—21 to 30 inches, reddish-brown (5YR 4/4) and gray (5YR 5/1) heavy silty clay loam; many, medium, prominent, yellowish-red (5YR 5/8) mottles; moderate, medium, subangular blocky structure; firm; few roots; increase in percentage of coarse sand; 5 percent pebbles; thick, continuous clay films on surfaces of peds; neutral; gradual, wavy boundary.

IIB3t—30 to 42 inches, dusky-red (2.5YR 3/2) heavy silty clay loam; common, medium, prominent, dark yellowish-brown (10YR 4/4) and gray (10YR 5/1) mottles; weak, coarse, subangular blocky structure; firm; thick, patchy clay films on surfaces of peds; neutral; gradual, wavy boundary.

IIC—42 to 60 inches, very dark grayish brown (10YR 3/2) and dusky-red (2.5YR 3/2) silt loam; common, medium, prominent, strong-brown (7.5YR 5/6) mottles; massive; friable; 10 percent pebbles; highly micaceous; mildly alkaline.

The solum ranges from 40 to 50 inches in thickness. The upper layer of silty sediment ranges from 14 to 30 inches in thickness. In uncultivated areas there is a black A1 horizon 3 to 5 inches thick. Some profiles have an organic layer that is 2 to 3 inches thick. The A2 horizon ranges from 3 to 8 inches in thickness. The combined thickness of the A&Bg and B&Ag horizons ranges from 8 to 15 inches. The IIB2t horizon ranges from reddish brown to dark yellowish brown in color and from 8 to 16 inches in thickness. This horizon is silty clay loam or clay. The IIB3t horizon ranges from 8 to 15 inches in thickness and is dark reddish gray or dusky red. The IIC horizon is light silty clay loam, silt loam, or clay loam in the upper part and grades to fine sandy loam or silt loam in the lower part, depending on the mica and quartz content of the parent bedrock.

Altdorf soils are adjacent to Sherry soils and to somewhat poorly drained Dolph soils. They have more clay in the B horizon than Sherry soils. They are saturated at a shallower depth for longer periods than Dolph soils.

Altdorf silt loam (Af).—This nearly level soil occupies 15- to 40-acre tracts in the major drainageways of uplands. Included in mapping are small areas of Dolph and Sherry soils. Very stony areas are shown by spot symbols on the soil map.

Most areas of this soil are used for pasture or as woodland. Some areas are drained and are used for crops. Response of crops to lime and fertilizer is limited because the soil is saturated with water during periods of wetness. In some places, stones on the surface hinder cultivation. Some areas are subject to ponding. The hazard of frost heave is high. Capability unit IIIw–3; recreation group 5; wildlife group 6; woodland group 2o1.

Billett Series

The Billett series consists of nearly level, well-drained soils that are moderately deep to sand and gravel. These soils are on glacial outwash plains. They formed in loamy deposits and the underlying outwash sand and gravel.

In a representative profile the surface layer is sandy loam 9 inches thick. The upper part is black, and the lower part is dark brown. The subsoil, about 25 inches thick, is dark brown. The upper part is gravelly sandy loam, and the lower part is sandy loam. The substratum is yellowish-brown sand and gravel.

Permeability is moderately rapid in the surface layer and subsoil and very rapid in the substratum. Available water capacity is medium.

Most areas of these soils are used for crops.

Representative profile of Billett sandy loam, 0 to 2 percent slopes, 2,640 feet west and 990 feet south of the northeast corner of sec. 29, T. 23 N., R. 9 E.:

Ap—0 to 7 inches, black (10YR 2/1) sandy loam, dark gray (10YR 4/1) dry; moderate, fine, granular structure; friable; common roots; slightly acid; abrupt, smooth boundary.

A3—7 to 9 inches, dark-brown (10YR 3/3) sandy loam, brown (10YR 5/3) dry; weak, fine, subangular blocky structure; very friable; few roots; medium acid; clear, wavy boundary.

B1—9 to 16 inches, dark-brown (7.5YR 4/4) gravelly sandy loam; weak, fine, subangular blocky structure; friable; few roots; 20 percent pebbles and cobbles; medium acid; clear, wavy boundary.

B21t—16 to 21 inches, dark-brown (7.5YR 4/4) sandy loam; moderate, fine, subangular blocky structure; friable; few roots; discontinuous clay films on vertical and horizontal surfaces of peds; 3 percent clay increase; few pebbles; strongly acid; gradual, wavy boundary.

B22t—21 to 28 inches, dark-brown (7.5YR 4/4) heavy sandy loam; moderate, medium, subangular blocky structure; friable; few roots; moderately thick, continuous clay films on vertical and horizontal surfaces of peds; 5 percent pebbles; strongly acid; clear, wavy boundary.

IIB3t—28 to 34 inches, dark-brown (7.5YR 4/4) sandy loam; weak, medium, subangular blocky structure; very friable; weak clay bridging of sand grains and few, thin, patchy clay films on surfaces of peds; 10 percent pebbles; medium acid; gradual, wavy boundary.

IIC—34 to 60 inches, yellowish-brown (10YR 5/4) stratified sand and gravel; single grained; loose; medium acid.

The solum ranges from 30 to 40 inches in thickness. The Ap horizon is black to very dark grayish brown. In uncultivated areas the A1 horizon is 4 or 5 inches thick and is black. The A2 horizon ranges from dark grayish brown to pale brown and is as much as 4 inches thick in some places. The A3 horizon ranges from 1 to 5 inches in thickness. The combined B21t and B22t horizons range from 6 to 15 inches in thickness and are sandy loam or heavy sandy loam. The IIB3t horizon ranges from heavy loamy sand to sandy loam in texture and from 9 to 15 inches in thickness. The B2t horizon has few pebbles to 15 percent gravel, and the IIB3t and IIC horizons have 10 to 50 percent gravel.

Billett soils are adjacent to Richford and Rosholt soils. They have a finer textured solum than Richford soils. They have a thicker and darker A horizon than Rosholt soils.

Billett sandy loam, 0 to 2 percent slopes (Bt).—This nearly level soil occupies 40- to 640-acre tracts on outwash plains. Included in mapping are small areas of soils that have a surface layer of loam and small areas that have slopes of more than 2 percent. Also included are small areas of Richford and Rosholt soils.

Most areas of this soil are used for crops. Many areas are irrigated. Available water capacity is medium, and the hazard of soil blowing is slight. Capability unit IIIs–4; recreation group 1; wildlife group 1; woodland group 3o1.

Cathro Series

The Cathro series consists of nearly level, very poorly drained organic soils. These soils are in depressions and wet drainageways. They formed in 16 to 51 inches of organic deposits over loamy deposits.

In a representative profile the surface layer is 11 inches of very dark brown muck underlain by 24 inches of dark reddish-brown, very dark brown, and black muck. The substratum is greenish-gray sandy loam.

Permeability is moderate, and available water capacity is high. The soils are saturated with water at a depth of less than 1 foot during periods of wetness. Bedrock is at a depth of more than 5 feet. The growing season is short.

Most areas of these soils remain in natural vegetation.

Representative profile of Cathro muck (0 to 2 percent slopes) 440 feet north and 1,360 feet east of the southwest corner of sec. 28, T. 25 N., R. 7 E.:

Oa1—0 to 4 inches, very dark brown (10YR 2/2) sapric material, black (10YR 2/1) rubbed; weak, fine, granular structure; slightly sticky; many roots; less than 5 percent fiber when rubbed; medium acid; clear, wavy boundary.

Oa2—4 to 11 inches, very dark brown (10YR 2/2) sapric material; black (10YR 2/1) rubbed; moderate, medium, platy structure parting to weak, very fine, subangular blocky; slightly sticky; common roots; less than 5 percent fiber when rubbed; medium acid; clear, wavy boundary.

Oe1—11 to 18 inches, very dark brown (10YR 2/2) hemic material, black (10YR 2/1) rubbed; moderate, coarse, platy structure; slightly sticky; common roots; 25 percent fiber when rubbed; medium acid; clear, wavy boundary.

Oa3—18 to 30 inches, dark reddish-brown (5YR 2/2) sapric material, very dark brown (10YR 2/2) rubbed; moderate, coarse, platy structure; slightly sticky; few roots; less than 5 percent fiber when rubbed; medium acid; clear, wavy boundary.

Oa4—30 to 35 inches, black (10YR 2/1) sapric material, 20 percent mineral content that remains black when rubbed; massive; slightly sticky; less than 5 percent fiber when rubbed; neutral; abrupt, smooth boundary.

IICg—35 to 60 inches, greenish-gray (5GY 5/1) sandy loam; massive; slightly sticky; mildly alkaline.

The organic material ranges from 16 to 51 inches in thickness and from black to dark reddish brown in color. In places it contains thin lenses of fine sand, and in places are layers that have a high content of woody peat (sapric material). The organic layer just above the IIC horizon is mixed with mineral material in some profiles. The IIC horizon ranges from yellowish-red to greenish-gray sandy loam and light silty clay loam. Reaction ranges from medium acid to neutral in the organic part and from slightly acid to moderately alkaline in the IIC horizon.

Cathro soils are adjacent to Seelyeville and Markey soils. They have a thinner deposit of muck than Seelyeville soils. They have a finer textured IIC horizon than Markey soils.

Cathro muck (Ca).—This nearly level soil occupies 10- to 640-acre tracts in wet drainageways and depressions. Included in mapping are small areas of Seelyeville and Markey soils.

Most areas of this soil remain in natural vegetation of sedges, swamp grasses, and water-tolerant trees. A few areas are used for pasture, and a very few are used for crops. A short growing season and water saturation are the main limitations to the use of this soil for crops. Capability unit IVwc–9; recreation group 6; wildlife group 8; not assigned to a woodland group.

Coloma Series

The Coloma series consists of deep, gently sloping to sloping, excessively drained soils. These soils are in hilly areas of glacial drift. They formed in deep sandy deposits.

In a representative profile the surface layer is very dark brown loamy sand about 2 inches thick. The subsoil extends to a depth of 60 inches. The upper part is dark-brown and strong-brown loamy sand; the middle part is yellowish-brown and strong-brown sand; and the lower part, below a depth of 42 inches, is banded light yellowish-brown fine sand and yellowish-red loamy sand. The substratum is banded light yellowish-brown sand and yellowish-red fine sand.

Permeability is rapid, and available water capacity is low.

Most areas of these soils are used for pasture or as woodland.

Representative profile of Coloma loamy sand, 6 to 12 percent slopes, 1,280 feet north and 1,120 feet west of the southeast corner of sec. 11, T. 21 N., R. 10 E.:

A1—0 to 2 inches, very dark brown (10YR 2/2) loamy sand; very weak, fine, granular structure; very friable; many roots; medium acid; clear, wavy boundary.

B11—2 to 9 inches, dark-brown (7.5YR 4/4) and strong-brown (7.5YR 5/6) loamy sand; very weak, fine, subangular blocky structure; very friable; common roots; 10 percent gravel 2 to 15 millimeters in diameter; strongly acid; clear, wavy boundary.

B12—9 to 42 inches, yellowish-brown (10YR 5/6) and strong-brown (7.5YR 5/6) sand; very weak, fine, subangular blocky structure to single grained; very friable to loose; few roots; 5 percent gravel 2 to 10 millimeters in diameter; strongly acid; abrupt, wavy boundary.

A2&Bt—42 to 60 inches, light yellowish-brown (10YR 6/4) sand 2 to 4 inches thick (A2 part) alternating with yellowish-red (5YR 5/6) loamy sand lamellae ⅛ to ½ inch thick (Bt part); Bt part has weak, fine, subangular blocky structure and very friable consistence; A2 is single grained and loose; weak clay bridging of sand grains in Bt part; strongly acid; gradual, wavy boundary.

C—60 to 70 inches, light yellowish-brown (10YR 6/4) sand banded alternately with yellowish-red (5YR 5/6) fine sand; bands of sand are single grained and 3 to 6 inches thick; bands of fine sand are single grained and ⅛ to ½ inch thick; loose; medium acid.

The A1 horizon ranges from 2 to 5 inches in thickness and is very dark brown or dark brown. The A2 horizon, where present, is as much as 12 inches thick and is brown or light brown. In cultivated areas the Ap horizon ranges from 5 to 8 inches in thickness and is dark grayish brown, dark brown, or brown. The B1 horizon ranges from dark yellowish brown to strong brown and is loamy sand or sand. It ranges from 26 to 46 inches in thickness. The Bt part of the A2&Bt horizon is made up of lamellae ⅛ to ½ inch in thickness. The total thickness of all lamellae is less than 6 inches. The lamellae are loamy sand or heavy loamy sand and are strong brown or yellowish red. The A2 part of the A2&Bt horizon ranges from 1 inch to 8 inches in thickness. The C horizon is at a depth of 40 to 60 inches or more. It is loamy sand to coarse sand.

Coloma soils are adjacent to Kranski, Mecan, Plainfield, and Wyocena soils. They have coarser textured B and C horizons than Kranski, Mecan, and Wyocena soils. They have lamellae, which the Plainfield soils lack.

Coloma loamy sand, 2 to 6 percent slopes (CoB).—

This gently sloping soil occupies 5- to 40-acre tracts in areas of glacial drift. It has a profile similar to the one described as representative of the series, but the surface layer is slightly thicker. Included in mapping are small areas of Kranski, Mecan, Plainfield, and Wyocena soils. Also included are small areas of soils that have a surface layer of sand and small areas of soils that have slopes of more than 6 percent.

Most areas of this soil are used for pasture or as woodland. The low available water capacity, a severe hazard of soil blowing, and a moderate hazard of water erosion are the main limitations to the use of this soil for crops. Some of the wooded areas are used for Christmas trees. Capability unit IVs–3; recreation group 2; wildlife group 3; woodland group 3s1.

Coloma loamy sand, 6 to 12 percent slopes (CoC).—This sloping soil occupies 10- to 20-acre tracts in areas of glacial drift. It has the profile described as representative of the series. Included in mapping are small areas of Kranski, Mecan, and Wyocena soils. Also included are small areas of soils that have slopes of less than 6 percent or more than 12 percent, and small areas of soils that have a surface layer of sand. Severely eroded areas are shown by spot symbols on the soil map.

Most areas of this soil are used for pasture or as woodland. The low available water capacity, a severe hazard of soil blowing, and a hazard of water erosion are the main limitations to the use of this soil for crops. Some of the wooded areas are used for Christmas trees. Capability unit VIs–3; recreation group 2; wildlife group 3; woodland group 3s1.

Dancy Series

The Dancy series consists of deep, nearly level, poorly drained soils. These soils are in drainageways, depressions, and bog borders on uplands. They formed in loamy deposits and the underlying loamy residuum from igneous rock.

In a representative profile the surface layer is black and very dark gray sandy loam 8 inches thick. The subsurface layer is dark grayish-brown loamy sand 7 inches thick and has strong-brown mottles. The subsoil is 17 inches thick. The upper part is dark-brown sandy loam and has light brownish-gray mottles, and the lower part is gray and strong-brown loam. The substratum is gray and strong-brown loam.

Permeability is moderate, and available water capacity is high. The soils are saturated with water at a depth of less than 1 foot during periods of wetness. Stones commonly are on the surface. Bedrock is at a depth of 5 to 20 feet.

Many areas of these soils are used for pasture or as woodland. A few areas are cultivated.

Representative profile of Dancy sandy loam (0 to 2 percent slopes), 1,300 feet west and 1,650 feet south of the northeast corner of sec. 21, T. 25 N., R. 7 E.:

Ap—0 to 5 inches, black (10YR 2/1) sandy loam, dark gray (10YR 4/1) dry; weak, medium, granular structure; friable; many roots; medium acid; abrupt, smooth boundary.

A12—5 to 8 inches, very dark gray (10YR 3/1) light sandy loam, dark gray (10YR 4/1) dry; weak, medium, subangular blocky structure parting to weak, very fine, subangular blocky; friable; common roots; medium acid; clear, wavy boundary.

A2g—8 to 15 inches, dark grayish-brown (10YR 4/2) loamy sand; few, fine, prominent, strong-brown (7.5YR 5/6) mottles; weak, medium, subangular blocky structure; very friable; few roots; medium acid; gradual, wavy boundary.

B&A—15 to 18 inches, 80 percent dark-brown (7.5YR 4/4) sandy loam (B part); many, medium, distinct, light brownish-gray (10YR 6/2) mottles and common, medium, prominent, yellowish-brown (10YR 5/8) mottles; weak, medium, subangular blocky structure; friable; few roots; tongues of dark grayish-brown (10YR 4/2) loamy sand (A2 part), more than 15 millimeters in diameter; medium acid; clear, wavy boundary.

IIB2tg—18 to 25 inches, 60 percent gray (N 6/0) and 40 percent strong-brown (7.5YR 5/8) heavy loam; moderate, medium, subangular blocky structure; friable; few roots; thin, discontinuous clay films on surfaces of peds; medium acid; gradual, wavy boundary.

IIB3t—25 to 32 inches, gray (N 6/0) and strong brown (7.5YR 5/8) heavy loam; weak, medium, subangular blocky structure; friable; few, patchy clay films on surfaces of peds; significant increase in mica content; medium acid; gradual, wavy boundary.

IIC—32 to 60 inches, gray (N 6/0) and strong-brown (7.5YR 5/8) loam; massive; friable; medium acid.

The solum ranges from 24 to 40 inches in thickness. It is 10 to 30 percent stones throughout. The loamy upper story ranges from 15 to 30 inches in thickness. In some places as much as 12 inches of organic matter is on the surface. The Ap horizon is black or very dark brown. In uncultivated areas the A1 horizon ranges from 6 to 9 inches in thickness. The A2g horizon ranges from 3 to 17 inches in thickness. The B&A horizon ranges from 3 to 7 inches in thickness. The IIB2tg horizon ranges from 5 to 10 inches in thickness, from dark gray to grayish brown in color, and from heavy loam to sandy clay loam in texture. The IIB3t horizon ranges from 4 to 9 inches in thickness. The IIC horizon ranges from sandy loam to sandy clay loam.

Dancy soils are adjacent to the somewhat poorly drained Meadland, Point, and Rockers soils. They have a finer textured B horizon than Meadland soils and a finer textured solum than Rockers soils. They are saturated at a shallower depth and for longer periods than Point soils.

Dancy sandy loam (Da).—This nearly level soil occupies 10- to 200-acre tracts on uplands. Included in mapping are small areas of Meadland, Point, and Rockers soils. Also included are small areas of soils that have a surface layer of loamy sand and areas that have more than 20 percent stones in the surface layer. The very stony areas and areas of bedrock outcrop are indicated by a symbol on the soil map.

Most areas of this soil are in pasture or woodland. Saturation at a depth of less than 1 foot during periods of wetness and stones on the surface are the main limitations to the use of this soil for crops. Capability unit IVw–3; recreation group 5; wildlife group 7; woodland group 3w4.

Dolph Series

The Dolph series consists of deep, nearly level, somewhat poorly drained soils. These soils are on uplands. They formed in silty deposits and the underlying loamy residuum from igneous rock.

In a representative profile the surface layer is very dark grayish-brown silt loam 8 inches thick. The subsurface layer is brown silt loam 9 inches thick and has

brownish-yellow mottles. The subsoil is 13 inches thick. The upper part is dark-brown silty clay loam and has strong-brown and brown mottles, and the lower part is dark reddish-brown clay and has yellowish-red mottles. The substratum is dark reddish-brown clay loam and has yellowish-red mottles.

Permeability is slow, and available water capacity is high. The soils are saturated with water at a depth of less than 3 feet during periods of wetness. Bedrock is at a depth of 8 to 20 feet.

Most areas of these soils are used for crops. Some areas are used for pasture or as woodland.

Representative profile of Dolph silt loam, 1 to 3 percent slopes, 1,330 feet south and 20 feet west of the northeast corner of sec. 6, T. 24 N., R. 6 E.:

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) silt loam, light brownish gray (10YR 6/2) dry; weak, fine, granular structure; friable; many roots; strongly acid; abrupt, smooth boundary.

A2—8 to 11 inches, brown (10YR 5/3) silt loam; common, medium, prominent, brownish-yellow (10YR 6/6) mottles; weak, medium, platy structure to weak, very fine, subangular blocky; friable; common roots; strongly acid; clear, wavy boundary.

A&B—11 to 17 inches, 70 percent brown (10YR 5/3) silt loam (A2); many, medium, prominent, brownish-yellow (10YR 6/6) mottles; A2 surrounds remnants of dark yellowish-brown (10YR 4/4) heavy silt loam (B); weak, medium, platy structure to weak, very fine, subangular blocky; friable; common roots; strongly acid; gradual, wavy boundary.

B21t—17 to 20 inches, dark-brown (7.5YR 4/4) silty clay loam; common, medium, distinct, strong-brown (7.5YR 5/6) mottles and many, medium, distinct, brown (7.5YR 5/2) mottles; firm; few roots; thin, discontinuous clay films on surfaces of peds; silt coatings on surfaces of peds in some places; strongly acid; clear, wavy boundary.

IIB22t—20 to 30 inches, dark reddish-brown (2.5YR 3/4) clay; common, medium, prominent, yellowish-red (5YR 5/8) mottles; moderate, fine, subangular blocky structure; firm; few roots; thin, discontinuous clay films on surfaces of peds; strongly acid; clear, wavy boundary.

IIC—30 to 60 inches, dark reddish-brown (2.5YR 3/4) clay loam, common, coarse, prominent, yellowish-red (5YR 5/8) mottles; massive; firm; few dark reddish-brown (5YR 3/2) manganese concretions; medium acid.

The solum ranges from 24 to 40 inches in thickness. The silty upper story ranges from 15 to 24 inches in thickness. The Ap horizon is very dark grayish brown or dark grayish brown. In uncultivated areas the A1 horizon ranges from 3 to 5 inches in thickness and is black or very dark brown. The A2 horizon is grayish brown or brown and ranges from 2 to 8 inches in thickness. The A&B horizon ranges from 5 to 10 inches in thickness. Some profiles have a B&A horizon. The B21t horizon is silty clay loam or clay loam and ranges from 2 to 6 inches in thickness. The IIB22t horizon is heavy clay loam or clay that ranges from 8 to 13 inches in thickness. The IIC horizon is sandy clay loam to silty clay loam.

Dolph soils are adjacent to Meadland soils, well drained and moderately well drained Rozellville soils, and poorly drained Altdorf soils. They have finer textured B and C horizons than Meadland soils. They are saturated at a shallower depth and for a longer period than Rozellville soils and at a greater depth for a shorter period than Altdorf soils.

Dolph silt loam, 1 to 3 percent slopes (DoA).—This nearly level soil occupies 20- to 200-acre tracts on uplands. Included in mapping are small areas of Rozellville, Meadland, and Altdorf soils.

Most areas of this soil are used for crops. Response of crops to fertilizer is limited by water saturation at a depth of less than 3 feet during periods of wetness. The hazard of frost heave is moderate in the silty upper part of the soil. Areas subject to ponding are indicated on the map by a symbol for wetness. Surface drains are beneficial to crops commonly grown in the county. Capability unit IIw–3; recreation group 3; wildlife group 6; woodland group 3o1.

Dunnville Series

The Dunnville series consists of gently sloping, well-drained soils that are moderately deep to sand. These soils are on river terraces, benches, and islands. They formed in loamy deposits over alluvial sand.

In a representative profile the surface layer is dark-brown very fine sandy loam 12 inches thick. The subsoil is dark reddish-brown very fine sandy loam 18 inches thick. The substratum is yellowish-brown fine sand.

Permeability is moderately rapid, and available water capacity is medium.

Most areas of these soils are used for crops. Some areas are subject to occasional flooding from adjacent streams or rivers.

Representative profile of Dunnville very fine sandy loam, 2 to 6 percent slopes, 150 feet south and 80 feet east of the northwest corner of sec. 14, T. 25 N., R. 7 E.:

Ap—0 to 8 inches, dark-brown (7.5YR 3/2) very fine sandy loam, brown (7.5YR 4/2) dry; weak, medium, granular structure; friable; many roots; slightly acid; abrupt, smooth boundary.

A12—8 to 12 inches, dark-brown (7.5YR 3/2) very fine sandy loam, brown (7.5YR 4/2) dry; weak, medium, subangular blocky structure to weak, very fine, subangular blocky; friable; common roots; medium acid; clear, wavy boundary.

B2—12 to 30 inches, dark reddish-brown (5YR 3/4) very fine sandy loam; weak, medium, subangular blocky structure; friable; few roots; strongly acid; clear, wavy boundary.

IIC—30 to 60 inches, yellowish-brown (10YR 5/6) fine sand; single grained; loose; strongly acid.

The solum ranges from 24 to 40 inches in thickness. In uncultivated areas the A1 horizon ranges from 9 to 15 inches in thickness and is very dark reddish brown, dark brown, or very dark grayish brown. It is dark reddish gray to grayish brown when dry. The B horizon is very fine sandy loam or fine sandy loam. It is dark brown, dark reddish brown, or reddish brown and ranges from 12 to 28 inches in thickness. The IIC horizon ranges from fine sand to coarse sand and is 0 to 15 percent gravel.

Dunnville soils are adjacent to Plainfield variant soils and to somewhat poorly drained Dunnville variant soils. They have a finer textured solum than Plainfield variant soils and are saturated at a greater depth and for shorter periods than Dunnville variant soils.

Dunnville very fine sandy loam, 2 to 6 percent slopes (DuB).—This gently sloping soil occupies 10- to 160-acre tracts on river terraces, benches, and islands. Included in mapping are small areas of Plainfield variant soils and Dunnville variant soils. Also included are small areas of soils that have slopes of less than 2 percent or more than 6 percent; small areas that have a surface layer of fine sandy loam or loamy fine sand; and small areas that are saturated with water at a depth of less than 5 feet.

Most areas of this soil are used for crops. The haz-

ards of soil blowing, water erosion, and frost heave are moderate. Some areas are subject to occasional flooding. Capability unit IIIs–4; recreation group 1; wildlife group 1; woodland group 3o1.

Dunnville Variant

The Dunnville variant consists of nearly level, somewhat poorly drained soils that are moderately deep to sand. These soils are on river terraces, islands, river meanders, and oxbows. They formed in loamy deposits over alluvial sand.

In a representative profile the surface layer is very dark grayish-brown very fine sandy loam 10 inches thick. The subsoil is very fine sandy loam 24 inches thick. The upper part is dark brown and has brown mottles, and the lower part is dark brown and light brownish gray. The substratum is grayish-brown fine sand.

Permeability is moderately rapid, and available water capacity is medium. The soils are saturated with water at a depth of less than 3 feet during periods of wetness, and in most places they are subject to occasional flooding.

Most areas of these soils are used for pasture, or as woodland and wildlife habitat.

Representative profile of Dunnville very fine sandy loam, mottled subsoil variant, 1 to 3 percent slopes, 300 feet west and 100 feet south of the northeast corner of sec. 24, T. 23 N., R. 7 E.:

Ap—0 to 6 inches, very dark grayish-brown (10YR 3/2) very fine sandy loam, grayish brown (10YR 5/2) dry; weak, medium, granular structure; friable; common roots; strongly acid; abrupt, smooth boundary.

A12—6 to 10 inches, very dark grayish-brown (10YR 3/2) very fine sandy loam, grayish brown (10YR 5/2) dry; common, fine, distinct, dark-brown (7.5YR 4/4) mottles; weak, medium, subangular blocky structure; friable; few roots; strongly acid; clear, wavy boundary.

B1—10 to 17 inches, dark-brown (7.5YR 4/4) very fine sandy loam, common, fine, distinct, brown (7.5YR 5/2) mottles; weak, medium, subangular blocky structure; friable; few roots; strongly acid; gradual, wavy boundary.

B2—17 to 24 inches, dark-brown (7.5YR 4/4) very fine sandy loam; many, distinct, medium, light brownish-gray (10YR 6/2) mottles; weak, medium, subangular blocky structure; friable; few roots; strongly acid; gradual, wavy boundary.

B3g—24 to 34 inches, 70 percent light brownish-gray (10YR 6/2) and 30 percent dark-brown (7.5YR 4/4) very fine sandy loam; weak, medium, subangular blocky structure; friable; strongly acid; clear, wavy boundary.

IIC—34 to 60 inches, grayish-brown (10YR 5/2) fine sand; single grained; loose; strongly acid.

The solum ranges from 24 to 40 inches in thickness. In uncultivated areas the A1 horizon ranges from 9 to 14 inches in thickness. It is very dark brown, very dark grayish brown, or dark brown when moist and is brown or grayish brown when dry. The B horizon is very fine sandy loam or fine sandy loam and is 12 to 30 inches thick. The B2 horizon has 30 to 50 percent mottles of a low chroma. The IIC horizon ranges from fine sand to coarse sand and 0 to 15 percent gravel.

Dunnville variant soils are adjacent to well-drained Dunnville soils, to Meehan variant soils, and to poorly drained Alluvial land, wet. They have a finer textured solum than Meehan variant soils.

Dunnville very fine sandy loam, mottled subsoil variant, 1 to 3 percent slopes (DxA).—This nearly level soil occupies 5- to 100-acre tracts on river terraces, islands, meanders, and oxbows. Included in mapping are small areas of Dunnville soils on ridges and small areas of Alluvial land, wet, in pockets or depressions. Also included are small areas of Meehan variant soils. Wet areas are indicated on the soil map by a symbol for wetness.

Most areas of this soil are used for pasture or as woodland and wildlife habitat. Only a few areas are cropped, because of the intermingling of wet areas, drainageways, and small ridges. Saturation during periods of wetness and occasional flooding are the main limitations to the use of this soil for crops. Capability unit IIw–5; recreation group 3; wildlife group 6; woodland group 3o1.

Friendship Series

The Friendship series consists of deep, nearly level, moderately well drained soils. These soils are on sand plains and river terraces. They formed in deep, medium to coarse sand.

In a representative profile (fig. 6), the surface layer is very dark grayish-brown loamy sand 7 inches thick. The subsoil is 23 inches thick. The upper part is yellowish-brown loamy sand, and the lower part is

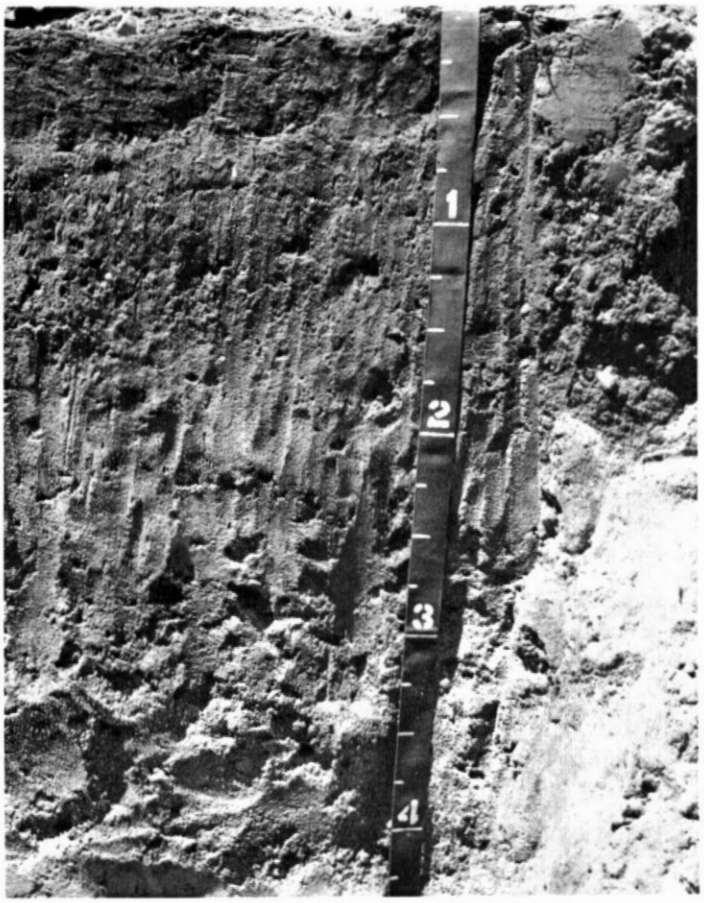

Figure 6.—**Profile of an area of Friendship loamy sand, 0 to 3 percent slopes, in a cultivated field.**

brownish-yellow medium sand. The substratum is pale-brown medium sand that extends to a depth of 60 inches. The upper part has strong-brown and yellowish-brown mottles, and the lower part has strong-brown and grayish-brown mottles.

Permeability is rapid, and available water capacity is low. The soils are saturated with water at a depth of 3 to 5 feet during periods of wetness. Bedrock is at a depth of more than 10 feet.

Many areas of these soils are used for crops. Some areas are used for pasture or as woodland.

Representative profile of Friendship loamy sand, 0 to 3 percent slopes, 1,950 feet south and 30 feet west of the northeast corner of sec. 36, T. 25 N., R. 8 E.:

Ap—0 to 7 inches, very dark grayish-brown (10YR 3/2) loamy sand, grayish brown (10YR 5/2) dry; weak, fine, granular structure; very friable; common roots; neutral; abrupt, smooth boundary.

B2—7 to 19 inches, yellowish-brown (10YR 5/6) loamy sand; weak, medium, subangular blocky structure; very friable; few roots; slightly acid; gradual, wavy boundary.

B3—19 to 30 inches, brownish-yellow (10YR 6/6) medium sand; weak, medium, subangular blocky structure; loose; few roots; medium acid; gradual, wavy boundary.

C1—30 to 56 inches, pale-brown (10YR 6/3) medium sand; common, medium, prominent, yellowish-brown (10YR 5/6) and strong-brown (7.5YR 5/8) mottles; single grained; loose; medium acid; gradual, wavy boundary.

C2—56 to 60 inches, pale-brown (10YR 6/3) medium sand; common, medium, prominent strong-brown (7.5YR 5/8) mottles and few, fine, faint, grayish-brown (10YR 5/2) mottles; single grained; loose; medium acid.

The solum ranges from 24 to 36 inches in thickness. It is 0 to 15 percent gravel. The Ap horizon is very dark brown, dark brown, or very dark grayish brown. In uncultivated areas the A1 horizon ranges from 1 to 5 inches in thickness and is black or very dark brown. The A3 horizon is brown or pale-brown loamy sand or sand that ranges from 2 to 6 inches in thickness. The B horizon ranges from 10 to 26 inches in thickness and is loamy sand or sand. The B2 horizon is brown, yellowish brown, brownish yellow, or strong brown.

Friendship soils are adjacent to Pearl soils, excessively drained Plainfield soils, and somewhat poorly drained Meehan soils. They have less clay in the B horizon than Pearl soils.

Friendship loamy sand, 0 to 3 percent slopes (FrA).—This nearly level soil occupies 5- to 200-acre tracts on sand plains and river terraces. Included in mapping are small areas of Plainfield, Meehan, and Pearl soils. Also included are small areas of soils that have a red surface layer because of the influence of iron. Severely eroded spots and blowouts are identified by symbols.

Much of the acreage of this soil is used for crops. Response of crops to lime and fertilizer is limited by the low available water capacity and a severe hazard of soil blowing. Irrigation is beneficial to potatoes and other vegetable crops. Capability unit IVs–3; recreation group 2; wildlife group 3; woodland group 3s1.

Kert Series

The Kert series consists of deep, nearly level, somewhat poorly drained soils. These soils are on uplands. They formed in silty deposits and the underlying sandstone and shale residuum.

In a representative profile the surface layer is dark-brown silt loam 6 inches thick. The subsurface layer is brown silt loam 7 inches thick and has yellowish-red mottles. The subsoil is 13 inches thick. The upper 9 inches is dark yellowish-brown silt loam and has yellowish-red, grayish-brown, and yellowish-brown mottles, and the lower 4 inches is dark yellowish-brown and grayish-brown sandy loam and has yellowish-red mottles. The substratum is multicolored banded sand, loamy sand, and clay.

Permeability is slow, and available water capacity is medium. The soils are saturated with water at a depth of less than 3 feet during periods of wetness. In some places many stones are on the surface. Hard sandstone bedrock is at a depth of 4 to 15 feet. Frost heave is a hazard.

Most areas of these soils are used for crops. Some areas are used for pasture or as woodland.

Representative profile of Kert silt loam, 1 to 3 percent slopes, 600 feet east and 30 feet south of the northwest corner of sec. 18, T. 23 N., R. 7 E.:

Ap—0 to 6 inches, dark-brown (10YR 3/3) silt loam, pale brown (10YR 6/3) dry; weak, fine, granular structure; friable; common roots; very strongly acid; abrupt, smooth boundary.

A2—6 to 9 inches, brown (10YR 5/3) silt loam; few, fine, prominent, yellowish-red (5YR 5/8) mottles; weak, thin, platy structure; very friable; few roots; very strongly acid; clear, wavy boundary.

A&B—9 to 13 inches, 70 percent brown (10YR 5/3) silt loam (A2); few, fine, prominent, yellowish-red (5YR 5/8) mottles; A2 part surrounds remnants of dark yellowish-brown (10YR 4/4) silt loam (B2); weak, medium, platy structure to weak, very fine, subangular blocky; friable, few roots; very strongly acid; clear, wavy boundary.

B&A—13 to 18 inches, 60 percent dark yellowish-brown (10YR 4/4) heavy silt loam (B); few, fine, prominent, yellowish-red (5YR 5/8) mottles; weak, fine, subangular blocky structure; friable; few roots; few, patchy clay films on surfaces of peds in Bt part; tongues of brown (10YR 5/3) silt loam (A2), more than 15 millimeters in diameter throughout; very strongly acid; clear, wavy boundary.

B2t—18 to 22 inches, dark yellowish-brown (10YR 4/4) heavy silt loam; common, medium, distinct, grayish-brown (10YR 5/2) mottles and many, medium, prominent, yellowish-brown (10YR 5/8) mottles; weak, medium, subangular blocky structure; friable; few roots; weak, patchy clay films on surfaces of peds; tongues of brown (10YR 5/3) silt loam (A2) more than 10 millimeters in diameter throughout; silt coatings on surfaces of peds; very strongly acid; clear, wavy boundary.

IIB3t—22 to 26 inches, dark yellowish-brown (10YR 4/4) and grayish-brown (10YR 5/2) sandy loam; common, medium, prominent, yellowish-red (5YR 5/8) mottles; weak, coarse, subangular blocky structure; very friable; thin, discontinuous clay films on surfaces of peds; very strongly acid; clear, wavy boundary.

IIC—26 to 60 inches, banded sandstone and shale residuum; bands 3 to 5 inches thick; very strongly acid; sandstone flags throughout; the shale residuum is dark-gray (10YR 4/1), grayish-brown (10YR 5/2), and dark yellowish-brown (10YR 4/4) clay; massive; firm. The sandstone residuum is yellowish-red (5YR 5/8) and dark yellowish-brown (10YR 4/4 and 3/4) sand and loamy sand; single grained; loose.

The solum ranges from 24 to 40 inches in thickness. It is 5 to 15 percent sandstone fragments. The upper story of silty sediment ranges from 15 to 30 inches in thickness. In uncultivated areas the A1 horizon ranges from 3 to 5 inches

in thickness and is very dark grayish brown. The A2 horizon is dark grayish brown to light brownish gray and from 2 to 9 inches in thickness. The combined A&B and B&A horizons range from 5 to 19 inches in thickness. The B&A horizon ranges from heavy loam to light silty clay loam. The B2t horizon is reddish-brown to olive-brown. It ranges from heavy sandy loam to silty clay loam in texture and from 3 to 8 inches in thickness. The IIB3t horizon ranges from sandy loam to clay loam in texture and from 3 to 8 inches in thickness. The IIC horizon has variable texture because of the interlayering of the residuum.

Kert soils are adjacent to the well-drained Norgo variant soils and to the poorly drained Vesper and Sherry soils. They differ from the Norgo variant, Vesper, and Sherry soils in that they are underlain by interlayered sandstone and shale residuum.

Kert silt loam, 1 to 3 percent slopes (KeA).—This nearly level soil occupies 10- to 80-acre tracts on uplands. Included in mapping are small areas of Norgo variant, Sherry, and Vesper soils. Also included are small areas of soils that have no shale bands in the substratum.

Most areas of this soil are used for crops. Response of crops to lime and fertilizer is limited because of water saturation during periods of wetness. In some places ponding limits cultivation. Areas subject to ponding are indicated on the map by a symbol for wetness. Surface drains are beneficial to such commonly grown crops as corn, small grain, and hay. Capability unit IIw–3; recreation group 3; wildlife group 6; woodland group 2o1.

Kranski Series

The Kranski series consists of deep, gently sloping to very steep, excessively drained soils. These soils are on moraines. They formed in sandy glacial till.

In a representative profile the surface layer is dark-brown loamy sand 5 inches thick. The subsurface layer is yellowish-brown loamy sand 6 inches thick. The subsoil is 25 inches thick. The upper part is strong-brown loamy sand, the middle part is reddish-brown sandy loam, and the lower part is yellowish-red loamy sand. The substratum is dark-brown loamy sand.

Permeability is moderately rapid, and available water capacity is low.

Most areas of these soils are used as woodland or for pasture. Less sloping areas are used for crops. Stones on the surface and low available water capacity are limitations to the use of these soils for crops.

Representative profile of Kranski loamy sand, 6 to 12 percent slopes, 200 feet west and 1,300 feet north of the southeast corner of sec. 5, T. 21 N., R. 9 E.:

Ap—0 to 5 inches, dark-brown (10YR 3/3) loamy sand, brown (10YR 5/3) dry; weak, fine, subangular blocky structure to weak, medium, granular; very friable; common roots; medium acid; abrupt, smooth boundary.

A2—5 to 11 inches, yellowish-brown (10YR 5/4) loamy sand; weak, fine, subangular blocky structure; very friable; common roots; medium acid; clear, wavy boundary.

B1—11 to 16 inches, strong-brown (7.5YR 5/6) loamy sand; weak, medium, subangular blocky structure; very friable; common roots; medium acid; clear, wavy boundary.

B2t—16 to 24 inches, reddish-brown (5YR 4/4) light sandy loam; weak and moderate, medium, subangular blocky structure; friable; common roots; discontinuous clay films on vertical and horizontal surfaces of peds; 10 percent gravel, cobbles, and stones; medium acid; clear, wavy boundary.

B3t—24 to 36 inches, yellowish-red (5YR 4/6) loamy sand; weak, medium, subangular blocky structure; very friable; weak clay bridging; 10 percent gravel, cobbles, and stones; medium acid; clear, wavy boundary.

C—36 to 60 inches, dark-brown (7.5YR 4/4) loamy sand glacial till; massive; very friable; 10 percent gravel, cobbles, and stones; medium acid.

The solum ranges from 28 to 40 inches in thickness. It is 5 to 15 percent gravel, cobbles, and stones throughout. The Ap horizon is dark brown or brown. In uncultivated areas the A1 horizon ranges from 2 to 4 inches in thickness. The A2 horizon ranges from 2 to 6 inches in thickness. The B1 horizon is loamy sand or light sandy loam and ranges from 2 to 6 inches in thickness. The B2t horizon ranges from heavy loamy sand to heavy sandy loam and is 5 to 10 inches thick. The B3t horizon is loamy sand or light sandy loam and ranges from 6 to 14 inches in thickness. The C horizon ranges from medium acid to neutral.

Kranski soils are adjacent to Coloma, Plainfield, Mecan, and Wyocena soils. They have finer textured B and C horizons than Plainfield or Coloma soils. They have a thinner solum than Mecan soils. They have a coarser textured solum than Wyocena soils.

Kranski loamy sand, 2 to 6 percent slopes (KrB).—This gently sloping soil occupies 5- to 40-acre tracts in areas of glacial till. It has a profile similar to the one described as representative of the series, but the combined A and B horizons are slightly thicker. Included in mapping are small areas of soils that have a surface layer of sandy loam, small areas that have lost 3 to 5 inches of the surface layer through erosion, and areas that have slopes of more than 6 percent. Also included are small areas of Coloma, Plainfield, Wyocena, and Mecan soils. Eroded areas and very stony areas are indicated by symbols.

Most areas of this soil are used for crops. Response of crops to lime and fertilizer is limited by the low available water capacity. The hazards of severe soil blowing and moderate water erosion are limitations to the use of this soil for crops. Capability unit IIIe–4; recreation group 2; wildlife group 3; woodland group 3o1.

Kranski loamy sand, 6 to 12 percent slopes (KrC).—This sloping soil occupies 10- to 100-acre tracts in areas of glacial deposits. It has the profile described as representative of the series. Included in mapping are small areas of soils that have a surface layer of sandy loam, small areas that have lost 3 to 5 inches of the surface layer through erosion, and areas that have slopes of less than 6 percent or more than 12 percent. Also included are small areas of Coloma, Plainfield, Wyocena, and Mecan soils. Very stony areas and severely eroded areas are identified on the map by symbols.

Most areas of this soil are used for pasture or as woodland. Some are used for grain and hay crops. Response of crops to lime and fertilizer is limited by the low available water capacity. Severe hazards of soil blowing and water erosion are limitations to the use of this soil for crops. Capability unit IVe–4; recreation group 2; wildlife group 3; woodland group 3o1.

Kranski loamy sand, 12 to 20 percent slopes (KrD).—This moderately steep soil occupies 10- to 100-acre tracts in areas of glacial till. It has a profile similar to the one described as representative of the series, but the combined surface layer and subsoil are slightly

thinner. Included in mapping are small areas of soils that have lost 3 to 5 inches of the surface layer through erosion and areas that have slopes of less than 12 percent or more than 20 percent. Also included are areas of Coloma, Wyocena, and Mecan soils. Very stony areas and areas that have lost all or nearly all of the surface layer are identified by symbols.

This soil is better suited to use for pasture or as woodland or wildlife habitat than to cultivated crops. Low available water capacity, stones on the surface, and severe hazard of soil blowing, and a very severe hazard of water erosion are the main limitations to the use of this soil for crops. Capability unit VIe–4; recreation group 2; wildlife group 3; woodland group 3r2.

Leola Series

The Leola series consists of deep, nearly level, somewhat poorly drained soils. These soils are on outwash plains. They formed in medium sand outwash.

In a representative profile the surface layer is loamy sand 18 inches thick. The upper part is very dark brown, and the lower part is dark yellowish-brown and has strong-brown mottles. The subsoil is 24 inches thick. The upper part is yellowish-brown loamy sand and has strong-brown mottles, the middle part is light brownish-gray and strong-brown sandy loam, and the lower part is light brownish-gray loamy sand and has strong-brown mottles. The substratum is light brownish-gray medium sand and has strong-brown mottles.

Permeability is moderately rapid, and available water capacity is low. The soils are saturated with water at a depth of less than 3 feet during periods of wetness. Bedrock is at a depth of more than 10 feet.

Most areas of these soils are used for crops. Some areas are used for pasture or as woodland.

Representative profile of Leola loamy sand, 0 to 3 percent slopes, 1,320 feet west and 150 feet south of the northeast corner of sec. 21, T. 21 N., R. 8 E.:

Ap—0 to 8 inches, very dark brown (10YR 2/2) loamy sand, grayish brown (10YR 5/2) dry; weak, fine, subangular blocky structure; very friable; many roots; 5 percent pebbles; strongly acid; abrupt, smooth boundary.

A3—8 to 18 inches, dark yellowish-brown (10YR 4/4) loamy sand; common, medium, prominent, strong-brown (7.5YR 5/8) mottles; weak, medium, subangular blocky structure; very friable; many roots; 5 percent pebbles; medium acid; clear, wavy boundary.

B1—18 to 26 inches, yellowish-brown (10YR 5/4) heavy loamy sand; many, medium, prominent, strong-brown (7.5YR 5/8) mottles; weak, medium, subangular blocky structure; very friable; common roots; 5 percent pebbles; medium acid; gradual, wavy boundary.

B2t—26 to 36 inches, light brownish-gray (10YR 6/2) and strong-brown (7.5YR 5/8) sandy loam; weak, medium, subangular blocky structure; very friable; common roots; thin clay bridging of sand grains; 5 percent pebbles; very strongly acid; gradual, wavy boundary.

B3tg—35 to 42 inches, light brownish-gray (10YR 6/2) loamy sand; many, coarse, prominent, strong-brown (7.5YR 5/8) mottles; moderate, coarse, subangular blocky structure; very friable; few roots; thin clay bridging of sand grains; 5 percent pebbles; medium acid; gradual, wavy boundary.

C—42 to 60 inches, light brownish-gray (10YR 6/2) medium sand; many, coarse, prominent, strong-brown (7.5YR 5/8) mottles; single grained; loose; slightly acid.

The solum ranges from 30 to 50 inches in thickness. It is 5 to 15 percent pebbles. In uncultivated areas the A1 horizon is very dark brown or black in color and ranges from 3 to 5 inches in thickness. The A3 horizon is dark yellowish brown to pale brown in color and ranges from 8 to 15 inches in thickness. The B1 horizon is loamy sand, heavy loamy sand, or light sandy loam. It ranges from 4 to 10 inches in thickness. The B2t horizon ranges from 6 to 11 inches in thickness and from heavy loamy sand to heavy sandy loam in texture. It has 20 to 60 percent colors of low chroma. The B3t horizon is 5 to 9 inches thick.

Leola soils are adjacent to Meehan and Oesterle soils, moderately well drained Pearl soils, poorly drained Roscommon soils, and Roscommon variant soils. They have a finer textured B horizon than Meehan soils. They have a coarser textured solum than Oesterle soils.

Leola loamy sand, 0 to 3 percent slopes (LeA).—This nearly level soil occupies 20- to 250-acre tracts on outwash plains. Included in mapping are small areas of Meehan, Oesterle, Pearl, and Roscommon variant soils. Also included are small areas of soils that have a surface layer of sandy loam.

Much of the acreage of this soil is used for crops. Response of crops to lime and fertilizer is limited by low available water capacity in dry periods and water saturation at a depth of less than 3 feet during periods of wetness. This soil is well suited to irrigated crops if it is drained. Capability unit IIIw–6; recreation group 4; wildlife group 6; woodland group 3w4.

Lupton Series

The Lupton series consists of deep, nearly level, very poorly drained organic soils. These soils are in former glacial lake basins. They formed in woody organic deposits.

In a representative profile the soils are black muck to a depth of 60 inches.

Permeability is moderately rapid, and available water capacity is very high. The soils are saturated with water at a depth of less than 1 foot during periods of wetness. The growing season is short.

Most areas of these soils remain in natural vegetation. Drained areas are subject to severe hazards of soil blowing and subsidence.

Representative profile of Lupton muck (0 to 2 percent slopes) 750 feet west and 50 feet south of the northeast corner of sec. 23, T. 25 N., R. 10 E.:

Oa1—0 to 6 inches, black (N 2/0) sapric material; weak, medium, granular structure; nonsticky; many roots; 30 percent woody fragments when not rubbed and less than 10 percent fiber when rubbed; mildly alkaline; abrupt, wavy boundary.

Oa2—6 to 12 inches, black (N 2/0) sapric material; weak, coarse, platy structure; nonsticky; few roots; 30 percent woody fragments when not rubbed and less than 10 percent fiber when rubbed; mildly alkaline; abrupt, wavy boundary.

Oa3—12 to 60 inches, black (N 2/0) sapric material; weak, medium, granular structure; nonsticky; 30 percent woody fragments when not rubbed and less than 5 percent fiber when rubbed; mildly alkaline.

The organic deposits consist of more than 51 inches of black sapric material. The profile is 20 to 40 percent, by volume, woody fibers throughout when not rubbed. Some profiles have thin layers that are more than 10 percent woody fiber when rubbed. The structure is granular, platy, or massive.

Lupton soils are adjacent to Markey and Seelyeville soils. They have thicker organic deposits than Markey soils. They have more woody fragments than Seelyeville soils.

Lupton muck (Lu).—This nearly level soil occupies 10- to 160-acre tracts in wooded bogs in former glacial lake basins. Included in mapping are small areas of Markey and Seelyeville soils.

Most of these soils remain in natural vegetation of white cedar, tamarack, and birch. Capability unit IVwc–9; recreation group 6; wildlife group 8; not assigned to a woodland group.

Markey Series

The Markey series consists of nearly level, very poorly drained organic soils. These soils are in drainageways and former glacial lake basins. They formed in 16 to 51 inches of organic deposit over sand.

In a representative profile black muck extends to a depth of 35 inches. Gray sand is below the muck.

Permeability is moderately rapid, and available water capacity is high. The soils are saturated with water at a depth of less than 1 foot during periods of wetness, unless drained.

Most areas of these soils are used for pasture and crops or as wildlife habitat.

Representative profile of Markey muck (0 to 2 percent slopes) 180 feet east and 2,480 feet south of the northeast corner of sec. 30, T. 24 N., R. 9 E.:

Oa1—0 to 10 inches, black (N 2/0) sapric material; weak, medium, granular structure; slightly sticky; common roots; less than 5 percent fiber when rubbed; neutral; abrupt, wavy boundary.

Oa2—10 to 16 inches, black (N 2/0) sapric material; weak, medium, subangular blocky structure; slightly sticky; common roots; less than 5 percent fiber when rubbed; slightly acid; abrupt, wavy boundary.

Oa3—16 to 24 inches, black (N 2/0) sapric material; weak, coarse, subangular blocky structure; slightly sticky; few roots; less than 5 percent fiber when rubbed; neutral; clear, wavy boundary.

Oa4—24 to 35 inches, black (10YR 2/1) sapric materal; weak, coarse, subangular blocky structure; slightly sticky; less than 5 percent fiber when rubbed; neutral; abrupt, smooth boundary.

IICg—35 to 60 inches, gray (5YR 5/1) medium sand; single grained; loose; neutral.

The organic deposit ranges from 16 to 51 inches in thickness and from black to dark brown in color. In most places it is sapric material, but thin layers of hemic material are in some places. The organic layer is subangular blocky or platy. The IICg horizon is sand that ranges in color from gray to light brownish gray.

Markey soils are adjacent to Cathro, Lupton, Roscommon, and Seelyeville soils. They are underlain by a coarser textured mineral deposit than Cathro soils. They have a thinner organic deposit than Lupton and Seelyeville soils. They have a thicker organic deposit than Roscommon soils.

Markey muck (Ma).—This nearly level soil occupies 20- to 640-acre tracts in former glacial lake basins and wet drainageways on outwash plains. This soil has the profile described as representative of the series. The organic layer is 24 to 51 inches thick.

Included in mapping are small areas of Cathro, Lupton, and Seelyeville soils and small areas of soils that have less than 24 inches of organic material.

Available water capacity is high.

Some areas of this soil are used for crops. Response of crops to lime and fertilizer is limited by wetness and a severe hazard of soil blowing. Drainage is needed for vegetables and such specialty crops as mint. Capability unit IVwc–9; recreation group 6; wildlife group 8; not assigned to a woodland group.

Markey muck, shallow (Mb).—This nearly level soil occupies 10- to 200-acre tracts in former glacial lake basins and drainageways on outwash plains. This soil has a profile similar to the one described as representative of the series, but the organic layer is only 16 to 24 inches thick over sand. Included in mapping are small areas of Cathro and Roscommon soils and small areas of soils that have more than 24 inches of organic material.

Some areas of this soil are used for vegetables and specialty crops, if drained. Drained areas are subject to severe soil blowing, to subsidence, and to oxidation. If not controlled, these hazards result in the loss of the thin organic layer. The growing season is short. Response of crops to lime and fertilizer is limited by wetness. Capability unit IVwc–9; recreation group 6; wildlife group 8; not assigned to a woodland group.

Marsh

Marsh (Mc) consists of wet organic soils intermixed with mineral material of various kinds (fig. 7). It is along lake borders, river meanders, flowage edges, and in depressions on outwash plains and glacial drift areas.

Areas of Marsh are saturated with water at a depth of less than 1 foot. They are flooded most of the year.

Marsh is not suitable for crops, pasture, or woodland. It is used mainly as wildlife habitat. The vegetation is sedges, cattails, and other semiaquatic plants. Capability unit VIIIw–15; recreation group 6; wildlife group 7; woodland group 6s1.

Meadland Series

The Meadland series consists of deep, nearly level, somewhat poorly drained soils. These soils are on uplands. They formed in a thin mantle of loamy sediment and the underlying residuum from igneous bedrock.

In a representative profile the surface layer is very dark grayish-brown loam 6 inches thick. Below this layer is brown sandy loam 9 inches thick. The subsoil is 14 inches thick. The upper part is strong-brown and dark-brown loam and has brown mottles, and the lower part is strong-brown sandy loam and has pinkish-gray mottles. The substratum is strong-brown and pinkish-gray loam.

Permeability is moderate, and available water capacity is high. The soils are saturated with water at a depth of less than 3 feet during periods of wetness. In some places there are many stones. Bedrock is at a depth of 5 to 20 feet.

Most areas of these soils are used for crops.

Representative profile of Meadland loam, 1 to 3 percent slopes, 1,620 feet south and 20 feet west of the northeast corner of sec. 30, T. 25 N., R. 6 E.:

Ap—0 to 6 inches, very dark grayish-brown (10YR 3/2) light loam, light brownish gray (10YR 6/2) dry; weak, fine, granular structure; friable; many roots; medium acid; abrupt, smooth boundary.

A&B—6 to 15 inches, 70 percent brown (7.5 5/2) micaceous

Figure 7.—**An area of Marsh surrounding open water.**

sandy loam (A2 part) surrounds remnants of dark-brown (7.5YR 4/4) micaceous loam (Bt part); weak, thick, platy structure to weak, fine, subangular blocky; friable; common roots; few, thin, discontinuous clay films on surfaces of peds of Bt part; tongues of A2 part are more than 15 millimeters in diameter throughout; strongly acid; gradual, wavy boundary.

B2t—15 to 23 inches, strong-brown (7.5YR 5/8) and dark-brown (7.5YR 4/4) highly micaceous heavy loam; many, coarse, distinct, brown (7.5YR 5/2) mottles; moderate, medium, subangular blocky structure; friable; common roots; few, thin, discontinuous clay films on surfaces of peds; 10 percent gravel; medium acid; gradual, wavy boundary.

B3t—23 to 29 inches, strong-brown (7.5YR 5/8) highly micaceous heavy sandy loam; many, coarse, prominent, pinkish-gray (7.5YR 6/2) mottles; weak, medium, subangular blocky structure; friable; few, thin, discontinuous clay films on surfaces of peds; 5 percent gravel-sized fragments of unweathered schistose; medium acid; clear, wavy boundary.

C—29 to 60 inches, strong-brown (7.5YR 5/8) and pinkish-gray (7.5YR 6/2) highly micaceous loam; massive; friable; 5 percent gravel-sized fragments of unweathered schist; very strongly acid.

The solum ranges from 20 to 40 inches in thickness. It is 5 to 15 percent stones throughout. The Ap horizon is very dark grayish brown or dark brown. In uncultivated areas the A1 horizon is very dark brown or very dark grayish brown in color and ranges from 3 to 5 inches in thickness. Some profiles have no A&B horizon but have a B&A horizon, and other profiles have both horizons. The B2t horizon ranges from 4 to 12 inches in thickness and from heavy clay loam to heavy sandy loam in texture. The B3t horizon is heavy sandy loam or loam. It ranges from dark brown to light brownish gray in color and from 3 to 10 inches in thickness. The C horizon ranges from olive to reddish brown.

Meadland soils are adjacent to Dolph and Point soils, well drained and moderately well drained Rozellville soils, and poorly drained Sherry and Dancy soils. They have a coarser textured B horizon than Point and Dolph soils.

Meadland loam, 1 to 3 percent slopes (MeA).—This nearly level soil occupies 20- to 300-acre tracts on uplands. Included in mapping are small areas of Rozellville, Point, and Dancy soils and small areas of soils that have a surface layer of sandy loam or silt loam. Areas of soils that are subject to ponding and areas that have many stones on the surface are identified by symbols.

Most areas of this soil are used for crops. Response of crops to lime and fertilizer is limited by wetness. Surface drainage is beneficial to crops commonly grown in the county. The hazard of frost heave is moderate. Capability unit IIw–4; recreation group 3; wildlife group 6; woodland group 3o1.

Mecan Series

The Mecan series consists of deep, gently sloping to moderately steep, well-drained soils. These soils formed in areas of loamy sand glacial till.

In a representative profile the surface layer is sandy loam 15 inches thick. The upper part is very dark brown, and the lower part is yellowish brown. The subsoil is 42 inches thick. The upper part is light yellowish-brown sandy loam, the middle part is yellowish-red and strong-brown sandy loam, and the lower part is strong-brown loamy sand. The substratum is strong-brown loamy sand.

Permeability is moderately rapid, and available water capacity is medium.

Most areas of these soils are used as woodland or for pasture. Less sloping areas are used for crops.

Representative profile of Mecan sandy loam, 6 to 12 percent slopes, 800 feet south and 15 feet east of the northwest corner of sec. 1, T. 23 N., R. 9 E:

A1—0 to 3 inches, very dark brown (10YR 2/2) sandy loam; weak, fine, granular structure; friable; common roots; medium acid; abrupt, smooth boundary.

A3—3 to 15 inches, yellowish-brown (10YR 5/4) light sandy loam; weak, very fine, subangular blocky structure; very friable; common roots; few small pebbles and cobbles; slightly acid; gradual, wavy boundary.

B1—15 to 27 inches, light yellowish-brown (10YR 6/4) light sandy loam; weak, medium, subangular blocky structure; very friable; few roots; few small pebbles and cobbles; slightly acid; gradual, wavy boundary.

B21t—27 to 37 inches, yellowish-red (5YR 4/6) sandy loam; weak, medium, subangular blocky structure; friable; few roots; moderately thick, patchy clay films on surface of peds; slightly acid; gradual, wavy boundary.

B22t—37 to 49 inches, banded, 60 percent strong-brown (7.5YR 5/6) light sandy loam and 40 percent reddish-brown (5YR 4/4) heavy sandy loam; weak, medium, subangular blocky structure; friable; moderately thick, continuous clay films on surfaces of peds; slightly acid; gradual, wavy boundary.

B3—49 to 57 inches, strong-brown (7.5YR 5/6) loamy sand; very weak, coarse, subangular blocky structure; very friable; slightly acid; gradual, wavy boundary.

C—57 to 60 inches, strong-brown (7.5YR 5/6) loamy sand glacial till; massive; very friable; 15 percent gravel, cobbles, and stones; slightly acid.

The solum ranges from 40 to 60 inches in thickness. It is 5 to 20 percent cobbles and stones throughout. The A1 horizon ranges from 3 to 5 inches in thickness and is very dark brown or very dark gray. In cultivated areas the Ap horizon is very dark grayish brown or dark yellowish brown and ranges from 6 to 8 inches in thickness. It is loamy sand or sandy loam. In some profiles an A2 horizon or an A3 horizon is present, and in other profiles both horizons are present. These horizons, combined, range from 5 to 15 inches in thickness. The B1 horizon ranges from 6 to 14 inches in thickness. The B2t horizon ranges from 14 to 24 inches in thickness and is sandy loam or heavy sandy loam. In some profiles the B22t horizon has bands of light sandy loam and heavy sandy loam, and in other profiles it has bands of sandy loam and heavy loamy sand. The bands range from 2 to 4 inches in thickness. The B3 horizon is loamy sand or light sandy loam and ranges from 4 to 10 inches in thickness. The substratum ranges from medium acid to neutral.

Mecan soils are adjacent to Coloma, Kranski, and Wyocena soils. They have finer textured B and C horizons than Coloma soils. They have a thicker solum than Kranski and Wyocena soils.

Mecan loamy sand, 2 to 6 percent slopes (MfB).—This gently sloping soil occupies 5- to 40-acre tracts in areas of till. It has a profile similar to the one described as representative of the series, but the surface layer and subsoil are coarser textured and the available water capacity is slightly lower. Included in mapping are small areas of Coloma, Kranski, and Wyocena soils. Also included are small areas of soils that have a surface layer of sandy loam and areas that have slopes of more than 6 percent. Very stony areas and severely eroded areas are identified by symbols.

Much of the acreage of this soil is used for crops. Response of crops to lime and fertilizer is limited by the medium available water capacity. A severe hazard of soil blowing and a moderate hazard of water erosion are also limitations to the use of this soil for crops. Capability unit IIIe–4; recreation group 2; wildlife group 3; woodland group 3o1.

Mecan loamy sand, 6 to 12 percent slopes (MfC).—This sloping soil occupies 10- to 100-acre tracts in areas of till. It has a profile similar to the one described as representative of the series, but the surface layer and subsoil are coarser textured and the available water capacity is slightly lower. Included in mapping are small areas of Coloma, Kranski, and Wyocena soils. Also included are small areas of soils that have a surface layer of sandy loam and areas that have slopes of less than 6 percent or more than 12 percent. Very stony areas and severely eroded areas are identified by symbols.

Most areas of this soil are used for pasture or as woodland. The medium available water capacity, a severe hazard of soil blowing, and a severe hazard of water erosion are limitations to the use of this soil for crops. Capability unit IVe–4; recreation group 2; wildlife group 3; woodland group 3o1.

Mecan loamy sand, 12 to 20 percent slopes (MfD).—This moderately steep soil occupies 10- to 100-acre tracts in areas of till. It has a profile similar to the one described as representative of the series, but the surface layer and subsoil are coarser textured and the available water capacity is lower. Included in mapping are small areas of Coloma, Kranski, and Wyocena soils. Also included are small areas of soils that have a surface layer of sandy loam and areas of soils that have slopes of less than 12 percent or more than 20 percent. Very stony areas and severely eroded areas are identified by symbols.

This soil is better suited to pasture, woodland, or wildlife habitat than to cultivated crops. The medium available water capacity, stones on the surface, and very severe hazards of soil blowing and water erosion are the main limitations to the use of this soil for crops. Capability unit VIe–4; recreation group 2; wildlife group 3; woodland group 3r2.

Mecan sandy loam, 2 to 6 percent slopes (MgB).—This gently sloping soil occupies 5- to 40-acre tracts in areas of till. It has a profile similar to the one described as representative of the series, but the surface layer is slightly thicker. Included in mapping are small areas of Coloma, Kranski, and Wyocena soils. Also included are small areas of soils that have a surface layer of loamy sand and areas that have slopes of more than 6 percent. There are also stony areas, which are identified by symbols.

Much of the acreage of this soil is used for crops. Response of crops to lime and fertilizer is limited by

the medium available water capacity. Moderate hazards of soil blowing and water erosion are also limitations to the use of this soil for crops. Capability unit IIIe–4; recreation group 1; wildlife group 1; woodland group 3o1.

Mecan sandy loam, 6 to 12 percent slopes (MgC).—This sloping soil occupies 10- to 100-acre tracts in areas of till. It has the profile described as representative of the series. Included in mapping are small areas of Coloma, Kranski, and Wyocena soils. Also included are small areas of soils that have a surface layer of loamy sand and areas of soils that have slopes of less than 6 percent or more than 12 percent. Very stony areas and severely eroded areas are identified by symbols.

Most areas of this soil are used for pasture or as woodland. The medium available water capacity, moderate hazard of soil blowing, and severe hazard of water erosion are limitations to the use of this soil for crops. Capability unit IVe–4; recreation group 1; wildlife group 1; woodland group 3o1.

Mecan sandy loam, 12 to 20 percent slopes (MgD).—This moderately steep soil occupies 10- to 100-acre tracts in areas of till. It has a profile similar to the one described as representative of the series, but the combined surface layer and subsoil are slightly thinner. Included in mapping are small areas of Coloma, Kranski, and Wyocena soils. Also included are small areas of soils that have a surface layer of loamy sand and areas that have slopes of less than 12 percent or more than 20 percent. Very stony areas and severely eroded areas are identified by symbols.

This soil is better suited to pasture, woodland, or wildlife habitat than to cultivated crops. The medium available water capacity, the stones on the surface, the moderate hazard of soil blowing, and the very severe hazard of water erosion are the main limitations to the use of this soil for crops. Capability unit VIe–4; recreation group 1; wildlife group 1; woodland group 3r2.

Meehan Series

The Meehan series consists of deep, nearly level, somewhat poorly drained soils. These soils formed in medium and coarse sand on plains and river terraces.

In a representative profile the surface layer is very dark brown loamy sand 7 inches thick. The subsurface layer is brown loamy sand 2 inches thick and has dark-brown mottles. The subsoil is loamy sand 22 inches thick. The upper part is dark brown and has pinkish-gray and reddish-brown mottles, and the lower part is reddish brown and brown. The substratum is brown medium and coarse sand.

Permeability is rapid, and available water capacity is low. These soils are saturated with water at a depth of less than 3 feet during periods of wetness. Bedrock is at a depth of more than 10 feet.

Most areas of these soils are used for pasture or as woodland. Some areas are used for crops.

Representative profile of Meehan loamy sand, 0 to 3 percent slopes, 710 feet south and 30 feet east of the northeast corner of sec. 14, T. 22 N., R. 7 E.:

Ap—0 to 7 inches, very dark brown (10YR 2/2) loamy sand, dark grayish brown (10YR 4/2) dry; weak, fine, subangular blocky structure; very friable; common roots; slightly acid; abrupt, smooth boundary.

A2—7 to 9 inches, brown (10YR 5/3) loamy sand; few, medium, faint, dark-brown (7.5YR 4/4) mottles; weak, medium, subangular blocky structure; very friable; few roots; slightly acid; gradual, wavy boundary.

B2—9 to 18 inches, dark-brown (7.5YR 4/4) loamy sand; few, fine, distinct, pinkish-gray (7.5YR 6/2) mottles and common, coarse, faint, reddish-brown (5YR 4/4) mottles; weak, medium, subangular blocky structure; very friable; few roots; slightly acid; gradual, wavy boundary.

B3—18 to 31 inches, reddish-brown (5YR 4/4) and brown (7.5YR 5/2) loamy sand; very weak, coarse, subangular blocky structure to single grained; very friable; slightly acid; gradual, wavy boundary.

C—31 to 60 inches, brown (7.5YR 5/2) medium and coarse sand; single grained; loose; slightly acid.

The solum ranges from 24 to 36 inches in thickness. In uncultivated areas the A1 horizon is very dark brown or dark-brown loamy sand and ranges from 2 to 4 inches in thickness. The A2 horizon is yellowish brown or brown and ranges from 1 to 6 inches in thickness. The B horizon ranges from 11 to 30 inches in thickness, is dark-brown to yellowish-brown loamy sand or sand, and has dark reddish-brown to light-gray mottles. The C horizon ranges from brown to light yellowish brown.

Meehan sandy loam, red surface, 0 to 3 percent slopes, has a finer textured A1 or Ap horizon than is described in the range for the Meehan series. This difference affects very slightly the use and behavior of this soil.

Meehan soils are adjacent to Leola soils, moderately well drained Friendship soils, and poorly drained Roscommon soils. They have a coarser textured B horizon than Leola soils.

Meehan loamy sand, 0 to 3 percent slopes (MnA).—This nearly level soil occupies 5- to 500-acre tracts on plains and river terraces. It has the profile described as representative of the series. Included in mapping are small areas of Friendship, Roscommon, and Leola soils. Also included are small areas of soils that have a surface layer of sandy loam. Small poorly drained areas are identified by symbols.

Some areas of this soil are used for crops. Response of crops to lime and fertilizer is limited by the low available water capacity, a severe hazard of soil blowing, and wetness. Irrigation and drainage are beneficial to potatoes and other vegetable crops. Capability unit IVw–5; recreation group 4; wildlife group 6; woodland group 3w4.

Meehan loamy sand, sandstone substratum, 0 to 3 percent slopes (MoA).—This nearly level soil occupies 10- to 100-acre tracts adjacent to sandstone ridges and in depressions on sandstone uplands. It has a profile similar to the one described as representative of the series, but sandstone bedrock is at a depth of 20 to 40 inches. Included in mapping are small areas of Plainbo and Rockers soils. Poorly drained areas are identified by wet symbols.

Most areas of this soil are used for pasture or as woodland. The soil is not well suited to crops, because of low available water capacity, a severe hazard of soil blowing, and wetness. Capability unit IVw–5; recreation group 4; wildlife group 6; woodland group 3w4.

Meehan sandy loam, red surface, 0 to 3 percent slopes (MpA).—This nearly level soil occupies 5- to 40-acre tracts along river terraces and on sand plains in Grant and Pine Grove Townships. This soil has a profile similar to the one described as representative of the series, but the surface layer is finer textured and

redder colored and iron concretions are common throughout the profile. Included in mapping are small areas of Roscommon, Friendship, and Leola soils. Also included are small areas of soils that have a surface layer of loamy sand.

Some areas of this soil are used for crops. Response of crops to lime and fertilizer is limited by low available water capacity, a severe hazard of soil blowing, and wetness. Irrigation and drainage are beneficial to potatoes and other vegetable crops. Capability unit IVw–5; recreation group 4; wildlife group 6; woodland group 3w4.

Meehan Variant

This series consists of nearly level, somewhat poorly drained soils. These soils are on river terraces. They formed in loamy deposits and the underlying sand and gravel deposits.

In a representative profile the surface layer is dark-brown fine sandy loam 7 inches thick. The subsoil is 11 inches thick and is dark reddish brown. The upper part is sandy loam and has yellowish-red mottles. The lower part is sandy loam and has reddish-gray and yellowish-red mottles. The substratum is reddish-brown and reddish-gray sand and gravel.

Permeability is rapid, and available water capacity is low. The soils are saturated with water at a depth of less than 3 feet during periods of wetness and in some areas are subject to flooding. Bedrock is at a depth of more than 10 feet.

Most areas of these soils are used for pasture or as woodland.

Representative profile of Meehan fine sandy loam, gravelly variant, (0 to 2 percent slopes) 2,360 feet east and 480 feet north of the southwest corner of sec. 11, T. 24 N., R. 7 E.:

Ap—0 to 7 inches, dark-brown (7.5YR 3/2) fine sandy loam, brown (7.5YR 5/2) dry; weak, medium, granular structure; friable; common roots; strongly acid; abrupt, wavy boundary.

B2ir—7 to 12 inches, dark reddish-brown (5YR 3/4) sandy loam; few, fine, distinct, yellowish-red (5YR 4/6) mottles; weak, medium, subangular blocky structure; very friable; few roots; 10 percent gravel; medium acid; clear, wavy boundary.

IIB3—12 to 18 inches, dark reddish-brown (5YR 3/4) sandy loam; few, fine, distinct, yellowish-red (5YR 4/6) and reddish-gray (5YR 5/2) mottles; very weak, medium, subangular blocky structure to single grained; very friable to loose; few roots; 55 percent gravel; medium acid; abrupt, wavy boundary.

IIC—18 to 60 inches, 60 percent reddish-brown (5YR 5/4) and 40 percent reddish-gray (5YR 5/2) stratified sand and gravel; single grained; loose; 50 percent gravel; slightly acid.

The solum ranges from 16 to 24 inches in thickness. It is 5 to 15 percent gravel in the upper part. The Ap horizon is very dark brown or dark-brown fine sandy loam or sandy loam. In uncultivated areas the A1 horizon is black or very dark brown and ranges from 2 to 4 inches in thickness, and the A2 horizon is grayish brown and ranges from 2 to 6 inches in thickness. The B2ir horizon ranges from 4 to 10 inches in thickness. The IIB3 horizon ranges from 4 to 8 inches in thickness. The IIB3 and IIC horizons are 35 to 80 percent gravel.

Meehan variant soils are adjacent to well-drained Plainfield variant and Dunnville variant soils. They have a coarser textured solum than Dunnville variant soils.

Meehan fine sandy loam, gravelly variant (Mr).—This nearly level soil occupies 5- to 60-acre tracts on river terraces. Included in mapping are small areas of Dunnville variant soils, Plainfield variant soils, and Alluvial land, wet. Also included are small areas of soils that have a surface layer of loam.

Most areas of this soil are used for pasture or as woodland or wildlife habitat. The low available water capacity, wetness, and hazard of occasional flooding are the main limitations to the use of this soil for crops. Capability unit IVw–5; recreation group 3; wildlife group 6; woodland group 3w4.

Mosinee Series

The Mosinee series consists of moderately deep, gently sloping, well-drained soils on uplands. These soils formed in loamy deposits and the underlying loamy residuum from igneous rock.

In a representative profile the surface layer is dark brown sandy loam 7 inches thick. The subsoil is brown and is 33 inches thick. The upper part is sandy loam, and the lower part is gravelly sandy loam. Shattered granite bedrock is at a depth of 40 inches.

Permeability is moderate to bedrock, and available water capacity is low. Bedrock is at a depth of 4 to 10 feet. Stones on the surface and bedrock outcrop are common.

Most areas of these soils are used for pasture or as woodland. A few areas are used for crops.

Representative profile of Mosinee sandy loam, 2 to 6 percent slopes, 1,420 feet north and 420 feet west of the southeast corner of sec. 11, T. 24 N., R. 7 E.:

Ap—0 to 7 inches, dark-brown (10YR 3/3) sandy loam, pale brown (10YR 6/3) dry; weak, medium, granular structure; friable; common roots, 10 percent stones; strongly acid; abrupt, smooth boundary.

B1—7 to 12 inches, brown (7.5YR 4/4) light sandy loam; weak, medium, subangular blocky structure; friable; few roots; 5 percent pebbles; 10 percent stones; strongly acid; clear, wavy boundary.

B21—12 to 18 inches, brown (7.5YR 4/4) sandy loam; weak, medium, subangular blocky structure; friable; few roots; 5 percent quartz pebbles; 10 percent stones; medium acid; gradual, wavy boundary.

IIB22—18 to 24 inches, brown (7.5YR 4/4) heavy sandy loam; weak, medium, subangular blocky structure; friable; few roots; 10 percent fine and medium gravel-size fragments of igneous rock; 10 percent stones; strongly acid; gradual wavy boundary.

IIB3—24 to 40 inches, brown (7.5YR 4/4) gravelly sandy loam; weak, coarse, subangular blocky structure; friable; 20 percent fine and medium gravel-size fragments of igneous rock; evidence of rocklike structure; 60 percent cobbles and stones; strongly acid; gradual, wavy boundary.

R—40 inches, shattered granite bedrock.

The solum ranges from 24 to 40 inches in thickness. It is 10 to 60 percent stones throughout. The Ap horizon is very dark grayish brown or dark brown when moist and light brownish gray or pale brown when dry. In uncultivated areas the A1 horizon is very dark brown or very dark grayish brown in color and ranges from 3 to 5 inches in thickness. The A2 horizon ranges from 2 to 4 inches in thickness. The B1 horizon ranges from 3 to 6 inches in thickness and is dark yellowish brown or brown. The B2 horizon ranges from 8 to 14 inches in thickness and from heavy loamy sand to loam in texture. The IIB3 horizon ranges from 6 to 19 inches in thickness and from gravelly sandy loam to loam in texture.

Mosinee soils are adjacent to Rock land, Rozellville soils, and somewhat poorly drained Point and Rockers soils. They

have a coarser textured solum than Rozellville soils. They lack the high content of stones in the surface and the outcrops that are typical of Rock land.

Mosinee sandy loam, 2 to 6 percent slopes (MsB).—This gently sloping soil occupies 10- to 200-acre tracts on uplands. Included in mapping are small areas of Rozellville, Rockers, and Point soils. Also included are areas of soils that have a surface layer and subsoil of loamy sand, small areas of soils that have reddish-yellow mottles in the lower part of the subsoil, and small areas that have slopes of more than 6 percent. Very stony areas and rock outcrop are identified by symbols.

Most of this soil is used for pasture or as woodland. Stones on the surface and bedrock outcrop are limitations to the use of this soil for crops. Capability unit IIe–2; recreation group 1; wildlife group 1; woodland group 3d1.

Norgo Variant

This series consists of moderately deep, gently sloping to sloping, well-drained soils. These soils are on uplands in higher positions on the landscape. They formed in thin silty deposits and the underlying residuum from acid sandstone bedrock.

In a representative profile the surface layer is dark-brown silt loam 5 inches thick. The subsurface layer is yellowish-brown silt loam 2 inches thick. The subsoil is 18 inches thick. The upper part is dark-brown silt loam, the middle part is dark reddish-brown loam, and the lower part is reddish-brown loamy sand. Strong-brown sandstone bedrock is at a depth of 25 inches.

Permeability is moderate to bedrock, and available water capacity is low. Bedrock is at a depth of less than 3 feet.

Most areas of this soil are used for pasture. Some areas are used for crops or as woodland.

Representative profile of Norgo silt loam, moderately deep variant, 2 to 6 percent slopes, 440 feet north of the southwest corner of sec. 8, T. 23 N., R. 7 E.:

Ap—0 to 5 inches, dark-brown (10YR 3/3) silt loam; weak, medium, granular structure; friable; common roots; medium acid; abrupt, smooth boundary.

A2—5 to 7 inches, yellowish-brown (10YR 5/4) silt loam; weak, medium, platy structure to very fine, subangular blocky structure; friable; few roots; very strongly acid; clear, wavy boundary.

B&A—7 to 12 inches, 60 percent dark-brown (7.5YR 4/4) silt loam (B part); weak, fine, subangular blocky structure; friable; few roots; 40 percent tongues of yellowish-brown (10YR 5/4) silt loam (A2 part), more than 15 millimeters in diameter throughout; very strongly acid; gradual, wavy boundary.

IIB2t—12 to 19 inches, dark reddish-brown (5YR 3/4) loam; moderate, fine, subangular blocky structure; friable; few roots; silt coatings and thin, discontinuous clay films on surfaces of peds; very strongly acid; gradual; wavy boundary.

IIB3t—19 to 25 inches, reddish-brown (5YR 4/4) heavy loamy sand; weak, medium, subangular blocky structure; friable; few roots; thin, discontinuous clay films on surfaces of peds; light-colored coatings on vertical surfaces of peds; very strongly acid; abrupt, wavy boundary.

R—25 inches, strong-brown (7.5YR 5/6) sandstone bedrock; single-grained medium sand from weathered sandstone in cracks and crevices.

The solum ranges from 20 to 30 inches in thickness. It is 5 to 30 percent sandstone fragments throughout. The upper story of silty material ranges from 10 to 15 inches in thickness. In uncultivated areas the A1 horizon is very dark grayish brown or very dark brown and is 2 or 3 inches thick. The A2 horizon ranges from 2 to 4 inches in thickness and from grayish brown to yellowish brown in color. An A&B horizon is present in some profiles. It ranges from 4 to 8 inches in thickness. The IIB2t horizon is heavy loam to heavy sandy loam and ranges from 6 to 10 inches in thickness. It is dark brown, reddish brown, or dark reddish brown. The IIB3t horizon is sandy loam or loamy sand and ranges from 4 to 8 inches in thickness.

Norgo variant soils are adjacent to Plainbo soils and somewhat poorly drained Kert soils. They have a finer textured solum than Plainbo soils.

Norgo silt loam, moderately deep variant, 2 to 6 percent slopes (NoB).—This gently sloping soil occupies 10- to 60-acre tracts on ridgetops of sandstone uplands. It has the profile described as representative of the series. Included in mapping are small areas of Kert and Plainbo soils and areas of soils that have slopes of more than 6 percent.

Much of the acreage of this soil is used for crops. The low available water capacity, the moderate hazard of water erosion, and the presence of stones are the main limitations to the use of this soil for crops. This soil is very strongly acid unless limed. Capability unit IIe–2; recreation group 1; wildlife group 1; woodland group 3d1.

Norgo silt loam, moderately deep variant, 6 to 12 percent slopes (NoC).—This sloping soil occupies 10- to 60-acre tracts on the sides of ridges on uplands. It has a profile similar to the one described as representative of the series, but the combined thickness of the surface layer and subsoil is slightly less. Included in mapping are small areas of Plainbo soils and areas of soils that have slopes of less than 6 percent or more than 12 percent.

Most areas of this soil are used for pasture or as woodland. The low available water capacity, the severe hazard of water erosion, and the presence of stones are the main limitations to the use of this soil for crops. This soil is very strongly acid unless limed. Capability unit IIIe–2; recreation group 1; wildlife group 1; woodland group 3d1.

Oesterle Series

The Oesterle series consists of nearly level, somewhat poorly drained soils that are moderately deep to sand and gravel. These soils are along flood plains and in depressional areas and drainageways of outwash plains and till areas. They formed in loamy deposits and the underlying outwash sand and gravel.

In a representative profile the surface layer is very dark brown sandy loam 7 inches thick. The subsurface layer is brown sandy loam 4 inches thick and has yellowish-brown mottles. The subsoil is sandy loam 20 inches thick. The upper part is yellowish brown and has light brownish-gray and yellowish-red mottles, and the lower part is light brownish gray and yellowish red. The substratum is yellowish-brown gravelly sand.

Permeability is moderate, and available water capacity is low. The soils are saturated with water at a depth of less than 3 feet during periods of wetness. Bedrock is at a depth of more than 10 feet.

Most areas of these soils are used for pasture or crops.

Representative profile of Oesterle sandy loam (0 to 2 percent slopes) 500 feet east and 1,000 feet south of the northwest corner of sec. 31, T. 25 N., R. 10 E.:

Ap—0 to 7 inches, very dark brown (10YR 2/2) sandy loam, dark grayish brown (10YR 4/2) dry; weak, fine, granular structure; friable; few roots; 5 percent gravel 5 to 50 millimeters in diameter; very strongly acid; abrupt, smooth boundary.

A&B—7 to 11 inches, 70 percent brown (10YR 5/3) sandy loam (A2 part); few, fine, prominent, yellowish-brown (10YR 5/8) mottles; A2 part surrounds remnants of yellowish-brown (10YR 5/4) heavy sandy loam (Bt part); weak clay bridging of sand grains in Bt part; weak, coarse, platy structure to moderate, very fine, subangular blocky; friable; 5 percent gravel 5 to 50 millimeters in diameter; very strongly acid; clear, wavy boundary.

B21t—11 to 16 inches, yellowish-brown (10YR 5/4) heavy sandy loam; many, fine, distinct, light brownish-gray (10YR 6/2) mottles and many, fine, prominent, yellowish-red (5YR 5/8) mottles; weak, medium, subangular blocky structure; friable; thin, discontinuous clay films on horizontal and vertical surfaces of peds; very strongly acid; clear, wavy boundary.

B22t—16 to 27 inches, yellowish-brown (10YR 5/4) heavy sandy loam; many, medium, distinct, light brownish-gray (10YR 6/2) and many, medium, prominent, yellowish-red (5YR 5/8) mottles; moderate, medium, subangular blocky structure; firm; 10 percent gravel 5 to 50 millimeters in diameter; thin, continuous clay films on horizontal and vertical surfaces of peds; very strongly acid; gradual, wavy boundary.

B3t—27 to 31 inches, light brownish-gray (10YR 6/2) and yellowish-red (5YR 5/8) sandy loam; weak, medium, subangular blocky structure; very friable; 10 percent gravel 5 to 50 millimeters in diameter; weak clay bridging of sand grains; strongly acid; clear, wavy boundary.

C—31 to 60 inches, yellowish-brown (10YR 5/4) gravelly sand; about 20 percent, by volume, gravel 5 to 50 millimeters in diameter; single grained; loose; medium acid.

The solum ranges from 24 to 40 inches in thickness. The Ap horizon is very dark grayish-brown to very dark brown sandy loam. In uncultivated areas the A1 horizon is very dark brown to very dark grayish-brown sandy loam and ranges from 2 to 4 inches in thickness. The A2 horizon, where present, is brown or pale-brown sandy loam and is as much as 4 inches in thickness. The A&B horizon ranges from 3 to 7 inches in thickness and is sandy loam or loam. The B21t and B22t horizons range from 8 to 22 inches in thickness and are sandy loam or loam. The B3t horizon ranges from 3 to 8 inches in thickness and is yellowish brown to light brownish gray. The C horizon is 5 to 60 percent gravel.

Oesterle soils are adjacent to Oesterle variant soils, Leola soils, poorly drained Roscommon variant soils, and well-drained Billett soils. They have a finer textured solum than Leola soils. They have a coarser textured C horizon than Oesterle variant soils.

Oesterle sandy loam (Oe). —This nearly level soil occupies 5- to 80-acre tracts along flood plains and in depressions and drainageways of outwash plains. Included in mapping are small areas of Billett, Leola, Rosholt, Oesterle variant, and Roscommon variant soils. Also included are small areas of soils that have a surface layer of loam.

Most areas of this soil are used for pasture or crops. The main limitation to the use of this soil for crops is wetness. Drainage is beneficial to such commonly grown crops as corn and small grain. Capability unit IIw–5; recreation group 3; wildlife group 6; woodland group 3o1.

Oesterle Variant

This series consists of deep, nearly level, somewhat poorly drained soils. These soils formed in loamy deposits and the underlying lacustrine deposits.

In a representative profile the surface layer is black loam 8 inches thick. The subsurface layer is pale-brown loam 4 inches thick. The subsoil is 31 inches thick. The upper part is brown and pale-brown sandy loam, the middle part is strong-brown and grayish-brown loam, and the lower part is grayish-brown, light brownish-gray, brown, and yellowish-red silt loam and has strong-brown mottles. The substratum is yellowish-red and light brownish-gray, banded, lacustrine very fine sand and coarse silt.

Permeability is moderate, and available water capacity is high. The soils are saturated with water at a depth of less than 3 feet during periods of wetness.

Many areas of these soils are used for crops.

Representative profile of Oesterle loam, silty subsoil variant (0 to 2 percent slopes) 700 feet south and 1,370 feet west of the northeast corner of sec. 2, T. 22 N., R. 8 E.:

Ap—0 to 8 inches, black (10YR 2/1) loam, dark gray (10YR 4/1) dry; weak, fine, granular structure; friable; common roots; slightly acid; abrupt, smooth boundary.

A&B—8 to 12 inches, 70 percent pale-brown (10YR 6/3) light loam (A2 part) surrounds remnants of brown (10YR 5/3) loam (B part); weak, very fine, subangular blocky structure; very friable; few roots; slightly acid; clear, wavy boundary.

B&A—12 to 17 inches, 70 percent brown (10YR 4/3) sandy loam (B part); few, fine, prominent, yellowish-brown (10YR 5/6) mottles; weak, medium, subangular blocky structure; friable; few roots; few, thin, patchy clay films on surfaces of peds in Bt part; 30 percent tongues of pale-brown (10YR 6/3) A2 part, greater than 15 millimeters in diameter throughout; slightly acid; clear, wavy boundary.

B21t—17 to 22 inches, grayish-brown (10YR 5/2) and strong-brown (7.5YR 5/8) light loam; weak, very thick, platy structure to moderate, fine, subangular blocky; friable; few roots; few, thin, patchy clay films on surfaces of peds; silt coatings on surface of peds; neutral; clear, wavy boundary.

IIB22t—22 to 28 inches, grayish-brown (10YR 5/2) and brown (7.5YR 5/2) heavy silt loam; few, fine, prominent, strong-brown (7.5YR 5/8) mottles; weak, very thick, platy structure to moderate, fine, subangular blocky; friable; few roots; few, patchy, clay films on surfaces of peds; neutral; clear, wavy boundary.

IIB3—28 to 43 inches, yellowish-red (5YR 5/8) and light brownish-gray (10YR 6/2) silt loam; weak, fine, subangular blocky structure; friable; few roots; neutral; gradual, wavy boundary.

IIC—43 to 60 inches, yellowish-red (5YR 5/8) and light brownish-gray (10YR 6/2), banded, lacustrine very fine sand and coarse silt; massive; friable; mildly alkaline.

The solum ranges from 30 to 50 inches in thickness. It is 0 to 10 percent gravel. The upper story ranges from 18 to 24 inches in thickness. In uncultivated areas the A1 horizon ranges from 4 to 6 inches in thickness and is black, very dark gray, or very dark brown, and the A2 horizon ranges from 2 to 4 inches in thickness. The combined A&B and B&A horizons range from 7 to 12 inches in thickness; they are sandy loam or loam. The B21t horizon ranges from 4 to 6 inches in thickness and is heavy sandy loam to heavy loam. The IIB22t horizon ranges from 5 to 7 inches in thickness and from light silt loam to heavy silt loam in texture. The IIB3 horizon ranges from 6 to 18 inches

in thickness. Thickness of the fine and coarse silt bands in the C horizon ranges from 1 to 12 inches.

Oesterle variant soils are adjacent to Oesterle and Leola soils and to poorly drained Roscommon variant soils. They have a finer textured C horizon than Oesterle soils and a finer textured solum than Leola soils.

Oesterle loam, silty subsoil variant (Ov).—This nearly level soil occupies 20- to 200-acre tracts on former glacial lake basins. Included in mapping are small areas of Oesterle, Rosholt, and Roscommon variant soils. Also included are small areas of soils that have a surface layer of fine sandy loam or silt loam.

Most areas of this soil are used for crops. Response of crops to lime and fertilizer is limited by wetness and a slight hazard of soil blowing. Drainage is beneficial to crops. The hazard of frost heave is high. Capability unit IIw–5; recreation group 3; wildlife group 6; woodland group 3o1.

Pearl Series

The Pearl series consists of nearly level, moderately well drained soils that are 30 to 50 inches thick over sand. These soils are on outwash plains. They formed in medium outwash sand.

In a representative profile the surface layer is very dark grayish-brown loamy sand 8 inches thick. The subsurface layer is loamy sand 14 inches thick. The upper part is dark brown, and the lower part is brown. The subsoil is 23 inches thick. The upper part is dark-brown sandy loam and has yellowish-red mottles, the middle part is dark-brown loamy sand and has yellowish-red and brown mottles, and the lower part is light brownish-gray, brown, and yellowish-red loamy sand. The substratum is coarse sand. It is strong brown and pinkish gray to a depth of 55 inches and pinkish gray below this depth.

Permeability is moderately rapid, and available water capacity is low. The soils are saturated with water at a depth of less than 5 feet during periods of wetness. Bedrock is at a depth of more than 10 feet.

Many areas of this soil are used for crops. Some areas are used for pasture.

Representative profile of Pearl loamy sand, 1 to 3 percent slopes, 60 feet west and 600 feet south of the northeast corner of sec. 3, T. 22 N., R. 8 E.:

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) loamy sand, grayish brown (10YR 5/2) dry; weak, fine, granular structure; very friable; few roots; strongly acid; abrupt, smooth boundary.

B2ir—8 to 16 inches, dark-brown (7.5YR 4/4) loamy sand; weak, fine, subangular blocky structure; very friable; few roots; 10 percent gravel 10 to 30 millimeters in diameter; strongly acid; gradual, wavy boundary.

A2—16 to 22 inches, brown (7.5YR 5/4) loamy sand; weak, medium, subangular blocky structure; very friable; few roots; 10 percent gravel 3 to 10 millimeters in diameter; strongly acid; clear, wavy boundary.

B21t—22 to 27 inches, dark-brown (7.5YR 4/4) light sandy loam; few, fine, prominent, yellowish-red (5YR 5/8) mottles; weak, medium, subangular blocky structure; friable; thin, discontinuous clay films on vertical and horizontal surfaces of peds; 5 percent gravel 10 to 45 millimeters in diameter; strongly acid; clear, wavy boundary.

B22t—27 to 32 inches, dark-brown (7.5YR 4/4) loamy sand; few, fine, faint, brown (7.5YR 5/4) mottles and few, fine, prominent, yellowish-red (5YR 5/8) mottles; weak, medium, subangular blocky structure; friable; thin, patchy clay films on vertical and horizontal surfaces of peds; 5 percent gravel 10 to 45 millimeters in diameter; strongly acid; clear, wavy boundary.

B3t—32 to 45 inches, brown (7.5YR 5/4), yellowish-red (5YR 5/8), and light brownish-gray (10YR 6/2) loamy sand; weak, medium, subangular blocky structure; very friable; weak clay bridging of sand grains; 5 percent gravel 15 to 50 millimeters in diameter; strongly acid; gradual, wavy boundary.

C1—45 to 55 inches, strong-brown (7.5YR 5/6) and pinkish-gray (7.5YR 6/2) coarse sand; single grained; loose; 5 percent gravel 15 to 50 millimeters in diameter; very strongly acid; clear, wavy boundary.

C2—55 to 60 inches, pinkish-gray (7.5YR 6/2) coarse sand; few, fine, prominent, yellowish-red (5YR 5/6) mottles; single grained; loose; very strongly acid.

The solum ranges from 30 to 50 inches in thickness. In uncultivated areas the A1 horizon is very dark grayish brown or very dark brown and ranges from 3 to 5 inches in thickness. The B2ir horizon ranges from 4 to 9 inches in thickness and from dark yellowish brown to brown in color. The A2 horizon ranges from 4 to 8 inches in thickness and is yellowish brown, brown, or strong brown. The B21t horizon ranges from dark brown to reddish brown in color and from heavy loamy sand to heavy sandy loam in texture. The B22t horizon ranges from dark brown to reddish brown in color and from loamy sand to sandy loam in texture. The B2t horizon is 5 to 13 inches thick. The B3t horizon is 10 to 15 inches thick. The C horizon is 0 to 20 percent gravel.

Pearl soils are adjacent to Friendship soils, well-drained Richford soils, and somewhat poorly drained Leola soils. They have a finer textured B horizon than Friendship soils.

Pearl loamy sand, 1 to 3 percent slopes (PaA).—This nearly level soil occupies 10- to 100-acre tracts on outwash plains. Included in mapping are small areas of Friendship, Leola, and Richford soils.

Much of the acreage of this soil is used for crops. Response of crops to lime and fertilizer is limited by low available water capacity and a severe hazard of soil blowing. This soil is well suited to irrigated crops. Capability unit IIIs–4; recreation group 2; wildlife group 3; woodland group 3s1.

Plainbo Series

The Plainbo series consists of moderately deep, gently sloping, excessively drained soils. These soils are on uplands. They formed in sandy residuum from sandstone bedrock.

In a representative profile the surface layer is very dark grayish-brown loamy sand 6 inches thick. The subsurface layer is light brownish-gray loamy sand 2 inches thick. The subsoil is brown loamy sand 12 inches thick. The substratum is strong-brown and very pale brown medium sand. Sandstone bedrock is at a depth of 36 inches.

Permeability is rapid, and available water capacity is low. Bedrock is at a depth of less than 5 feet.

Many areas of this soil are used for crops. Some are used for pasture or as woodland.

Representative profile of Plainbo loamy sand, 2 to 6 percent slopes, 1,330 feet north and 1,720 feet east of the southwest corner of sec. 11, T. 23 N., R. 7 E.:

Ap—0 to 6 inches, very dark grayish-brown (10YR 3/2) loamy sand, light brownish gray (10YR 6/2) dry; weak, medium, granular structure; very friable; common roots; very strongly acid; abrupt, wavy boundary.

A2—6 to 8 inches, light brownish-gray (10YR 6/2) light loamy sand; weak, coarse, subangular blocky struc-

ture; very friable; common roots; very strongly acid; abrupt, wavy boundary.

B2ir—8 to 20 inches, brown (7.5YR 4/4) loamy sand; weak, coarse, subangular blocky structure; very friable; common roots; very strongly acid; gradual, wavy boundary.

C1—20 to 23 inches; strong-brown (7.5YR 5/6) medium sand; single grained; loose; few roots; very strongly acid; clear, wavy boundary.

C2—23 to 36 inches, very pale brown (10YR 7/4) medium sand; single grained; loose; strongly acid; gradual, wavy boundary.

R—36 to 60 inches, very pale brown (10YR 7/4) consolidated sandstone; medium acid.

The solum ranges from 10 to 30 inches in thickness. In uncultivated areas the A1 horizon is 2 to 4 inches of very dark brown, very dark grayish-brown, or dark-brown loamy sand. The A2 horizon is 1 to 4 inches of light brownish-gray to dark yellowish-brown loamy sand or sand. The B horizon is loamy sand or sand. It ranges from 4 to 22 inches in thickness and from brown to brownish yellow in color. The C horizon ranges from yellowish brown to very pale brown. Consolidated sandstone is at a depth of 20 to 40 inches.

Plainbo soils are adjacent to Rock land, Plainfield soils, Norgo variant soils, and somewhat poorly drained Meehan soils. Unlike Plainfield soils, Plainbo soils have sandstone bedrock within a depth of 40 inches. They are coarser textured in the solum than Norgo variant soils. They lack the stones on the surface and the rock outcrop that are typical of 50 to 90 percent of Rock land.

Plainbo loamy sand, 2 to 6 percent slopes (PbB).—This gently sloping soil occupies 10- to 100-acre tracts along sandstone ridges on uplands. Included in mapping are small areas of Plainfield soils and Norgo variant soils and areas of soils that have slopes of less than 2 percent and more than 6 percent. Very stony areas and rock outcrop are identified by symbols.

Some areas of this soil are used for crops. Response of crops to lime and fertilizer is limited by low available water capacity, a severe hazard of soil blowing, and a slight hazard of water erosion. Capability unit IVs–3; recreation group 2; wildlife group 3; woodland group 3s1.

Plainfield Series

The Plainfield series consists of deep, nearly level to very steep, excessively drained soils. These soils are on sand plains and river terraces. They formed in deep, medium to coarse sand.

In a representative profile (fig. 8) the surface layer is very dark grayish-brown loamy sand 5 inches thick. The subsoil is 29 inches thick. The upper part is brown loamy sand, and the lower part is yellowish-brown medium sand. The substratum is light yellowish-brown sand.

Permeability is rapid, and available water capacity is low. Bedrock is at a depth of more than 10 feet.

Many of the less sloping areas of these soils are used for crops. Sloping and steep areas are used as woodland or for pasture.

Representative profile of Plainfield loamy sand, 2 to 6 percent slopes, 2,590 feet south and 1,310 feet west of the northeast corner of sec. 18, T. 24 N., R. 8 E.:

Ap—0 to 5 inches, very dark grayish-brown (10YR 3/2) loamy sand, grayish brown (10YR 5/2) dry; weak, fine, granular structure; very friable; many roots; strongly acid; abrupt, smooth boundary.

B2ir—5 to 14 inches, brown (7.5YR 4/4) light loamy sand; weak, medium, subangular blocky structure; very friable; common roots; medium acid; clear, wavy boundary.

B3—14 to 34 inches, yellowish-brown (10YR 5/6) medium sand; single grained; loose; few roots; slightly acid; clear, wavy boundary.

C—34 to 60 inches, light yellowish-brown (10YR 6/4) medium and coarse sand; single grained; loose; slightly acid.

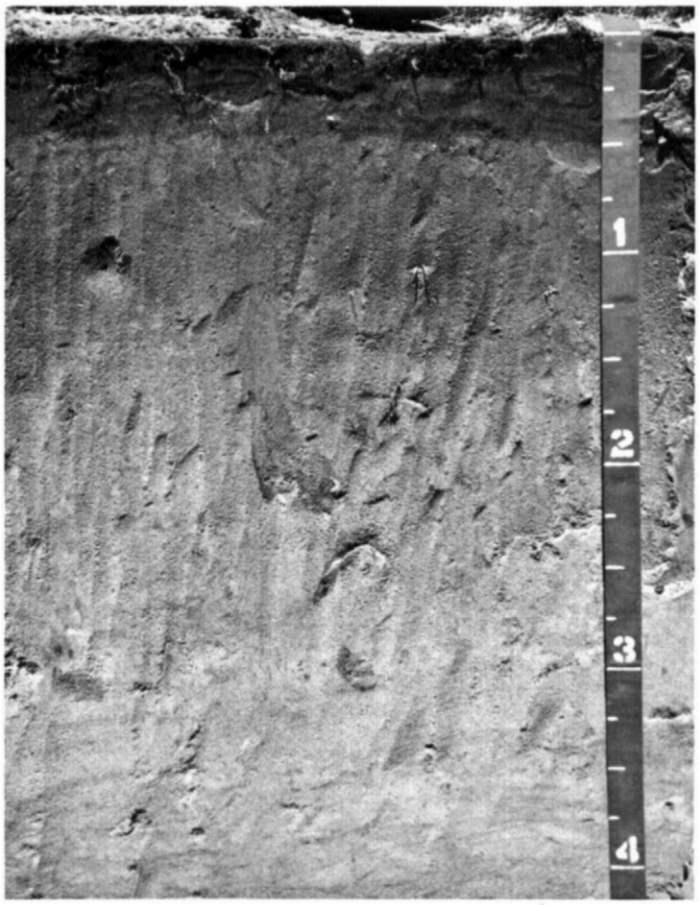

Figure 8.—**Profile of Plainfield loamy sand, 0 to 2 percent slopes, in a cultivated field.**

The solum ranges from 18 to 36 inches in thickness. In uncultivated areas the A1 horizon is 1 to 4 inches thick and is black or very dark brown. The A2 horizon is 1 to 3 inches thick and is strong-brown or yellowish-brown loamy sand or sand. The C horizon ranges from yellowish brown to yellow and is 0 to 15 percent gravel.

The mean annual soil temperature of these Plainfield soils is slightly lower than is defined as within the range for the series. This slight difference in temperature, however, does not affect use and management of these soils.

Plainfield soils are adjacent to Richford, Kranski, Coloma, Plainbo, Plainfield variant, and moderately well drained Friendship soils. They have less clay in the B horizon than Richford, Coloma, and Kranski soils. They differ from Plainbo soils by lacking sandstone bedrock at a depth of less than 40 inches. They have less gravel in the solum than Plainfield variant soils.

Plainfield loamy sand, 0 to 2 percent slopes (PfA).—This nearly level soil occupies 20- to 600-acre tracts on sand plains. It has a profile similar to the one described as representative of the series, but the surface layer is slightly thicker. Included in mapping are small areas of Friendship, Richford, and Plainfield variant soils.

Also included are small areas of soils that have slopes of more than 2 percent and small areas that have a surface layer of sand. Small, wet areas and areas that have been severely eroded by soil blowing are identified by symbols.

Much of the acreage of this soil is used for crops. Response of crops to lime and fertilizer is limited by the low available water capacity and a severe hazard of soil blowing. Some areas are irrigated for specialty crops. Capability unit IVs–3; recreation group 2; wildlife group 3; woodland group 3s1.

Plainfield loamy sand, 2 to 6 percent slopes (PfB).—This gently sloping soil occupies 5- to 100-acre tracts on sand plains and river terraces. It has the profile described as representative of the series. Included in mapping are small areas of soils that have slopes of less than 2 percent and greater than 6 percent and small areas of Richford and Friendship soils. Small blowouts are identified by symbols.

Some areas of this soil are used for crops. Response of crops to lime and fertilizer is limited by the low available water capacity and a severe hazard of soil blowing. Some areas are irrigated for specialty crops. Capability unit IVs–3; recreation group 2; wildlife group 3; woodland group 3s1.

Plainfield loamy sand, 6 to 12 percent slopes (PfC).—This sloping soil occupies 5- to 25-acre tracts in breaks adjacent to drainageways and on the edges of sand plains. It has a profile similar to the one described as representative of the series, but the surface layer is thinner and lighter colored. Included in mapping are small areas of soils that have slopes of less than 6 percent and areas of Richford, Coloma, and Kranski soils. Areas where the subsoil has been exposed through erosion are identified by symbols.

Most areas of this soil are used as woodland or for pasture. The low available water capacity, a severe hazard of soil blowing, and a moderate hazard of water erosion are limitations to the use of this soil for crops. Many of the woodland areas are used for Christmas trees. Capability unit VIs–3; recreation group 2; wildlife group 3; woodland group 3s1.

Plainfield loamy sand, granite substratum, 2 to 6 percent slopes (PgB).—This gently sloping soil occupies 5- to 30-acre tracts on convex uplands. It is underlain by granite bedrock at a relatively shallow depth. It has a profile similar to the one described as representative of the series, but it is underlain by loamy residuum from granitic rock at a depth of 40 to 60 inches. In some areas of this soil there are strong-brown mottles between depths of 36 and 60 inches. Stones and cobbles are common throughout. Granitic bedrock is at a depth of 4 to 10 feet. Included in mapping are small areas of Rockers and Mosinee soils. Areas of bedrock outcrop are identified by a symbol.

This soil is used mainly for pasture and as woodland. It is suited to Christmas trees or pulpwood. The low available water capacity and a severe hazard of soil blowing are the main limitations to the use of this soil for crops. Capability unit IVs–3; recreation group 2; wildlife group 3; woodland group 3s1.

Plainfield and Kranski soils (Ph).—These steep and very steep soils occupy 10- to 100-acre tracts on pitted outwash plains and in glacial outwash areas. Plainfield soils make up about 35 percent of this undifferentiated group, and Kranski soils make up about 25 percent. The rest is loamy sand and sand soils in the Coloma, Mecan, and Richford series. The soils are too intermingled to map separately. Included in mapping are small areas of soils that have slopes of less than 12 percent. Eroded areas are identified by a symbol for erosion.

Figure 9.—**Profile of Plainfield sandy loam, gravelly variant, 2 to 6 percent slopes, showing strata of the sand and gravel in the substratum.**

The soils in this mapping group are not suited to crops. They are better suited to wildlife habitat, woodland, or recreation than to most other uses. The very severe hazards of water erosion and soil blowing and the low available water capacity are limitations to the use of these soils for crops. Most areas are too steep for the use of machinery. Capability unit VIIs–3; recreation group 2; wildlife group 3; woodland group 3s2.

Plainfield Variant

This series consists of gently sloping, excessively drained soils that are 12 to 24 inches deep over sand and gravel. These soils are on river terraces and benches. They formed in loamy deposits and the underlying sand and gravel.

In a representative profile (fig. 9) the surface layer is very dark brown sandy loam 7 inches thick. The sub-

soil is dark brown and is 10 inches thick. The upper part is loamy sand and the lower part is sand and gravel. The substratum is dark yellowish-brown loose sand and gravel.

Permeability is rapid, and available water capacity is low. Bedrock is at a depth of more than 10 feet.

Many areas of these soils are used as a source of sand and gravel. Other areas are used for crops and pasture and as woodland.

Representative profile of Plainfield sandy loam, gravelly variant, 2 to 6 percent slopes, 850 feet south and 450 feet east of the northwest corner of sec. 23, T. 23 N., R. 7 E.:

Ap—0 to 7 inches, very dark brown (10YR 2/2) light sandy loam, grayish brown (10YR 5/2) dry; weak, fine, granular structure; very friable; few roots; more than 50 percent coarse sand; strongly acid; abrupt, smooth boundary.

B2ir—7 to 14 inches, dark-brown (7.5YR 4/4) loamy sand; weak, coarse, subangular blocky structure; very friable; 5 percent gravel; about 45 percent coarse sand and 35 percent medium sand; strongly acid; clear, wavy boundary.

IIB3—14 to 17 inches, dark-brown (7.5YR 4/4) coherent sand and gravel; very weak, coarse, subangular blocky structure; loose; about 60 percent gravel; slightly acid; clear, wavy boundary.

IIC—17 to 60 inches, dark yellowish-brown (10YR 4/4) sand and gravel; single grained; loose; about 60 percent gravel; slightly acid.

The solum ranges from 12 to 24 inches in thickness. The Ap horizon is very dark brown or very dark grayish brown. In uncultivated areas the A1 horizon ranges from 2 to 4 inches in thickness and is black or very dark brown. The A2 horizon is grayish brown and is 1 to 2 inches thick. The B2ir horizon ranges from 5 to 9 inches in thickness and is reddish brown or dark brown. The IIB3 horizon ranges from 1 to 10 inches in thickness and from light gravelly loamy sand to coherent sand and gravel in texture. The IIB3 and IIC horizons range from 30 to 70 percent gravel, by volume.

Plainfield variant soils are adjacent to Plainfield and Dunnville soils and to the somewhat poorly drained Meehan variant soils. They have more gravel throughout than Plainfield or Dunnville soils.

Plainfield sandy loam, gravelly variant, 2 to 6 percent slopes (PkB).—This gently sloping soil occupies 5- to 60-acre tracts on river terraces and benches. Included in mapping are small areas of Plainfield and Dunnville soils and Meehan soils, gravelly variant. Also included are small areas of soils that have slopes of less than 2 percent and greater than 6 percent. Areas of soils that have a gravelly surface layer are identified by symbols.

Many areas of this soil are used as a source of sand and gravel. Other areas are used for crops and pasture or as woodland. The low available water capacity and the moderate hazards of soil blowing and water erosion are the main limitations to the use of this soil for crops. Capability unit IIIe–3; recreation group 1; wildlife group 3; woodland group 3d1.

Point Series

The Point series consists of deep, nearly level, somewhat poorly drained soils. These soils are on uplands. They formed in loamy deposits and the underlying residuum from igneous rock.

In a representative profile the surface layer is dark-brown sandy loam 10 inches thick. The subsurface layer is brown and dark yellowish-brown sandy loam 6 inches thick. The subsoil is 22 inches thick. The upper part is yellowish-brown sandy loam and has strong-brown and brown mottles, the middle part is yellowish-brown loam and has light brownish-gray, strong-brown, and yellowish-red mottles, and the lower part is dark-brown loam and has light brownish-gray and strong-brown mottles. The substratum is strong-brown loam and has grayish-brown mottles.

Permeability is moderately rapid in the surface layer and upper part of the subsoil and moderately slow below. Available water capacity is medium. The soils are saturated with water at a depth of less than 3 feet during periods of wetness. Stones and rock outcrop are in some places. Bedrock is at a depth of 4 to 20 feet.

Many areas of these soils are used for crops. Other areas are used for pasture or as woodland.

Representative profile of Point sandy loam, 1 to 3 percent slopes, 450 feet south and 450 feet west of the northeast corner of sec. 30, T. 24 N., R. 8 E.:

Ap—0 to 10 inches, dark-brown (10YR 3/3) sandy loam, pale brown (10YR 6/3) dry; moderate, fine, granular structure; friable; common roots; 5 to 10 percent cobble-size rock fragments; very strongly acid; abrupt, smooth boundary.

A&B—10 to 16 inches, 60 percent brown (10YR 5/3) sandy loam (A2 part) surrounds 40 percent dark yellowish-brown (10YR 4/4) heavy sandy loam (Bt part); weak, medium, subangular blocky structure; friable; few roots; thin, discontinuous clay films on Bt part; 5 to 10 percent angular cobbly and coarse chert fragments; tongues of A2 material more than 15 millimeters in diameter throughout surround columnarlike upward extensions of Bt material; strongly acid; clear, wavy boundary.

B&A—16 to 29 inches, 70 percent yellowish-brown (10YR 5/4) heavy sandy loam (Bt); few, fine, distinct, strong-brown (7.5YR 5/6) and brown (7.5YR 5/2) mottles; 30 percent tongues of brown (10YR 5/3) sandy loam (A2), greater than 15 millimeters in diameter throughout; weak, medium, subangular blocky structure; friable; few roots; thin, discontinuous clay films on Bt part; 5 to 10 percent cobble-size rock fragments; strongly acid; clear, wavy boundary.

IIB2t—29 to 32 inches, yellowish-brown (10YR 5/6) heavy loam; many, coarse, prominent, light brownish-gray (2.5Y 6/2), strong-brown (7.5YR 5/6), and yellowish-red (5YR 5/6) mottles; moderate, medium, subangular blocky structure; firm; moderately thick, patchy clay films on vertical and horizontal surfaces of peds; 5 to 10 percent cobble-size rock fragments; strongly acid; clear, wavy boundary.

IIB3t—32 to 38 inches, dark-brown (7.5YR 4/4) loam, common, coarse, distinct, light brownish-gray (2.5Y 6/2) and strong-brown (7.5YR 5/6) mottles; weak, coarse, subangular blocky structure; firm; thin, patchy clay films on all surfaces of peds and old root channels; 10 to 15 percent cobble-size rock fragments; strongly acid; clear, wavy boundary.

IIC—38 to 60 inches, strong-brown (7.5YR 5/6) loam; common, medium, distinct, grayish-brown (2.5Y 5/2) mottles; massive; friable; 10 to 15 percent cobble-size rock fragments; strongly acid.

The solum ranges from 24 to 48 inches in thickness. It is 5 to 30 percent cobbles and stones throughout. The upper story ranges from 20 to 30 inches in thickness. The Ap horizon is very dark grayish brown or dark brown. In uncultivated areas the A1 horizon ranges from 2 to 4 inches in thickness and is very dark brown or very dark grayish brown. The A2 horizon ranges from 2 to 6 inches in thickness. The combined A&B and B&A horizons range from 12

to 24 inches in thickness. The IIB2t horizon ranges from 2 to 6 inches in thickness and from loam to sandy clay loam in texture. The IIB3t horizon ranges from 3 to 9 inches in thickness and is loam or heavy loam.

Point soils are adjacent to Meadland and Rockers soils, well-drained Mosinee and Rozellville soils, and poorly drained Dancy soils. They have a finer textured B horizon than Meadland soils and a finer textured solum than Rockers soils.

Point sandy loam, 1 to 3 percent slopes (PoA).—This nearly level soil occupies 20- to 300-acre tracts on uplands. Included in mapping are small areas of Mosinee, Rozellville, Meadland, Rockers, and Dancy soils. Areas of soils that have many stones on the surface, areas of bedrock outcrop, and areas that pond are identified by symbols.

Much of the acreage of this soil is used for crops. Response of crops to lime and fertilizer is limited by wetness. Artificial drainage is beneficial to crops commonly grown in the county. In some places the stones on the surface and bedrock outcrop are limitations to the use of this soil for crops. Capability unit IIIw–6; recreation group 3; wildlife group 6; woodland group 3o1.

Richford Series

The Richford series consists of nearly level to sloping, well-drained soils that are 30 to 50 inches deep over sand and gravel. These soils are on outwash plains. They formed in loamy sand deposit and the underlying outwash sand.

In a representative profile the surface layer is dark-brown loamy sand 7 inches thick. The subsoil is 34 inches thick. The upper part is dark-brown, yellowish-brown and brown loamy sand, the middle part is dark-brown sandy loam, and the lower part is yellowish-brown loamy sand. The substratum is yellowish-brown sand.

Permeability is moderately rapid, and available water capacity is low. Bedrock is at a depth of more than 10 feet.

Most areas of these soils are used for crops (fig. 10).

Representative profile of Richford loamy sand, 0 to 2 percent slopes, 2,620 feet east and 50 feet north of the southwest corner of sec. 26, T. 23 N., R. 8 E.:

Ap—0 to 7 inches, dark-brown (10YR 3/3) loamy sand, brown (10YR 5/3) dry; weak, medium, granular structure; very friable; common roots; neutral; abrupt, smooth boundary.

B2ir—7 to 15 inches, dark brown (7.5YR 4/4) loamy sand; weak, medium, subangular blocky structure; very friable; few roots; slightly acid; gradual, wavy boundary.

A'2—15 to 25 inches, yellowish-brown (10YR 5/4) light loamy sand; weak, medium, subangular blocky structure; very friable; 10 percent gravel 5 to 60 millimeters in diameter; few roots; slightly acid; gradual, wavy boundary.

B1—25 to 27 inches, brown (10YR 4/3) loamy sand; weak, medium, subangular blocky structure; very friable; 10 percent gravel 5 to 60 millimeters in diameter; few roots; slightly acid; abrupt, wavy boundary.

B2t—27 to 34 inches, dark-brown (7.5YR 4/4) sandy loam; weak, medium, subangular blocky structure; friable; 10 percent gravel 5 to 60 millimeters in diameter; few roots; slightly acid; abrupt, wavy boundary.

B3t—34 to 41 inches, yellowish-brown (10YR 5/4) light loamy sand; weak, coarse, subangular blocky structure; very friable; 10 percent gravel 5 to 60 millimeters in diameter; weak clay bridging of sand grains; strongly acid; gradual, wavy boundary.

C—41 to 60 inches, yellowish-brown (10YR 5/4) medium and coarse sand; 4 to 15 percent gravel 5 to 60 millimeters in diameter scattered throughout; single grained; loose; neutral.

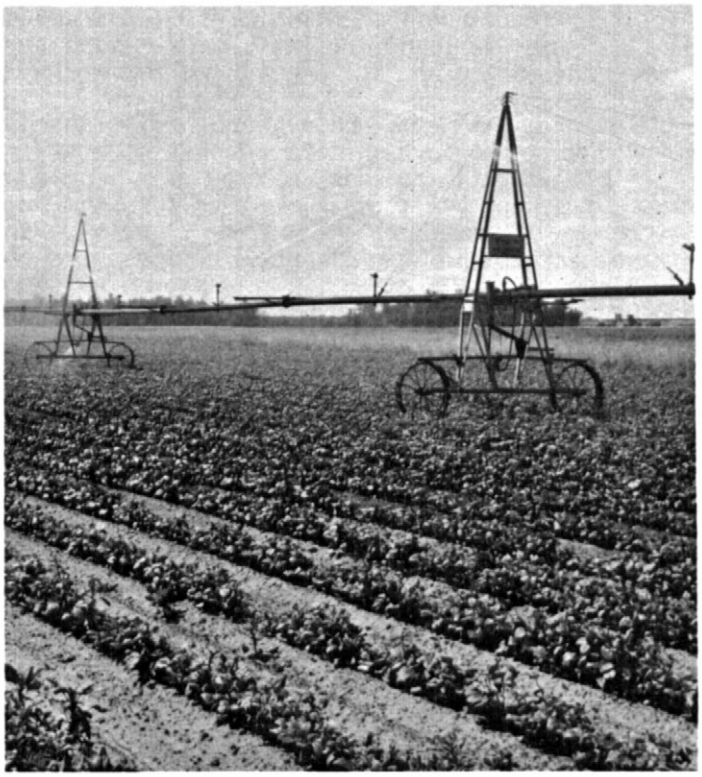

Figure 10.—**Sprinkler irrigation in an area of Richford loamy sand, 0 to 2 percent slopes.**

The solum ranges from 30 to 50 inches in thickness. In uncultivated areas the A1 horizon ranges from 3 to 5 inches in thickness and is very dark grayish brown or dark brown, and the A2 horizon is 2 to 4 inches thick and is brown or grayish brown. The B2ir horizon ranges from 4 to 9 inches in thickness and from yellowish brown to dark brown in color. The A'2 horizon ranges from 5 to 12 inches in thickness. The B1 horizon is brown, dark brown, or dark yellowish brown and ranges from 1 to 4 inches in thickness. The B2t horizon is sandy loam or heavy sandy loam, is 10 to 20 percent gravel, and is 6 to 9 inches thick. The B3t horizon is brown, yellowish brown, or dark yellowish brown and ranges from 5 to 9 inches in thickness. The C horizon is 5 to 24 percent gravel.

Richford soils are adjacent to Plainfield, Rosholt, and Billett soils and to moderately well drained Pearl soils. They have a finer textured B horizon than Plainfield soils. They have a coarser textured A horizon and less clay in the B horizon than Billett or Rosholt soils.

Richford loamy sand, 0 to 2 percent slopes (RfA).—This nearly level soil occupies 10- to 200-acre tracts on outwash plains. It has the profile described as representative of the series. Included in mapping are small areas of Plainfield, Rosholt, Pearl, and Billett soils. Also included are small areas of soils that have slopes of more than 2 percent and small areas of soils that have a surface layer of fine sand.

Most areas of this soil are used for crops. Response of crops to fertilizer is limited by low available water

capacity and a severe hazard of soil blowing. This soil is well suited to irrigated crops. Capability unit IIIs–4; recreation group 2; wildlife group 3; woodland group 3o1.

Richford loamy sand, 2 to 6 percent slopes (RfB).—This gently sloping soil occupies 10- to 100-acre tracts on the edge of outwash plains. It has a profile similar to the one described as representative of the series, but the surface layer is slightly thinner. Included in mapping are small areas of Plainfield, Rosholt, and Pearl soils. Also included are small areas of soils that have slopes of less than 2 percent and greater than 6 percent and small areas of soils that have a surface layer of loamy fine sand.

Most areas of this soil are used for crops. Response of crops to lime and fertilizer is limited by low available water capacity, a severe hazard of soil blowing, and a slight hazard of water erosion. This soil is well suited to irrigated crops. Capability unit IIIs–4; recreation group 2; wildlife group 3; woodland group 3o1.

Richford loamy sand, 6 to 12 percent slopes (RfC).—This sloping soil occupies 5- to 20-acre tracts on foot slopes on the outer edges of outwash plains. It has a profile similar to the one described as representative of the series, but the combined surface layer and subsoil are thinner. Included in mapping are small areas of soils that have slopes of less than 6 percent and areas of Plainfield and Rosholt soils.

Much of the acreage of this soil is used for crops. Response of crops to lime and fertilizer is limited by low available water capacity, a moderate hazard of soil blowing, and a severe hazard of water erosion. Capability unit IIIe–7; recreation group 2; wildlife group 3; woodland group 3o1.

Richford loamy fine sand, 2 to 6 percent slopes (RgB). This soil occupies 10- to 100-acre tracts in basins of former glacial lakes. It has a profile similar to the one described as representative of the series, but it has bands of loamy fine sand and fine sand throughout the subsoil and substratum and has less gravel. Included in mapping are small areas of Oesterle variant, Coloma, and Pearl soils. Also included are areas of Richford loamy sand.

Most areas of this soil are used for crops. Response of crops to lime and fertilizer is limited by low available water capacity, a severe hazard of soil blowing, and a slight hazard of water erosion. This soil is suited to irrigated crops. Capability unit IIIs–4; recreation group 1; wildlife group 3; woodland group 3o1.

Rockers Series

The Rockers series consists of deep, nearly level, somewhat poorly drained soils. These soils are on uplands. They formed in sandy deposits and the underlying loamy residuum from igneous rock.

In a representative profile the surface layer is black loamy sand 1 inch thick. The subsurface layer is pinkish-gray loamy sand about 1 inch thick. The subsoil is 32 inches thick. The upper part is reddish-brown loamy sand, the next part is dark reddish-brown loamy sand that has yellowish-red mottles and is over brown loamy sand that has light brownish-gray mottles, and the lower part is light brownish-gray gravelly loam and has yellowish-red mottles. The substratum is dark-brown and light brownish-gray gravelly loam.

Permeability is moderate, and available water capacity is medium. The soils are saturated with water at a depth of less than 3 feet during periods of wetness. Bedrock is at a depth of 4 to 20 feet. In some places there are stones and rock outcrop (fig. 11).

Most areas of these soils are used for pasture or as woodland. A few areas are used for crops.

Representative profile of Rockers loamy sand, 1 to 3 percent slopes, 1,430 feet west and 15 feet north of the southeast corner of sec. 29, T. 25 N., R. 8 E.:

A1—0 to 1 inch, black (10YR 2/1) loamy sand, dark gray (10YR 4/1) dry; weak, medium, subangular blocky structure; very friable; common roots; strongly acid; abrupt, smooth boundary.

A2—1 to 2 inches, pinkish-gray (5YR 6/2) loamy sand; weak, fine, subangular blocky structure; very friable; common roots; strongly acid; abrupt, smooth boundary.

B21ir—2 to 8 inches, reddish-brown (5YR 4/4) loamy sand; weak, fine, subangular blocky structure; very friable; common roots; strongly acid; clear, wavy boundary.

B22ir—8 to 16 inches, dark reddish-brown (5YR 3/4) loamy sand; few, fine, distinct, yellowish-red (5YR 5/6) mottles; weak, fine, subangular blocky structure; very friable; few roots; strongly acid; abrupt, smooth boundary.

A&B—16 to 24 inches, 70 percent brown (10YR 5/3) loamy sand (A'2 part); few, fine, faint, light brownish-gray (10YR 6/2) mottles; peds of dark-brown (7.5YR 4/4) sandy loam (Bt part) surrounds A'2 material; weak, medium, subangular blocky structure; very friable; few roots; weak clay bridging of sand grains in Bt part; very strongly acid; gradual, wavy boundary.

IIB'2tg—24 to 34 inches, light brownish-gray (10YR 6/2) gravelly loam; common, medium, prominent, yellowish-red (5YR 5/6) mottles; weak, medium, subangular blocky structure; friable; few roots; few, discontinuous clay films on vertical and horizontal surfaces of peds; gravel fragments of disintegrated igneous rock; very strongly acid; gradual, wavy boundary.

IIC—34 to 60 inches, light brownish-gray (10YR 6/2) and dark-brown (7.5YR 4/4) gravelly light loam from igneous rock; 25 percent cobbles and stones from partly weathered and disintegrated igneous rock; massive; friable; very strongly acid.

The solum ranges from 28 to 40 inches in thickness. The sandy upper story ranges from 20 to 30 inches in thickness. In places the A1 horizon is as much as 2 inches thick and is black or very dark brown, and the A2 horizon is as much as 3 inches thick. In cultivated areas the Ap horizon is 5 to 7 inches thick and is very dark grayish brown or dark brown. The Bir horizon ranges from 10 to 18 inches in thickness. The A&B horizon ranges from 5 to 10 inches in thickness. The IIB'2tg horizon ranges from gravelly heavy sandy loam to gravelly heavy loam in texture and from 6 to 12 inches in thickness. The IIC horizon ranges from gravelly sandy loam to heavy loam.

Rockers soils are adjacent to Point soils, poorly drained Dancy soils, and well-drained Mosinee soils. They have a coarser textured solum than Point soils.

Rockers loamy sand, 1 to 3 percent slopes (RhA).—This nearly level soil occupies tracts that are irregular in shape and 20 to 200 acres in size. It is on uplands. Included in mapping are small areas of Point, Mosinee, and Dancy soils. Areas of soils that have many stones on the surface and areas that have bedrock outcrop are identified by symbols.

Most areas of this soil are used for pasture or as woodland. Wetness is the main limitation to the use

Figure 11.—A stony area of Rockers loamy sand, 1 to 3 percent slopes.

of this soil for crops. The hazard of soil blowing is moderate during dry periods. Stones on the surface and bedrock outcrop are also limitations in some places. Capability unit IIIw–6; recreation group 4; wildlife group 6; woodland group 3w4.

Rock Land

Rock land (Rk) is gently sloping to very steep and is on hills or bluffs. Bedrock outcrop makes up about 50 to 90 percent of the surface. Shallow soils, cobbles, and stones are between the areas of outcrop. The outcrop is acid igneous, metamorphic, or sandstone. The cobbles and stones are 5 inches to more than 10 feet in diameter. Small pockets of loamy sand or sandy loam, ranging in depth from 6 to 36 inches, are between the stones and cracks in the bedrock.

Included in mapping are small areas of Plainbo and Mosinee soils.

This land type is not suited to crops. Vegetation such as grass, brush, and small trees grows only in the shallow soil between the stones and rock outcrop. This vegetation should be maintained. Capability unit VIIIs–10; recreation group 2; wildlife group 10; woodland group 6s1.

Roscommon Series

The Roscommon series consists of deep, nearly level, poorly drained soils. These soils are in major drainageways and depressions on sand plains. They formed in deep medium and coarse sand.

In a representative profile the surface layer is black muck 9 inches thick. The subsoil is light olive-brown medium sand 17 inches thick and has yellowish-brown and grayish-brown mottles. The substratum is grayish-brown sand.

Permeability is rapid, and available water capacity is low. The soils are saturated with water at a depth of less than 1 foot during periods of wetness. Bedrock is at a depth of more than 5 feet.

Most areas of these soils are used for pasture. Some areas are used for crops.

Representative profile of Roscommon muck (0 to 2 percent slopes) 2,100 feet east and 24 feet south of the northwest corner of sec. 30, T. 24 N., R. 9 E.:

Ap—0 to 9 inches, black (N 2/0) sapric material, 20 percent medium sand; weak, medium, granular structure; very friable; common roots; slightly acid; abrupt, smooth boundary.

B—9 to 26 inches, light olive-brown (2.5Y 5/4) medium

sand; few, fine, prominent, yellowish-brown (10YR 5/8) mottles and many, medium, distinct, grayish-brown (10YR 5/2) mottles; very weak, medium, subangular blocky structure; very friable to loose; few roots; sand grains not coated; neutral; clear, wavy boundary.

C—26 to 60 inches, grayish-brown (10YR 5/2) medium and coarse sand; single grained; loose; neutral.

The solum ranges from 12 to 30 inches in thickness. The A horizon is 4 to 16 inches of sapric material. It is black or very dark brown. In places a thin band of sandy loam is below the sapric material. The B horizon is loamy sand or sand and ranges from 7 to 18 inches in thickness. The C horizon ranges from light brownish gray to grayish brown and is medium and coarse sand. Reaction ranges from strongly acid to mildly alkaline.

Roscommon soils are adjacent to Roscommon variant soils, Markey soils, and somewhat poorly drained Meehan and Leola soils. They have a coarser textured B horizon than Roscommon variant soils. They have a thinner organic deposit than Markey soils.

Roscommon muck (Rm).—This nearly level soil occupies 5- to 1,000-acre tracts on sand plains and in major drainageways. It has the profile described as representative of the series. Included in mapping are small areas of Meehan and Markey soils and Roscommon variant soils. Also included are small areas of soils where the surface layer is high in content of iron.

Most areas of this soil are used as pasture. Some areas are used for crops. Response of crops to lime and fertilizer is limited by the low available water capacity, a severe hazard of soil blowing, and wetness. Drainage and irrigation are beneficial to potato and other vegetable crops. Capability unit IVw–5; recreation group 5; wildlife group 7; woodland group 4w4.

Roscommon-Meehan complex, 0 to 3 percent slopes (Rn).—Roscommon muck makes up 55 percent of this complex, and Meehan loamy sand makes up 35 percent. The other 10 percent is Friendship and Markey soils.

Meehan soils are on long, narrow ridges that wind irregularly through large tracts of Roscommon soils. These Roscommon and Meehan soils have profiles similar to the ones described as representative for their respective series.

Most areas of this complex are used for pasture. The low available water capacity, a severe hazard of soil blowing, and water saturation at a depth of less than 3 feet are limitations to the use of this complex for crops. Capability unit IVw–5; recreation group 5; wildlife group 7; woodland group 4w4.

Roscommon Variant

This series consists of nearly level, poorly drained soils that are moderately deep to sand and gravel. These soils are on outwash plains. They formed in loamy deposits over outwash sand and gravel.

In a representative profile the surface layer is black sandy loam 11 inches thick. The subsoil is sandy loam 15 inches thick. The upper part is pinkish gray and has dark-brown and strong-brown mottles, and the lower part is gray and has dark-brown mottles. The substratum is brown sand and gravel and has strong-brown mottles.

Permeability is moderately rapid in the surface layer and subsoil and very rapid in the substratum. Available water capacity is low. The soils are saturated with water at a depth of less than 1 foot during periods of wetness.

Most areas of these soils are used for pasture or as woodland. Some areas are drained and used for crops.

Representative profile of Roscommon sandy loam, loamy variant, 0 to 2 percent slopes, 2,140 feet north and 720 feet west of the southeast corner of sec. 27, T. 24 N., R. 7 E.:

Ap—0 to 11 inches, black (10YR 2/1) sandy loam, gray (10YR 5/1) dry; weak, medium, granular structure; friable; many roots; few small pebbles; slightly acid; abrupt, smooth boundary.

B1g—11 to 16 inches, pinkish-gray (7.5YR 6/2) sandy loam; many, coarse, distinct, dark-brown (7.5YR 4/4) mottles and many, coarse, prominent, strong-brown (7.5YR 5/8) mottles; weak, medium, subangular blocky structure; friable; few roots; 5 percent gravel; strongly acid; clear, wavy boundary.

B2g—16 to 26 inches, gray (10YR 5/1) sandy loam; many, coarse, prominent, dark-brown (7.5YR 4/4) mottles; weak, medium, prismatic structure to weak, medium, subangular blocky; friable; few roots; 5 percent gravel; strongly acid; clear, wavy boundary.

IIC—26 to 60 inches, brown (10YR 5/3) sand and gravel; many, coarse, prominent, strong-brown (7.5YR 5/8) mottles; single grained; loose; medium acid.

The solum ranges from 20 to 36 inches in thickness. The Ap horizon is black or very dark brown. In uncultivated areas the A1 horizon ranges from 1 to 5 inches in thickness and is black, and the A2 horizon ranges from 2 to 4 inches in thickness. In some places as much as 12 inches of organic matter covers the A1 horizon. The Bg horizon is sandy loam or loam and ranges from 12 to 28 inches in thickness. In some places thin loamy bands are in the C horizon.

Roscommon variant soils are adjacent to Roscommon soils and to somewhat poorly drained Oesterle variant soils and to Oesterle and Leola soils. They have a finer textured solum than Roscommon soils.

Roscommon sandy loam, loamy variant (Ro).—This nearly level soil occupies long and narrow 5- to 40-acre tracts in slight depressions, in drainageways, and on borders of lakes and streams. It has the profile described as representative of the series. Included in mapping are small areas of Roscommon, Oesterle, and Leola soils. Also included are small areas of soils that have a surface layer of loam.

Most areas of this soil are used for pasture or as woodland. Wetness is a limitation to the use of this soil for crops, and drainage is commonly difficult. Some areas are drained and used for crops. Capability unit IVw–3; recreation group 5; wildlife group 7; woodland group 4w4.

Roscommon sandy loam, loamy variant, loamy substratum (Rp).—This soil occupies long and narrow 5- to 20-acre tracts in slight depressions, in drainageways, and on borders of lakes. It has a profile similar to the one described as representative of the series, but the substratum is silt and fine sand within a depth of 5 feet. Included in mapping are small areas of soils that have silt and fine sand at a depth of more than 5 feet. Also included are small areas of Oesterle variant soils.

Most areas of this soil are used for pasture or as woodland. Wetness is a limitation to the use of this soil for crops, and drainage is commonly difficult. Some areas are drained and are used for crops. Capability unit IVw–3; recreation group 5; wildlife group 7; woodland group 4w4.

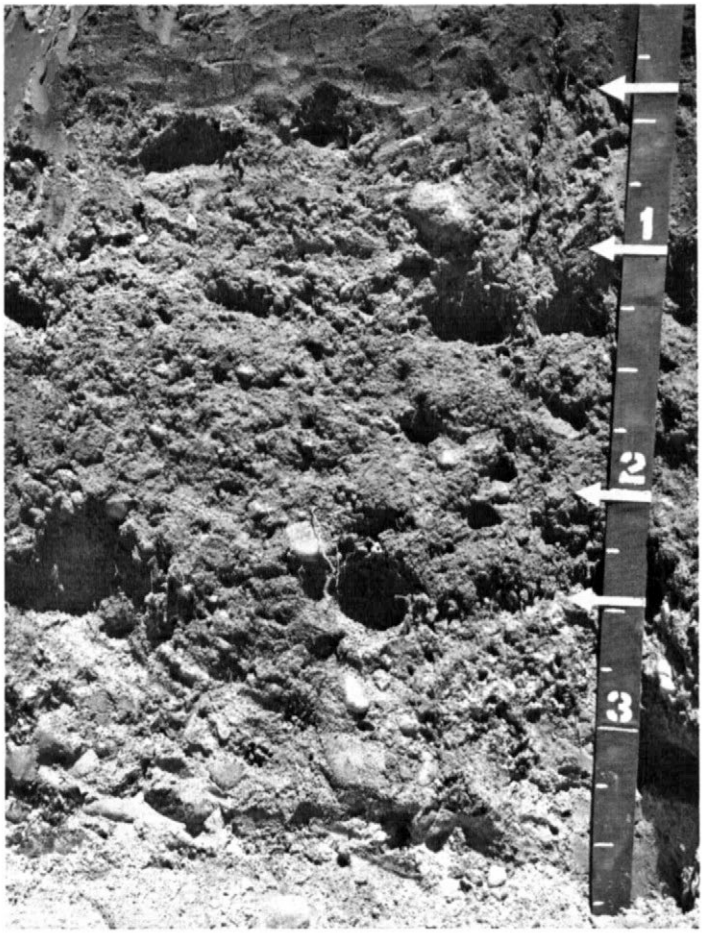

Figure 12.—**Profile of Rosholt sandy loam, 2 to 6 percent slopes, in a cultivated field.**

Rosholt Series

The Rosholt series consists of nearly level to very steep, well-drained soils that are moderately deep to sand and gravel. These soils are on glacial outwash plains and escarpments. They formed in loamy deposits and outwash sand and gravel.

In a representative profile (fig. 12) the surface layer is dark-brown sandy loam 6 inches thick. The subsurface layer is yellowish-brown and dark-brown sandy loam 8 inches thick. The subsoil is 15 inches thick. The upper part is dark-brown gravelly sandy loam, and the lower part is yellowish-red gravelly loamy sand. The substratum is pale-brown sand and gravel.

Permeability is moderately rapid in the surface layer and subsoil and very rapid in the substratum. Available water capacity is low.

Most areas of these soils are used for crops or as pasture (fig. 13). Areas that are steep and very steep are used as woodland and for pasture.

Representative profile of Rosholt sandy loam, 2 to 6 percent slopes, 2,620 feet west and 780 feet south of the northeast corner of sec. 13, T. 22 N., R. 10 E.:

Ap—0 to 6 inches, dark-brown (10YR 3/3) sandy loam, pale brown (10YR 6/3) dry; weak, fine, granular structure; friable; common roots; 5 percent gravel 2 to 10 millimeters in diameter; strongly acid; abrupt, smooth boundary.

A&B—6 to 14 inches, 80 percent yellowish-brown (10YR 5/4) sandy loam (A2 part) surrounds remnants of dark-brown (7.5YR 4/4) heavy sandy loam (Bt part); weak, medium, subangular blocky structure; friable; few roots; weak clay bridging of sand grains in Bt part; about 10 percent gravel 2 to 50 millimeters in diameter; medium acid; gradual, wavy boundary.

B21t—14 to 19 inches, dark-brown (7.5YR 4/4) gravelly heavy sandy loam; moderate, medium, subangular blocky structure; friable; few roots; thin, discontinuous clay films on surfaces of peds; 13 percent, by volume, tongues of sandy loam (A2 material); 15 percent gravel 2 to 50 millimeters in diameter; 5 percent cobbles; strongly acid; clear, wavy boundary.

B22t—19 to 22 inches, dark-brown (7.5YR 4/4) gravelly sandy loam; moderate, medium, subangular blocky structure; friable; few roots; thin, discontinuous clay films on surfaces of peds; 25 percent gravel 2 to 50 millimeters in diameter; 5 percent cobbles; strongly acid; clear, wavy boundary.

B3t—22 to 29 inches, yellowish-red (5YR 4/6) gravelly loamy sand; weak, medium, subangular blocky structure; very friable; few roots; weak clay bridging of sand grains; 20 percent gravel 2 to 50 millimeters in diameter; 5 percent cobbles; medium acid; gradual, wavy boundary.

C—29 to 60 inches, pale-brown (10YR 6/3) stratified sand and gravel; single grained; loose; 40 percent gravel 2 to 60 millimeters in diameter; 5 percent cobbles; medium acid.

The solum ranges from 20 to 40 inches in thickness. Coarse fragments (2 millimeters to 3 inches in diameter) make up 0 to 10 percent, by weight, of the A horizon and 10 to 40 percent, by weight, of the B horizon. The Ap horizon is very dark grayish-brown, dark-brown, or dark yellowish-brown sandy loam or loam. In uncultivated areas the A1 horizon ranges from 1 to 3 inches in thickness and is very dark grayish brown or dark brown, and the A2 horizon ranges from 2 to 4 inches in thickness. The combined A&B and B&A horizons, where these horizons are both present, range from 6 to 10 inches in thickness and are sandy loam or loam. The B2t horizon ranges from 6 to 12 inches in thickness and is dark brown or dark yellowish brown. The B21t horizon is gravelly heavy sandy loam or gravelly heavy loam, and the B22t horizon is gravelly loam or gravelly sandy loam. The B3t horizon is gravelly loamy sand or gravelly sandy loam and ranges from 3 to 14 inches in thickness. The C horizon is 20 to 60 percent gravel, by weight.

Rosholt soils are adjacent to Richford, Wyocena, and Billett soils and to excessively drained Rosholt variant soils. They have a lighter colored A horizon than Billett soils, a finer textured solum than Richford soils, and a coarser textured C horizon than Wyocena soils.

Rosholt sandy loam, 0 to 2 percent slopes (RrA).—This nearly level soil is on outwash plains. It is in areas that are 5 to 120 acres in size. It has a profile similar to the one described as representative of the series, but the surface layer is slightly thicker. Included in mapping are small areas of soils that have slopes of more than 2 percent and small areas of Oesterle, Richford, and Billett soils.

Most areas of this soil are used for crops. Many areas are irrigated. The available water capacity is low. The hazard of soil blowing is slight. Capability unit IIIs–4; recreation group 1; wildlife group 1; woodland group 2o1.

Rosholt sandy loam, 2 to 6 percent slopes (RrB).—This gently sloping soil occupies 5- to 120-acre tracts on outwash plains. It has the profile described as representative of the series. Included in mapping are small

Figure 13.—Renovated pasture on an area of Rosholt sandy loam, 2 to 6 percent slopes.

areas of soils that have slopes of less than 2 percent and more than 6 percent and small areas of Richford and Billett soils.

Most areas of this soil are used for crops. Some areas are irrigated. The available water capacity is low. The hazards of soil blowing and water erosion are slight. Capability unit IIIs–4; recreation group 1; wildlife group 1; woodland group 2o1.

Rosholt sandy loam, 6 to 12 percent slopes, eroded (RrC2).—This sloping soil occupies long and narrow, 5- to 40-acre tracts on outwash escarpments and sharp breaks. It has a profile similar to the one described as representative of the series, but the combined surface layer and subsoil are thinner and 2 to 6 inches of material in the surface layer has been lost through erosion. Included in mapping are small areas of soils that have a surface layer of loamy sand, small areas of soils that have lost their original surface layer, some areas where the surface layer and subsoil combined are less than 20 inches thick, and areas that have not been cropped or exposed to erosion and where all of the original surface layer remains. Depressions and severely eroded areas are identified by symbols.

Much of the acreage of this soil is used for pasture or as woodland. Some areas are used for crops. The hazard of soil blowing is moderate, and the hazard of water erosion is severe. Capability unit IIIe–7; recreation group 1; wildlife group 1; woodland group 2o1.

Rosholt loam, 2 to 6 percent slopes (RsB).—This gently sloping soil is on outwash plains. Areas are 5 to 200 acres in size. The profile of this soil is similar to the one described as representative of the series, but the surface layer and the upper part of the subsoil are loam. Also, available water capacity is slightly higher. Included in mapping are small areas of Wyocena and Billet soils and areas of soils that have slopes of less than 2 percent and more than 6 percent. Also included are small areas of soils that have a surface layer of sandy loam.

Most areas of this soil are used for crops. The hazard of water erosion is slight. Capability unit IIIs–4; recreation group 1; wildlife group 1; woodland group 2o1.

Rosholt loam, 6 to 12 percent slopes, eroded (RsC2).—This sloping soil is on outwash plains and terraces. Areas are from 5 to 100 acres in size. The profile of this soil is similar to the one described as representative of the series, but the surface layer is loam and 2 to 5 inches of material in the surface layer has been lost through erosion. Also, available water capacity is slightly higher.

Included in mapping are small areas of Wyocena

soils, areas of soils that have slopes of less than 6 percent or more than 12 percent, and areas of soils that have not been cropped or exposed to erosion and where all of the original surface layer remains. Also included are small areas that have a surface layer of sandy loam. Severely eroded areas and escarpments are identified by symbols.

Much of the acreage of this soil is used for crops. Some areas are used for pasture and as woodland. The hazard of water erosion is moderate. Capability unit IIIe–7; recreation group 1; wildlife group 1; woodland group 2o1.

Rosholt loam, loamy substratum, 0 to 2 percent slopes (Rt).—This nearly level soil occupies 5- to 60-acre tracts on outwash plains near former glacial lake basins. It has a profile similar to the one described as representative of the series, but the surface layer is loam, the lower part of the subsoil has brown or strong-brown mottles, and the substratum is banded silt and fine sand. This soil has moderate permeability and medium available water capacity. Included in mapping are small areas of Oesterle variant, Pearl, and Richford soils.

Most of the acreage of this soil is used for crops. This soil is saturated with water at a depth of less than 5 feet during periods of wetness. Capability unit IIIs–4; recreation group 1; wildlife group 1; woodland group 2o1.

Rosholt complex, 12 to 20 percent slopes (RuD).—These moderately steep soils are on sharp breaks and in areas surrounding depressions. Rosholt sandy loam makes up about 55 percent of this complex, and Rosholt sandy loam, gravelly variant, makes up about 45 percent.

Rosholt sandy loam is in swales and on the less steep part of slopes. Rosholt sandy loam, gravelly variant, is on the sharp breaks and steeper slopes.

The Rosholt sandy loam has a profile similar to the one described as representative of the Rosholt series, but the combined thickness of the surface layer and subsoil is less.

Included with these soils in mapping are small areas of soils that are severely or moderately eroded. Also included are small areas of soils that have a surface layer of loam or loamy sand. Depressions and severely eroded areas are identified by symbols.

The areas of this complex are not suited to crops. They are better suited to pasture or woodland than to most other uses. The hazard of water erosion is very severe. Capability unit VIe–3; recreation group 1; wildlife group 1; woodland group 2r2.

Rosholt complex, 20 to 40 percent slopes (RuE).—These steep soils are on escarpments between outwash plains and in areas surrounding deep depressions. Rosholt sandy loam makes up about 45 percent of this complex, and Rosholt sandy loam, gravelly variant, makes up about 40 percent. Wyocena and Mecan soils make up the remaining 15 percent.

Rosholt sandy loam is in swales and in the less steep part of slopes. Rosholt sandy loam, gravelly variant, is on sharp breaks and on steeper slopes.

Depressions and severely eroded areas are identified by symbols.

The areas of this complex are not suited to crops. They are better suited to pasture and woodland than to most other uses. The hazard of water erosion is very severe. Capability unit VIIe–3; recreation group 1; wildlife group 1; woodland group 2r2.

Rosholt Variant

The Rosholt variant consists of moderately steep to very steep, excessively drained soils (fig. 14) that are shallow to sand and gravel. These soils are in pitted glacial outwash areas. They formed in loamy deposits and outwash sand and gravel.

In a representative profile the surface layer is dark-brown gravelly sandy loam 6 inches thick. The subsoil is gravelly loamy sand 11 inches thick. The upper part is brown, and the lower part is strong brown. The substratum is yellowish-brown sand and gravel.

Permeability is moderately rapid, and available water capacity is low.

Most areas of these soils are used for pasture or as woodland. A few areas had been cleared and cultivated but are now used for pasture.

Representative profile of Rosholt gravelly sandy loam, gravelly variant, in an area of Rosholt complex, 12 to 20 percent slopes, 1,330 feet east and 1,310 feet north of the southwest corner of sec. 33, T. 25 N., R. 10 E.:

Ap—0 to 6 inches, dark-brown (10YR 4/3) gravelly sandy loam, brown (10YR 5/3) dry; weak, fine, granular structure; very friable; common roots; 20 percent gravel; slightly acid; abrupt, smooth boundary.

B2—6 to 11 inches, brown (7.5YR 4/4) gravelly loamy sand; weak, medium, subangular blocky structure; very friable; few roots; 25 percent gravel; slightly acid; clear, wavy boundary.

B3—11 to 17 inches, strong-brown (7.5YR 5/6) gravelly loamy sand; very weak, medium, subangular blocky structure; very friable; few roots; 20 percent gravel; medium acid; gradual, wavy boundary.

C—17 to 60 inches, yellowish-brown (10YR 5/4) sand and gravel; single grained; loose; 25 percent gravel; neutral.

The solum ranges from 12 to 20 inches in thickness. The Ap horizon is brown, dark brown, or dark grayish brown. In uncultivated areas the A1 horizon ranges from 1 to 4 inches in thickness, and the A2 horizon is as much as 4 inches in thickness and ranges from grayish brown to pale brown. The B2 horizon ranges from 3 to 6 inches in thickness and from reddish-brown to dark yellowish brown in color. It is gravelly sandy loam or gravelly loamy sand. The B3 horizon ranges from 4 to 8 inches in thickness and from light-brown to yellowish-brown in color. It is loamy sand or gravelly loamy sand. The C horizon is light yellowish brown or yellowish brown. Content of gravel ranges from 5 to 25 percent throughout the A and B horizons and from 14 to 35 percent in the C horizon.

In Portage County Rosholt variant soils are mapped only in a complex with Rosholt soils. Rosholt soils, gravelly variant, are more gravelly than Rosholt soils.

Rozellville Series

The Rozellville series consists of deep, gently sloping, well drained and moderately well drained soils. These soils are on uplands. They formed in loamy deposits and the underlying loamy residuum from igneous rock.

In a representative profile the surface layer is very dark grayish-brown loam 4 inches thick. The subsurface layer is yellowish-brown loam 2 inches thick. The

Figure 14.—**Area of Rosholt complex, 20 to 40 percent slopes.**

subsoil is 18 inches thick. The upper part is dark-brown and yellowish-brown loam, the middle part is dark-brown sandy clay loam, and the lower part is dark-brown loam. The substratum is pale-olive and dark-red stony loam.

Permeability is moderate, and available water capacity is medium. Some areas are saturated with water at a depth of less than 6 feet during periods of wetness. Bedrock is at a depth of 5 to 20 feet.

Most areas of these soils are used for crops. A few areas are used for pasture or as woodland.

Representative profile of Rozellville loam, 2 to 6 percent slopes, 145 feet east and 10 feet north of the southwest corner of sec. 3, T. 24 N., R. 6 E.:

A1—0 to 4 inches, very dark grayish-brown (10YR 3/2) loam, light brownish gray (10YR 6/2) dry; weak, medium, granular structure; friable; many roots; slightly acid; clear, wavy boundary.

A2—4 to 6 inches, yellowish-brown (10YR 5/4) loam; weak, medium, platy structure to weak, very fine, subangular blocky; friable; common roots; medium acid; abrupt, wavy boundary.

B&A—6 to 9 inches, 60 percent dark-brown (7.5YR 4/4) heavy loam (Bt); tongues of yellowish-brown (10YR 5/4) loam (A2) more than 15 millimeters in diameter throughout; weak, medium, subangular blocky structure; friable; common roots; few, thin, discontinuous clay films in Bt part; medium acid; clear, wavy boundary.

IIB2t—9 to 20 inches, dark-brown (7.5YR 4/4) light sandy clay loam; weak, medium, subangular blocky structure; friable; few roots; thin, continuous clay films on horizontal and vertical surfaces of peds; light-colored coatings of A2 material on vertical surfaces of peds; about 25 percent clay; medium acid; gradual, wavy boundary.

IIB3t—20 to 24 inches, dark-brown (7.5YR 4/4) loam; moderate, fine, subangular blocky structure; friable; few roots; thin, discontinuous clay films on horizontal and vertical surfaces of peds; about 10 percent, by volume, schist fragments 1 to 4 inches in diameter; strongly acid; clear, wavy boundary.

IIC—24 to 60 inches, dark-red (2.5YR 3/6) and pale-olive (5Y 6/4) stony loam; massive; friable; about 30 percent, by volume, igneous cobbles and stones 3 to 12 inches in diameter; strongly acid.

The solum ranges from 20 to 40 inches in thickness. The upper story ranges from 8 to 15 inches in thickness. The A1 horizon ranges from 2 to 4 inches in thickness and is very dark brown or very dark grayish brown. In cultivated areas the Ap horizon ranges from 6 to 8 inches in thickness and is very dark grayish brown or dark brown. The A2 horizon ranges from 1 to 5 inches in thickness. The B&A horizon and, where present, the A&B horizon range from 2 to 8 inches in thickness. The IIB2t horizon ranges from 8 to 14 inches in thickness and is heavy loam to clay loam. The IIB3t horizon ranges from 3 to 10 inches in thickness. In some profiles the IIB3t horizon has mottles that have a high chroma.

Rozellville soils are adjacent to Mosinee soils and to somewhat poorly drained Meadland and Point soils. They have a finer textured solum than Mosinee soils.

Rozellville loam, 2 to 6 percent slopes (RzB).—This gently sloping soil occupies 10- to 100-acre tracts on uplands. Included in mapping are small areas of Mosinee, Meadland, and Point soils. Also included are small areas of soils that have a surface layer of sandy loam or silt loam.

Most areas of this soil are used for crops. The hazard of water erosion is moderate. Crops respond to lime and fertilizer. Capability unit IIe–1; recreation group 1; wildlife group 1; woodland group 2o1.

Seelyeville Series

The Seelyeville series consists of deep, nearly level, very poorly drained organic soils. These soils are in former glacial lake basins and in wet depressions. They formed in organic deposits.

In a representative profile the upper 16 inches is black muck. Below this layer is very dark grayish-brown muck.

Permeability is moderately rapid, and available water capacity is very high. The soils are saturated with water at a depth of less than 1 foot during periods of wetness, unless they are drained.

Most areas of these soils are used as wildlife habitat or for pasture or crops.

Representative profile of Seelyeville muck, 0 to 2 percent slopes, 920 feet north and 175 feet east of the southwest corner of sec. 26, T. 24 N., R. 7 E.:

Oa1—0 to 5 inches, black (10YR 2/1) sapric material; weak, very fine, subangular blocky structure; slightly sticky; many roots; less than 5 percent fiber when rubbed; slightly acid; abrupt, wavy boundary.

Oa2—5 to 16 inches, black (10YR 2/1) sapric material; weak, fine, subangular blocky structure; slightly sticky; few roots; less than 5 percent fiber when rubbed; slightly acid; gradual, wavy boundary.

Oa3—16 to 60 inches, very dark grayish-brown (10YR 3/2) sapric material; weak; thin, platy structure; slightly sticky; less than 5 percent fiber when rubbed; slightly acid.

The organic deposits are more than 51 inches thick. Some profiles have a sphagnum surface tier that is as much as 4 inches thick. The subsurface tier and lower tier are black or very dark grayish-brown sapric material. In some profiles the subsurface or bottom tier has a hemic layer that is as much as 4 inches thick. Reaction ranges from medium acid to mildly alkaline.

Seelyeville soils are adjacent to Markey, Cathro, and Lupton soils. They have a thicker organic deposit than Markey and Cathro soils. They lack the woody fiber content of Lupton soils.

Seelyeville muck (Se).—This nearly level soil occupies 20- to 600-acre tracts in former glacial lake basins and very wet drainageways. Included in mapping are small areas of Cathro, Lupton, and Markey soils. Also included are small areas of soils that have a surface layer of peat.

Some areas of this soil are used for crops. This soil is subject to frost late in spring and early in fall. Response to lime and fertilizer is limited by wetness and a severe hazard of soil blowing. Drainage is necessary for growing vegetables and other specialty crops. Most areas are used as wildlife habitat or for pasture. Capability unit IVwc–9; recreation group 6; wildlife group 8; not assigned to a woodland group.

Sherry Series

The Sherry series consists of deep, nearly level, poorly drained soils. These soils are in drainageways on uplands. They formed in silty sediment and the underlying loamy residuum from igneous bedrock.

In a representative profile the surface layer is very dark brown silt loam 8 inches thick. The subsoil is 30 inches thick. The upper part is grayish-brown silt loam and has strong-brown mottles, and the lower part is grayish-brown and yellowish-red loam. The substratum is grayish-brown and dark-brown loam.

Permeability is moderately slow, and available water capacity is high. The soils are saturated with water at a depth of less than 1 foot during periods of wetness. Bedrock is at a depth of 5 to 20 feet.

Most areas of these soils are used as woodland or for pasture. A few areas are drained and used for crops.

Representative profile of Sherry silt loam (0 to 2 percent slopes), 2,620 feet west and 70 feet north of the southeast corner of sec. 32, T. 25 N., R. 6 E.:

Ap—0 to 8 inches, very dark brown (10YR 2/2) silt loam, grayish brown (10YR 5/2) dry; many, medium, distinct, reddish-brown (5YR 4/4) mottles; weak, thin, platy structure to weak, very fine, subangular blocky; friable; common roots; medium acid; abrupt, smooth boundary.

B11g—8 to 11 inches, grayish-brown (10YR 5/2) silt loam; many, medium, prominent, strong-brown (7.5YR 5/8) mottles; weak, thin, platy structure; friable; few roots; slightly acid; clear, wavy boundary.

B12g—11 to 17 inches, grayish-brown (10YR 5/2) silt loam; many, medium, prominent, strong-brown (7.5YR 5/8) mottles; weak, thick, platy structure parting to weak, fine, subangular blocky; friable, few roots; medium acid; gradual, wavy boundary.

IIB2tg—17 to 30 inches, grayish-brown (10YR 5/2) and yellowish-red (5YR 4/6) loam; weak, thick, platy structure parting to weak, subangular blocky; friable; few roots; thin, discontinuous clay films on surfaces of peds; medium acid; gradual, wavy boundary.

IIB3tg—20 to 38 inches, grayish-brown (10YR 5/2) and yellowish-red (5YR 4/6) light loam; massive; very friable; thin, discontinuous clay films on surfaces of peds; strongly acid; gradual, wavy boundary.

IIC—38 to 60 inches, grayish-brown (10YR 5/2) and dark-brown (7.5YR 4/4) light loam; massive; very friable; 5 percent pebbles; strongly acid.

The solum ranges from 36 to 50 inches in thickness. The silty upper story ranges from 15 to 20 inches in thickness. In uncultivated areas the A1 horizon ranges from 5 to 7 inches in thickness, and the light grayish-brown A2 horizon is as much as 3 inches thick. The B1g horizon ranges from 3 to 12 inches in thickness and from gray to grayish brown in color. The IIB2tg horizon is yellowish-red to grayish-brown loam or sandy clay loam and ranges from 12 to 20 inches in thickness. The IIB3tg horizon is yellowish-red to grayish-brown loam or sandy loam and ranges from 6 to 20 inches in thickness. In some profiles this horizon has a rocklike structure. The IIC horizon is sandy loam, loam, or silt loam, depending on the mica and quartz content of the schistose or gneissic parent rock.

Sherry soils are adjacent to Vesper and Altdorf soils and to somewhat poorly drained Kert and Meadland soils. They formed in igneous residuum, whereas Vesper and Kert soils formed in sandstone and shale residuum. They have less clay in the B horizon than Altdorf soils.

Sherry silt loam (Sh).—This nearly level soil occupies 10- to 40-acre tracts in major drainageways on uplands. Included in mapping are small areas of Kert, Meadland, Altdorf, and Vesper soils.

Most areas of this soil are used for pasture or as woodland. Response of crops to lime and fertilizer is limited by wetness. Some areas are subject to ponding. Capability unit IIIw–3; recreation group 5; wildlife group 7; woodland group 3w5.

Vesper Series

The Vesper series consists of deep, nearly level, poorly drained soils. These soils are on uplands. They formed in silty deposits and the underlying residuum from sandstone.

In a representative profile the surface layer is silt loam 8 inches thick. The upper part is very dark gray, and the lower part is black and has brown mottles. The subsurface layer is light-gray silt loam 3 inches thick and has strong-brown mottles. The subsoil is 33 inches thick. The upper part is light-gray and strong-brown silt loam, the middle part is light-gray and strong-brown sandy loam, and the lower part is brown and gray sandy loam. The substratum is brown medium sand.

Permeability is moderate in the surface layer and subsoil and rapid in the substratum. Available water capacity is medium. The soils are saturated with water at a depth of less than 1 foot during periods of wetness. Some areas are subject to ponding.

Most areas of these soils are used for pasture or as woodland. A few areas are drained and used for crops.

Representative profile of Vesper silt loam (0 to 2 percent slopes) 700 feet east and 590 feet south of the northwest corner of sec. 16, T. 23 N., R. 7 E.:

Ap1—0 to 3 inches, very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; moderate, fine, granular structure; friable; many roots; very strongly acid; clear, wavy boundary.

Ap2—3 to 8 inches, black (10YR 2/1) silt loam; common, fine, prominent, brown (7.5YR 5/4) mottles; moderate, very fine, subangular blocky structure; friable; common roots; very strongly acid; abrupt, smooth boundary.

A2—8 to 11 inches, light-gray (10YR 6/1) light silt loam; common, fine, prominent, strong-brown (7.5YR 5/6) mottles; weak, thin, platy structure; friable; few roots; very strongly acid; clear, wavy boundary.

B2g—11 to 23 inches, 70 percent light-gray (10YR 6/1) and 30 percent strong-brown (7.5YR 5/6) silt loam; weak, medium, platy structure parting to weak, very fine, subangular blocky; friable; strongly acid; gradual, wavy boundary.

IIB31g—23 to 36 inches, 60 percent light-gray (10YR 6/1) and 40 percent strong-brown (7.5YR 5/6) heavy sandy loam; moderate, medium, subangular blocky structure; friable; slightly acid; gradual, wavy boundary.

IIB32—36 to 44 inches, 65 percent brown (7.5YR 5/4) and 35 percent gray (N 6/0) light sandy loam; weak, medium, subangular blocky structure; very friable; slightly acid; gradual, wavy boundary.

IIC—44 to 60 inches, brown (7.5YR 5/4) medium sand; single grained; loose; few sandstone fragments 2 to 75 millimeters in diameter; slightly acid.

The solum ranges from 30 to 48 inches in thickness. The silty upper story ranges from 15 to 30 inches in thickness. In uncultivated areas the A1 horizon is black or very dark gray and ranges from 3 to 5 inches in thickness. The A2 horizon ranges from light gray to light brownish gray in color and from 3 to 8 inches in thickness. The B2g horizon ranges from olive gray to light brownish gray in color and from 7 to 18 inches in thickness. It is loam or silt loam. The IIB31g horizon ranges from olive gray to light brownish gray in color and from 9 to 16 inches in thickness. It is loam or sandy loam. The IIB32 horizon ranges from 5 to 10 inches in thickness.

Vesper soils are adjacent to Sherry soils and the somewhat poorly drained Kert soils. They formed in sandstone residuum, and Sherry soils formed in residuum from igneous rock.

Vesper silt loam (Vs).—This nearly level soil occupies 10- to 200-acre tracts on uplands. Included in mapping are small areas of Kert, Sherry, and Dancy soils.

Most areas of this soil are used for pasture or as woodland. Wetness is a limitation to the use of this soil for crops, and drainage is commonly difficult. Some areas are drained and used for crops. The hazard of stoniness is moderate. Capability unit IIIw–3; recreation group 5; wildlife group 7; woodland group 5w5.

Wyocena Series

The Wyocena series consists of deep, gently sloping to steep, well-drained soils. These soils are in areas of glacial till. They formed in loamy deposits and the underlying sandy glacial till.

In a representative profile the surface layer is dark-brown sandy loam 7 inches thick. The subsurface layer is yellowish-brown sandy loam 4 inches thick. The subsoil is sandy loam 19 inches thick. The upper part is dark brown, and the lower part is strong brown. The substratum is strong-brown loamy sand.

Permeability is moderately rapid, and available water capacity is medium.

Many areas of these soils are used for crops. The steeper areas are used for pasture or as woodland.

Representative profile of Wyocena sandy loam, 6 to 12 percent slopes, 600 feet west and 20 feet south of the northeast corner of sec. 1, T. 21 N., R. 9 E.:

Ap—0 to 7 inches, dark-brown (10YR 3/3) sandy loam, pale brown (10YR 6/3) dry; weak, very fine, subangular blocky structure; very friable; many roots; neutral; abrupt, smooth boundary.

A2—7 to 11 inches, yellowish-brown (10YR 5/4) sandy loam; weak, medium, subangular blocky structure parting to weak, very fine, subangular blocky; very friable; few roots; neutral; clear, wavy boundary.

B1—11 to 14 inches, dark-brown (7.5YR 4/4) sandy loam; weak, fine, subangular blocky structure; very friable; few roots; thin, patchy clay films on surfaces of peds; slightly acid; clear, wavy boundary.

B21t—14 to 19 inches, dark-brown (7.5YR 4/4) heavy sandy loam; weak, medium, subangular blocky structure; friable; few roots; thin, patchy clay films on horizonal surfaces of peds; medium acid; clear, wavy boundary.

IIB22t—19 to 23 inches, dark-brown (7.5YR 4/4) heavy sandy loam; weak, medium, subangular blocky structure; friable; few roots; moderately thick, continuous clay films on surfaces of peds; 5 to 10 percent gravel; this horizon has a higher percentage, by weight, of coarse sand than the overlying horizon; strongly acid; clear, wavy boundary.

IIB3t—23 to 30 inches, strong-brown (7.5YR 5/6) sandy loam; weak, medium, subangular blocky structure; very friable; few roots; weak clay bridging of sand grains; 5 to 10 percent gravel; few cobbles; slightly acid; gradual, wavy boundary.

IIC—30 to 60 inches, strong-brown (7.5YR 5/6) loamy sand; massive; very friable; 10 to 15 percent gravel, cobbles, and stones, by volume; neutral.

The solum ranges from 24 to 40 inches in thickness. In uncultivated areas the A1 horizon ranges from 1 to 4 inches in thickness and from black to dark brown in color. The

A2 horizon ranges from 3 to 8 inches in thickness. The B1 horizon ranges from 3 to 7 inches in thickness. The B21t horizon ranges from 3 to 10 inches in thickness and is heavy sandy loam or loam. The IIB22t horizon is heavy sand loam or loam and ranges from 3 to 7 inches in thickness. The IIB3t horizon is sandy loam or heavy loamy sand and ranges from 4 to 10 inches in thickness. Cobbles make up 5 to 15 percent, by volume, of the solum and 10 to 30 percent of the C horizon.

Wyocena soils are adjacent to Coloma, Mecan, Rosholt, and Kranski soils. They have a thinner solum than Mecan soils and are finer textured than Kranski and Coloma soils. They have a finer textured C horizon and have more stones and cobbles than Rosholt soils.

Wyocena sandy loam, 2 to 6 percent slopes (WyB).—This gently sloping soil occupies 5- to 40-acre tracts in areas of till. It has a profile similar to the one described as representative of the series, but the surface layer is slightly thicker and darker colored. Included in mapping are small areas of Rosholt and Kranski soils and areas of soils that have a surface layer of loam. Also included are small areas of soils that have lost 3 to 5 inches of the surface layer through erosion and areas of soils that have slopes of more than 6 percent.

Most areas of this soil are used for crops. A moderate hazard of water erosion, the hazard of soil blowing, and the medium available water capacity are the chief limitations to the use of this soil for crops. In some places stones are also a limitation. Capability unit IIIe–4; recreation group 1; wildlife group 1; woodland group 3o1.

Wyocena sandy loam, 6 to 12 percent slopes (WyC).—This sloping soil occupies 10- to 100-acre tracts in areas of till. It has the profile described as representative of the series. Included in mapping are small areas of Kranski, Coloma, Rosholt, and Mecan soils and areas of soils that have a surface layer of loam. Also included are small areas of soils that have slopes of less than 6 percent and more than 12 percent. Areas that have many stones on the surface are identified by symbols.

Most areas of this soil are used for pasture or as woodland. Some areas are used for crops. A severe hazard of water erosion, a slight hazard of soil blowing, and the medium available water capacity are the chief limitations to the use of this soil for crops. In some places stones are also a limitation. Capability unit IVe–4; recreation group 1; wildlife group 1; woodland group 3o1.

Wyocena sandy loam, 12 to 20 percent slopes (WyD).—This moderately steep soil occupies 10- to 100-acre tracts in areas of till. It has a profile similar to the one described as representative of the series, but the surface layer and subsoil are thinner. Included in mapping are small areas of Kranski, Coloma, and Mecan soils. Also included are small areas of soils that have slopes of less than 12 percent and more than 20 percent. Areas that have many stones on the surface and areas that have lost all or nearly all of the surface layer through erosion are identified by spot symbols.

This soil is not suited to crops. It is better suited to pasture, woodland, or wildlife habitat than to most other uses. The medium available water capacity, the stones on the surface, and the very severe hazard of water erosion are the main limitations to the use of this soil for crops. Capability unit VIe–4; recreation group 1; wildlife group 1; woodland group 3r2.

Wyocena sandy loam, 20 to 30 percent slopes (WyE).—This steep soil occupies long and narrow, 5- to 20-acre tracts on escarpments in areas of till. It has a profile similar to the one described as representative of the series, but the surface layer and subsoil are thinner and slightly coarser textured. Included in mapping are small areas of Mecan, Kranski, and Coloma soils. Also included are small areas of soils that have slopes of less than 20 percent and greater than 30 percent.

This soil is not suited to crops. It is better suited to pasture, woodland habitat, or wildlife than to most other uses. The very severe hazard of water erosion and the stones on the surface are the chief limitations to the use of this soil for crops. The steep slopes are limitations to the use of machines. In some places stones cover as much as 25 percent of the surface. Capability unit VIIe–4; recreation group 1; wildlife group 1; woodland group 3r2.

Use and Management of the Soils

This section explains how soils are grouped according to their capability and describes the capability units in Portage County. In addition, it gives predictions of average yields of the principal crops grown in the county under a high level of management and information on yields of irrigated specialty crops. It also explains the use of the soils for recreation, wildlife, engineering, and woodland.

Capability Grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The groups are made according to the limitations of the soils when used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to rice, cranberries, horticultural crops, or other crops requiring special management (*15*).

Those familiar with the capability classification can infer from it much about the behavior of soils when used for other purposes, but this classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for forest trees or for engineering.

In the capability system, the kinds of soil are grouped at three levels; the capability class, the subclass, and the unit. These levels are discussed in the following paragraphs.

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, defined as follows:

Class I soils have few limitations that restrict their use. (None in Portage County.)

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants, require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants, require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use largely to pasture, woodland, or wildlife habitat.

Class VI soils have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture, woodland, or wildlife habitat.

Class VII soils have very severe limitations that make them unsuited to cultivation and that restrict their use largely to pasture, woodland, or wildlife habitat.

Class VIII soils and landforms have limitations that preclude their use for commercial plants and restrict their use to recreation, wildlife habitat, water supply, or esthetic purposes.

CAPABILITY SUBCLASSES are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage) ; *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is too cold for commonly grown crops.

In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most, only the subclasses indicated by *w*, *s*, and *c*, because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use largely to pasture, woodland, wildlife habitat, or recreation.

CAPABILITY UNITS are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe–2 or IIIe–4. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraph; and the Arabic numeral specifically identifies the capability unit within each subclass.

Management by capability units

In the following pages the capability units in Portage County are described, and suggestions for use and management of the soils are given. The capability units are not numbered consecutively, because not all of the units in the Wisconsin system of grouping are in this county. The names of the soil series represented in the county are mentioned in the description of each capability unit, but this does not mean that all the soils of a given series appear in the unit. To find the names of all soils in any given capability unit, refer to the "Guide to Mapping Units" at the back of this survey.

The characteristics of the soils, the suitability of the soils for crops, and the management suitable for the soils are discussed for each unit. Although each soil differs somewhat from the others, certain practices of management are needed on all of the soils that are cultivated. Adding manure, using cover crops, and returning crop residue are among the practices that supply organic matter and help to improve fertility, preserve good tilth, and control erosion.

The natural fertility of all the soils in Portage County is low. Instead of giving the natural fertility rating for each unit, the response to lime and fertilizer, when applied according to soil test, is given.

CAPABILITY UNIT IIe–1

Only Rozellville loam, 2 to 6 percent slopes, is in this unit. This soil is deep, gently sloping, and well drained or moderately well drained. It has a subsoil of sandy clay loam and a substratum of loam.

Available water capacity is medium, and permeability is moderate. The hazard of water erosion is moderate. This soil responds well to lime and fertilizer.

This soil is easy to work. Controlling erosion, maintaining fertility, and supplying organic matter are the main concerns of management.

This soil is suited to corn, oats, and other crops commonly grown in the county and to alfalfa and bromegrass grown for hay. In addition, it is suited to permanent pasture, woodland, and wildlife habitat.

Terracing and contour stripcropping help to control water erosion.

CAPABILITY UNIT IIe–2

This unit consists of moderately deep, gently sloping, well-drained Norgo variant and Mosinee soils. These soils have a surface layer of sandy loam or silt loam and a subsoil of sandy loam or loam. They are underlain by sandstone or granitic bedrock.

Available water capacity is low, and permeability is moderate. The hazard of water erosion is moderate. These soils respond poorly to lime and fertilizer because of low available water capacity.

These soils are easy to work, except in some areas of Mosinee soils where many stones on the surface and outcrops of bedrock make cultivation very difficult. Controlling erosion, maintaining fertility, supplying organic matter, and conserving moisture are the main concerns of management.

These soils are suited to corn, oats, and other crops commonly grown in the county and to alfalfa and bromegrass grown for hay. In addition, they are suited to permanent pasture, woodland, and wildlife habitat.

Terracing and contour stripcropping help to control erosion. Supplemental irrigation is needed because the soils are droughty.

CAPABILITY UNIT IIw–3

This unit consists of deep, nearly level, somewhat poorly drained Dolph and Kert soils. These soils have a

surface layer of silt loam and a subsoil of silt loam or silty clay loam. Dolph soils have a substratum of sandy clay loam, and Kert soils have a substratum of banded sand, loamy sand, and clay.

Available water capacity is medium to high, and permeability is slow. The main limitation to the use of these soils is saturation at a depth of less than 3 feet during periods of wetness. These soils respond poorly to lime and fertilizer because of wetness.

These soils are difficult to work because of wetness. Removing excess water, maintaining fertility, and supplying organic matter are the main concerns of management.

If properly drained, these soils are suited to corn and oats and to alfalfa and bromegrass grown for hay. In areas that are not adequately drained, alfalfa is subject to winter killing and damage by frost heaving. Other suitable uses are permanent pasture, woodland, and wildlife habitat.

Surface drains can be used to remove excess water.

CAPABILITY UNIT IIw–4

Only Meadland loam, 1 to 3 percent slopes, is in this unit. The soil is deep, nearly level, and somewhat poorly drained. It has a subsoil and substratum of loam.

Available water capacity is high, and permeability is moderate. The main limitation to the use of this soil is saturation at a depth of less than 3 feet during periods of wetness. This soil responds poorly to lime and fertilizer because of wetness.

This soil is difficult to work because of wetness. Removing excess water, controlling erosion, maintaining fertility, and supplying organic matter are the main concerns of management.

If properly drained, this soil is suited to corn and oats and to alfalfa and bromegrass grown for hay. In areas that are not adequately drained, alfalfa is subject to winter killing and damage by frost heaving. Other suitable uses are permanent pasture, woodland, and wildlife habitat.

Surface drains can be used to remove excess water.

CAPABILITY UNIT IIw–5

This unit consists of nearly level, somewhat poorly drained Oesterle, Dunnville variant, and Oesterle variant soils. These soils have a surface layer of sandy loam, very fine sandy loam, or loam and a subsoil of sandy loam to silt loam. The Dunnville variant and Oesterle soils are moderately deep to a substratum of sand and gravel. The Oesterle variant soils are deep to a banded substratum of silt and very fine sand.

Available water capacity is low in the Oesterle soils, medium in the Dunnville variant soils, and high in the Oesterle variant soils. Permeability is moderate or moderately rapid. The main limitation to the use of these soils is saturation at a depth of less than 3 feet during periods of wetness. These soils respond poorly to lime and fertilizer because of wetness.

These soils are difficult to work because of wetness. Removing excess water, controlling erosion, maintaining fertility, and supplying organic matter are the main concerns of management.

If properly drained, these soils are suited to corn and oats and to alfalfa and bromegrass grown for hay. Other suitable uses are permanent pasture, woodland, and wildlife habitat.

Surface drains can be used to remove excess water.

CAPABILITY UNIT IIIe–2

Only Norgo silt loam, moderately deep variant, 6 to 12 percent slopes, is in this unit. This soil is moderately deep, sloping, and well drained. It has a subsoil of loam and is underlain by sandstone bedrock.

Available water capacity is low, and permeability is moderate. The hazard of water erosion is severe. This soil responds poorly to lime and fertilizer because of low available water capacity.

This soil is easy to work. Controlling erosion, maintaining fertility, supplying organic matter, and conserving moisture are the main concerns of management.

This soil is suited to corn, oats, and other crops commonly grown in the county and to alfalfa and bromegrass grown for hay. In addition, it is suited to permanent pasture, woodland, and wildlife habitat.

Contour stripcropping, grassed waterways, and diversions help control erosion. Reducing plant populations and adding organic matter help to conserve moisture.

CAPABILITY UNIT IIIe–3

Only Plainfield sandy loam, gravelly variant, 2 to 6 percent slopes, is in this unit. This soil is shallow, gently sloping, and excessively drained. It has a subsoil of loamy sand and a substratum of sand and gravel.

Available water capacity is low, and permeability is rapid. The hazards of water erosion and droughtiness are moderate. This soil responds poorly to lime and fertilizer because of low available water capacity.

This soil is easy to work. Controlling erosion, maintaining fertility, supplying organic matter, and conserving moisture are the main concerns of management.

This soil is suited to corn and oats and to alfalfa and bromegrass for hay. Other suitable uses are permanent pasture, woodland, and wildlife habitat.

Contour stripcropping and terracing help to control water erosion. Such moisture-conserving practices as reducing plant populations and adding organic matter are needed because the soil is droughty.

CAPABILITY UNIT IIIe–4

This unit consists of deep, gently sloping, excessively drained and well-drained Kranski, Mecan, and Wyocena soils. These soils have a surface layer of loamy sand or sandy loam, a subsoil of loamy sand or sandy loam, and a substratum of loamy sand.

Available water capacity is low to medium, and permeability is moderately rapid. The hazard of water erosion is moderate, and the hazard of droughtiness is moderate. These soils respond poorly to lime and fertilizer because of low or medium available water capacity.

These soils are easy to work. Controlling erosion, maintaining fertility, supplying organic matter, and conserving moisture are the main concerns of management.

These soils are suited to corn, oats, and other crops commonly grown in the county and to alfalfa and bromegrass grown for hay. In addition, they are suited to permanent pasture, woodland, and wildlife habitat.

Contour stripcropping and terracing help to control erosion. Reducing plant populations and adding organic matter help to conserve moisture.

CAPABILITY UNIT IIIe-7

This unit consists of sloping, well-drained Richford and Rosholt soils. These soils have a surface layer of loamy sand, sandy loam, or loam and a subsoil of sandy loam. They are moderately deep to deep to a sand and gravel substratum.

Available water capacity is low, and permeability is moderately rapid. The hazard of water erosion is severe, and the hazards of soil blowing and droughtiness are moderate. These soils respond poorly to lime and fertilizer because of low available water capacity.

These soils are easy to work. Controlling erosion, maintaining fertility, supplying organic matter, and conserving moisture are the main concerns of management.

These soils are suited to corn and oats and to alfalfa and bromegrass grown for hay. In addition, they are suited to permanent pasture, woodland, and wildlife habitat.

Contour stripcropping and diversions help to control water erosion. Windbreaks and cover crops help to control soil blowing. Reducing plant populations and adding organic matter help to conserve moisture.

CAPABILITY UNIT IIIw-3

This unit consists of deep, nearly level, poorly drained Altdorf, Sherry, and Vesper soils. These soils have a surface layer of silt loam and a subsoil of loam to silty clay loam. Altdorf and Sherry soils have a substratum of loam or silt loam, and Vesper soils have a substratum of sand.

Available water capacity is medium to very high, and permeability is moderate to slow. The main limitation to the use of these soils is saturation at a depth of less than 1 foot during periods of wetness. These soils respond poorly to lime and fertilizer because of wetness.

These soils are difficult to work because of wetness and the silt loam texture of the surface layer. They are subject to a hazard of frost in some places. Removing excess water, maintaining fertility, and supplying organic matter are the main concerns of management.

If properly drained, these soils are suited to corn. Small grain tends to lodge, and clover is better suited than alfalfa. Other suitable uses are permanent pasture, woodland, and wildlife habitat.

Surface drains can be used to remove excess surface water if an adequate outlet is available.

CAPABILITY UNIT IIIw-6

This unit consists of deep, nearly level, somewhat poorly drained Leola, Point, and Rockers soils. These soils have a surface layer of loamy sand or sandy loam and a subsoil of sandy loam or loam. Leola soils have a substratum of sand, and Point and Rockers soils have a substratum of gravelly loam.

Available water capacity is low to medium, and permeability is moderately rapid to moderately slow. The main limitation to the use of these soils is saturation at a depth of less than 3 feet during periods of wetness. These soils respond poorly to lime and fertilizer because of wetness and because of droughtiness of the surface layer during dry periods.

These soils are difficult to work because of wetness. Removing excess water, controlling erosion, maintaining fertility, and supplying organic matter are the main concerns of management. Droughtiness of the surface layer during dry periods is also a concern. Stones on the surface are a hazard to cultivation in Point and Rockers soils.

If properly drained, these soils are suited to corn and oats and to alfalfa and bromegrass grown for hay. Other suitable uses are permanent pasture, woodland, and wildlife habitat.

Surface drains can be used to remove excess water. Additions of organic matter help to overcome droughtiness of the surface layer. Some areas of Leola soils are suited to irrigation.

CAPABILITY UNIT IIIs-4

This unit consists of nearly level and gently sloping, well drained and moderately well drained Billett, Dunnville, Pearl, Richford, and Rosholt soils. These soils are moderately deep to deep to sand and gravel. They have a surface layer of loamy sand, sandy loam, very fine sandy loam, or loam and a subsoil of sandy loam. The substratum is sand and gravel or sand, except in Rosholt loam, loamy substratum, 0 to 2 percent slopes, where it is banded silt and fine sand.

Available water capacity is low to medium, and permeability is moderately rapid or moderate. These soils respond poorly to lime and fertilizer because of low or medium available water capacity.

These soils are easy to work. Maintaining fertility, supplying organic matter, and conserving moisture are the main concerns of management.

These soils are suited to corn, oats, and other crops commonly grown in the county, but crops do not grow well during periods of dryness. They are also suited to permanent pasture, woodland, and wildlife habitat.

Supplemental irrigation is needed because the soils are droughty. If irrigated, these soils are suited to such specialty crops as potatoes, snap beans, and other vegetables.

CAPABILITY UNIT IVe-4

This unit consists of deep, sloping, excessively drained and well-drained Kranski, Mecan, and Wyocena soils. These soils have a surface layer of loamy sand or sandy loam, a subsoil of loamy sand or sandy loam, and a substratum of loamy sand.

Available water capacity is low to medium, and permeability is moderately rapid. The hazard of water erosion is severe, and the hazard of droughtiness is moderate. These soils respond poorly to lime and fertilizer because of low or medium available water capacity.

These soils are easy to work. Controlling erosion, maintaining fertility, supplying organic matter, and conserving moisture are the main concerns of management. Stones on the surface hinder cultivation in some areas.

These soils are suited to oats and to alfalfa and bromegrass grown for hay. If erosion is controlled, row

crops can be included in the rotation every few years. In addition, the soils are suited to permanent pasture, woodland, and wildlife habitat.

Contour stripcropping and using diversions help to control erosion. Adding organic matter helps to control droughtiness.

CAPABILITY UNIT IVw–3

This unit consists of nearly level, poorly drained Dancy and Roscommon variant soils. These soils have a surface layer of sandy loam and a subsoil of sandy loam or loam. The Dancy soil is deep to a substratum of loam, and the Roscommon variant soils are moderately deep to a substratum of sand and gravel, or, in the loamy substratum phase, of silt loam and fine sand.

Available water capacity is high in the Dancy soil and low in the Roscommon variant soils. Permeability is moderate in the Dancy soil and moderately rapid in the Roscommon variant soils, but it is moderate in a loamy substratum phase in the lower part of the substratum. The main limitation to the use of these soils is water saturation at a depth of less than 1 foot during periods of wetness. These soils also are subject to ponding. They respond poorly to lime and fertilizer because of wetness.

Wetness hinders the workability of these soils. Removing excess water, maintaining fertility, and supplying organic matter are the main concerns of management. Frosts early in fall and late in spring are a hazard in some areas.

If properly drained, these soils are suited to corn. Small grain tends to lodge, and clover is better suited than alfalfa. Other suitable uses are permanent pasture, woodland, and wildlife habitat.

Surface drains can be used to remove excess surface water if a satisfactory outlet is available.

CAPABILITY UNIT IVw–5

This unit consists of nearly level, somewhat poorly drained and poorly drained Meehan, Roscommon, and Meehan variant soils. Meehan soils have a surface layer of loamy sand or sandy loam, a subsoil of loamy sand, and a substratum of sand. The Meehan soil, sandstone substratum, is moderately deep to sandstone bedrock. Roscommon soils have a surface layer of muck and a subsoil and substratum of sand. The Meehan variant soil has a surface layer of fine sandy loam, a subsoil of sandy loam, and a substratum of sand and gravel.

Available water capacity is low, and permeability is rapid. The main limitations to the use of these soils are saturation at a depth of less than 3 feet during periods of wetness and droughtiness of the surface layer during dry periods. The soils respond poorly to lime and fertilizer because of wetness and droughtiness.

Wetness hinders the workability of these soils. Removing excess water, controlling erosion, maintaining fertility, and supplying organic matter are the main concerns of management. Other concerns are frost hazard, soil blowing, ponding, and droughtiness of the surface layer during dry periods.

If properly drained, these soils are suited to corn, oats, and clover. Other suitable uses are permanent pasture, woodland, and wildlife habitat.

Surface drains can be used to remove excess surface water if a satisfactory outlet is available. Additions of organic matter are needed because the soils are droughty. Some areas of Meehan soils are drained and irrigated and are used for vegetable crops.

CAPABILITY UNIT IVwc–9

This unit consists of nearly level, very poorly drained organic Cathro, Lupton, Markey, and Seelyeville soils. Seelyeville and Lupton soils are muck to a depth of 51 inches or more. Cathro soils are 16 to 51 inches of muck over a loam substratum. Markey soils are 16 to 51 inches of muck over a sand substratum.

Available water capacity is medium to very high, and permeability is moderately rapid. The main limitations to the use of these soils are saturation at a depth of less than 1 foot during periods of wetness and a short growing season because of frost. The soils respond poorly to lime and fertilizer because of wetness.

These soils are difficult to work because of wetness and low bearing capacity. Removing excess water, maintaining fertility, and farming in the short growing season are the main concerns of management. If the subsoil is drained, subsidence and soil blowing also are concerns of management.

If properly drained, these soils are suited to such specialty crops as cranberries and mint. Other suitable uses are permanent pasture, woodland, and wildlife habitat.

Most areas of these soils are used as woodland or for wildlife habitat. Surface drains can be used to remove excess water if a satisfactory outlet is available.

CAPABILITY UNIT IVs–3

This unit consists of moderately deep and deep, nearly level and gently sloping, excessively drained and moderately well drained Coloma, Friendship, Plainbo, and Plainfield soils. These soils have a surface layer and a subsoil of loamy sand and a substratum of sand. Plainbo soils have sandstone bedrock within a depth of 40 inches of the surface. The Plainfield soil, granite substratum, has loamy residuum from granitic rock at a depth of 40 to 60 inches.

Available water capacity is low and permeability is generally rapid, but it is moderate in the Plainfield soil, granite substratum. The main limitation to the use of these soils is droughtiness because of low available water capacity. The soils respond poorly to lime and fertilizer because of droughtiness.

These soils are easy to work. Conserving moisture, maintaining fertility, controlling soil blowing, and supplying organic matter are the main concerns of management.

These soils are not suited to cultivated crops because they are too droughty; they are better suited to permanent pasture, woodland, or wildlife habitat.

Such moisture-conserving practices as reducing the plant population and adding organic matter are needed for dryfarmed crops. Soil blowing can be controlled by use of cover crops and windbreaks. Many areas of Plainfield and Friendship soils are irrigated and used for such specialty crops as potatoes, snap beans, and other vegetables.

CAPABILITY UNIT Vw–14

Only Alluvial land, wet, is in this unit. This land

type is deep, nearly level, and poorly drained and very poorly drained. It has organic and mineral layers from the surface to a depth of 60 inches. Its properties are variable from area to area.

The main limitations to the use of this land are flooding and ponding of water.

Flooding, ponding, a short growing season because of frost, and soil properties that are variable from place to place are the main concerns of management. Alluvial land, wet, is not suited to crops, but it is suited to permanent pasture, woodland, and wildlife habitat.

In some places, pasture on this land type can be improved by installing surface drains and by seeding improved varieties of grasses. In other places wildlife habitat can be improved by planting shrubs and other plants that provide food and cover. Ditches that hold water and shallow ponds can be used to improve areas for waterfowl, mink, and muskrat.

CAPABILITY UNIT VIe–3

Only soils of the Rosholt complex, 12 to 20 percent slopes, are in this unit. The soils are moderately steep and well drained and excessively drained. These soils have a sandy loam surface layer and a sandy loam or loamy sand subsoil. They are shallow and moderately deep to a sand and gravel substratum.

Available water capacity is low, and permeability is moderately rapid. The hazard of water erosion is very severe, and the hazard of droughtiness is moderate. Crops grown on these soils respond poorly to lime and fertilizer because of low available water capacity.

Controlling erosion and maintaining fertility are the main concerns of management. These soils are better suited to permanent pasture, woodland, and wildlife habitat than to crops.

Areas of these soils in pasture can be improved by use of lime and fertilizer. Controlling grazing helps to control erosion. Planting of shrubs and other plants that provide food and cover benefits wildlife.

CAPABILITY UNIT VIe–4

This unit consists of deep, moderately steep, excessively drained and well-drained Kranski, Mecan, and Wyocena soils. These soils have a surface layer of loamy sand or sandy loam, a subsoil of loamy sand or sandy loam, and a substratum of loamy sand.

Available water capacity is low or medium, and permeability is moderately rapid. The hazard of water erosion is very severe, and the hazard of droughtiness is moderate. Crops grown on these soils respond poorly to lime and fertilizer because of low or medium available water capacity.

Controlling erosion and maintaining fertility are the main concerns of management. These soils are better suited to permanent pasture, woodland, and wildlife habitat than to cultivated crops.

Areas of these soils used for pasture can be improved by use of lime and fertilizer. Controlling grazing helps to control erosion. Planting of shrubs and other plants that provide food and cover benefits wildlife.

CAPABILITY UNIT VIs–3

This unit consists of deep, sloping, excessively drained Coloma and Plainfield soils. These soils have a surface layer and a subsoil of loamy sand and a substratum of sand.

Available water capacity is low, and permeability is rapid. The main limitation to the use of these soils is droughtiness because of low available water capacity. Crops grown on these soils respond poorly to lime and fertilizer because of droughtiness.

These soils are better suited to permanent pasture, woodland, and wildlife habitat than to cultivated crops. Conserving moisture, maintaining fertility, and controlling erosion are the main concerns of management.

Areas of these soils in pasture can be improved by lime and fertilizer. Controlling grazing helps to control erosion. Planting of shrubs and other plants that provide food and cover benefits wildlife.

CAPABILITY UNIT VIIe–3

Only soils of the Rosholt complex, 20 to 40 percent slopes, are in this unit. These soils are steep and very steep and are well drained and excessively drained. They have a surface layer and subsoil of sandy loam. They are shallow and moderately deep to a sand and gravel substratum.

Available water capacity is low, and permeability is moderately rapid. The hazard of water erosion is very severe, and the hazard of droughtiness is moderate. Crops grown on these soils respond poorly to lime and fertilizer because of low available water capacity.

These soils are better suited to permanent pasture, woodland. and wildlife habitat than to cultivated crops.

Controlling erosion and maintaining fertility are the major concerns of management.

Areas of these soils in pasture can be improved by use of lime and fertilizer. Controlling grazing helps to control erosion. Planting of shrubs and other plants that provide food and cover benefits wildlife. Selective cutting and planting improve woodlots.

CAPABILITY UNIT VIIe–4

Only Wyocena sandy loam, 20 to 30 percent slopes, is in this unit. This soil is deep, steep, and well drained. It has a subsoil of sandy loam, and a substratum of loamy sand.

Available water capacity is medium, and permeability is moderately rapid. The hazard of water erosion is very severe, and the hazard of droughtiness is moderate. Crops grown on this soil respond poorly to lime and fertilizer because of medium available water capacity.

This soil is better suited to permanent pasture, woodland, and wildlife habitat than to cultivated crops. Controlling erosion and maintaining fertility are the main concerns of management.

Areas of this soil used for pasture can be improved by use of lime and fertilizer. Controlling grazing helps to control erosion. Planting of shrubs and other plants that provide food and cover benefits wildlife. Selective cutting and planting improves woodlots.

CAPABILITY UNIT VIIs–3

This unit consists of deep, moderately steep to very steep, excessively drained Plainfield and Kranski soils. These soils have a surface layer and subsoil of loamy sand. Plainfield soils have a substratum of sand, and Kranski soils have a substratum of loamy sand.

TABLE 2.—*Predicted average yields per acre of principal crops under a high level of management*

[Absence of a yield figure indicates that the soil is not suited to the crop specified or that the crop is not ordinarily grown. Alluvial land, wet, Cathro muck, Lupton muck, Marsh, and Rock land are not included in the table]

Soil	Corn		Oats	Alfalfa-bromegrass hay	Red clover-timothy hay	Native bluegrass (unimproved)
	Grain	Silage				
	Bu	*Tons*	*Bu*	*Tons*	*Tons*	*Tons*
Altdorf silt loam	75	12.5	60	3.5	2.5	0.75
Billett sandy loam, 0 to 2 percent slopes	70	11.5	50	2.25	2.0	.50
Coloma loamy sand, 2 to 6 percent slopes	45	7.0	35	2.25	1.75	.30
Coloma loamy sand, 6 to 12 percent slopes				2.0	1.5	.25
Dancy sandy loam	65	11	60	3.0	2.50	
Dolph silt loam, 1 to 3 percent slopes	90	15	70	4.0	2.5	1.25
Dunnville very fine sandy loam, 2 to 6 percent slopes	70	11.5	50	2.25	2.0	.50
Dunnville very fine sandy loam, mottled subsoil variant, 1 to 3 percent slopes	75	12.5	60	3.5	3.0	1.25
Friendship loamy sand, 0 to 3 percent slopes	50	7.5	40	2.25	1.5	.30
Kert silt loam, 1 to 3 percent slopes	75	12.5	55		2.25	.75
Kranski loamy sand, 2 to 6 percent slopes	70	11.5	50	2.25	2.0	.50
Kranski loamy sand, 6 to 12 percent slopes	65	10.5	45	2.0	1.75	.30
Kranski loamy sand, 12 to 20 percent slopes				1.75	1.5	.30
Leola loamy sand, 0 to 3 percent slopes	75	12	70	3.0	2.5	1.0
Markey muck	45	7.5	40		1.75	
Markey muck, shallow	45	7.5	40	2.25	1.75	
Meadland loam, 1 to 3 percent slopes	75	12.5	70	3.5	3.0	1.5
Mecan loamy sand, 2 to 6 percent slopes	70	11.5	50	2.25	2.0	.50
Mecan loamy sand, 6 to 12 percent slopes	65	10.5	45	2.0	1.75	.30
Mecan loamy sand, 12 to 20 percent slopes				1.75	1.50	.30
Mecan sandy loam, 2 to 6 percent slopes	75	12.5	55	2.5	2.25	.50
Mecan sandy loam, 6 to 12 percent slopes	70	12	50	2.25	2.0	.30
Mecan sandy loam, 12 to 20 percent slopes				2.0	1.75	.30
Meehan loamy sand, 0 to 3 percent slopes	60	9.5	50	2.5	1.75	.50
Meehan loamy sand, sandstone substratum, 0 to 3 percent slopes	55	8.5	45	2.25	1.5	.40
Meehan sandy loam, red surface, 0 to 3 percent slopes	65	11	55	2.5	2.0	.50
Meehan fine sandy loam, gravelly variant	60	9	55	2.5	2.0	.50
Mosinee sandy loam, 2 to 6 percent slopes	55	9	50	2.5	1.75	.50
Norgo silt loam, moderately deep variant, 2 to 6 percent slopes	75	12.5	55	2.75	2.25	1.0
Norgo silt loam, moderately deep variant, 6 to 12 percent slopes	70	12	50	2.5	2.0	.75
Oesterle sandy loam	75	12.5	70	3.0	2.5	1.0
Oesterle loam, silty subsoil variant	80	13	75	3.25	3.0	1.0
Pearl loamy sand, 1 to 3 percent slopes	55	8.5	50	2.25	2.0	.50
Plainbo loamy sand, 2 to 6 percent slopes	45	7.0	35	1.5		.25
Plainfield loamy sand, 0 to 2 percent slopes	45	7.0	35	2.25		.30
Plainfield loamy sand, 2 to 6 percent slopes	40	6.5	30	2.25		.30
Plainfield loamy sand, 6 to 12 percent slopes				2.0		.25
Plainfield loamy sand, granite substratum, 2 to 6 percent slopes	50	7.5	40	2.5		.50
Plainfield and Kranski soils						.20
Plainfield sandy loam, gravelly variant, 2 to 6 percent slopes	55	9	45	2.25	1.75	.50
Point sandy loam, 1 to 3 percent slopes	70	12	65	3.25	2.75	1.25
Richford loamy sand, 0 to 2 percent slopes	55	8.5	50	2.5	2.0	.50
Richford loamy sand, 2 to 6 percent slopes	55	8.5	50	2.5	2.0	.50
Richford loamy sand, 6 to 12 percent slopes	45	7.0	35	2.25	1.75	.40
Richford loamy fine sand, 2 to 6 percent slopes	65	10.5	55	2.75	2.25	.50
Rockers loamy sand, 1 to 3 percent slopes	60	9.5	45	2.5	1.5	.50
Roscommon muck	45	7.5	40	2.25	1.75	
Roscommon-Meehan complex, 0 to 3 percent slopes	55	8.5	45	2.5	1.75	
Roscommon sandy loam, loamy variant	70	12	60	3.25	2.75	
Roscommon sandy loam, loamy variant, loamy substratum	75	12.5	60	3.25	2.75	
Rosholt sandy loam, 0 to 2 percent slopes	70	11.5	50	2.25	2.0	.50
Rosholt sandy loam, 2 to 6 percent slopes	60	11.0	45	2.0	1.75	.50
Rosholt sandy loam, 6 to 12 percent slopes, eroded	50	7.5	40	1.75	1.5	.30
Rosholt loam, 2 to 6 percent slopes	70	11.5	50	2.25	2.0	.75
Rosholt loam, 6 to 12 percent slopes, eroded	60	11.0	45	2.0	1.75	.50
Rosholt loam, loamy substratum, 0 to 2 percent slopes	90	15	80	3.75	3.25	1.25

TABLE 2.—*Predicted average yields per acre of principal crops under a high level of management*—Continued

Soil	Corn		Oats	Alfalfa-bromegrass hay	Red clover-timothy hay	Native bluegrass (unimproved)
	Grain	Silage				
	Bu	*Tons*	*Bu*	*Tons*	*Tons*	*Tons*
Rosholt complex, 12 to 20 percent slopes				1.25	1.0	.25
Rosholt complex, 20 to 40 percent slopes						.25
Rozellville loam, 2 to 6 percent slopes	95	16	80	4.0	3.0	1.25
Seelyeville muck	45	7.5	40	2.25	1.75	
Sherry silt loam	75	12.5	55		2.5	
Vesper silt loam	70	12	50		2.25	
Wyocena sandy loam, 2 to 6 percent slopes	85	14	70	3.25	2.75	1.0
Wyocena sandy loam, 6 to 12 percent slopes	80	13	65	3.0	2.5	.75
Wyocena sandy loam, 12 to 20 percent slopes				2.5	2.0	.50
Wyocena sandy loam, 20 to 30 percent slopes						.25

Available water capacity is low, and permeability is rapid. The hazard of erosion is very severe. Crops grown on these soils respond poorly to lime and fertilizer because of droughtiness.

These soils are better suited to permanent pasture, woodland, and wildlife habitat than to crops. Conserving moisture and controlling erosion are the main concerns of management.

Areas of these soils used for pasture can be improved by additions of lime and fertilizer. Controlling grazing helps to reduce erosion. Planting of shrubs and other plants that provide food and cover benefits wildlife. Selective cutting and planting improve woodlots.

CAPABILITY UNIT VIIIw–15

Only Marsh is in this unit. This land type is nearly level and very poorly drained. It has a surface layer of muck underlain by organic material intermixed with variable mineral material. It is covered with water during most of the year. Drainage is not feasible. The vegetation is mainly cattails, bulrushes, and other water-tolerant plants.

Marsh is suited only to wildlife or recreational uses. In most places, level ditching will improve the habitat for waterfowl, muskrat, and other kinds of wildlife.

CAPABILITY UNIT VIIIs–10

Only Rock land is in this unit. This land type is gently sloping to very steep and excessively drained. Rock outcrop makes up 50 to 90 percent of the surface. Small pockets of loamy sand or sandy loam are between the rocks and in cracks in the bedrock.

This land type is suited only to wildlife or recreational uses. Establishing a plant cover is difficult, and all plants now growing should be protected.

Predicted Yields[3]

Table 2 gives the estimated long-time average yields for crops commonly grown in the county. The estimates were based on results obtained by the agricultural experiment station, on interviews with farmers, and on observations made by soil scientists and farm workers who are familiar with the soils.

Yields in table 2 are given for each soil under a high level of management. The soil is limed and fertilized according to soil test for the specific crop grown, adequate drainage and flood protection are provided, a good program of seedbed preparation and correct planting methods are used, timely and careful harvesting methods are practiced, needed erosion control practices are installed and maintained, cropping systems suited to the soil and slope are used, and good programs of weed and insect control are practiced.

The yields represent a 10-year average. Crop yields can vary greatly from year to year because of changes in management and differences in rainfall, temperature, and other weather conditions. Because of these differences and changes, the average yield figure for 10 years or more is more nearly representative than the yield for a single year.

Table 3 gives the predicted average yields for some common specialty crops under irrigation. Only the soils that are easily adapted to irrigation are listed in the table.

The yields are based on a high level of management, with irrigation applied as needed for best plant growth. Only sprinkler irrigation is used in Portage County because of the soil permeability and infiltration rate. In most areas of soils that are suited to irrigation, water for irrigation is easily obtained from the shallow ground water.

Recreation

Knowledge of soils is necessary in planning, developing, and maintaining areas used for recreation. In table 4 the soils of Portage County are rated according to limitations that affect their suitability for camp areas, playgrounds and athletic fields, picnic areas, paths and trails, and golf course fairways.

In table 4 the soils are rated as having slight, moderate, or severe limitations for the specified uses. For all of these ratings, it is assumed that a good cover of vegetation can be established and maintained. A limitation of *slight* means that soil properties are generally favorable and limitations are so minor that they easily can be overcome. A *moderate* limitation can be over-

[3] M. P. PINKERTON, county agent, assisted in preparing this section.

TABLE 3.—*Predicted average yields of some specialty crops (irrigated)*

[Absence of yield data indicates no information is available]

Soil	Sweet corn	Potatoes		Peas	Snapbeans	Cucumbers
		Early	Late			
	Tons	*Cwt*	*Cwt*	*Lbs*	*Lbs*	*Bu*
Billett sandy loam, 0 to 2 percent slopes	6.0	250	400	4,000	7,000	500
Dunnville very fine sandy loam, 2 to 6 percent slopes	5.5	200	350	4,000	7,000	
Friendship loamy sand, 0 to 3 percent slopes	5.0	200	300	2,500	6,000	400
Leola loamy sand, 0 to 3 percent slopes [1]	4.5	200	300	2,000	5,000	
Meehan loamy sand, 0 to 3 percent slopes [1]	4.5	200	300	2,500	5,000	
Meehan fine sandy loam, gravelly variant [1]	4.0	170	250	1,000	4,000	
Pearl loamy sand, 1 to 3 percent slopes	5.5	275	400	3,000	6,500	500
Plainfield loamy sand, 0 to 2 percent slopes	5.0	250	350	2,000	6,000	400
Plainfield loamy sand, 2 to 6 percent slopes	4.5	200	300	1,500	5,000	300
Plainfield sandy loam, gravelly variant, 2 to 6 percent slopes	3.5	150	200	1,000	3,500	200
Richford loamy sand, 0 to 2 percent slopes	5.5	275	400	4,000	7,000	500
Richford loamy sand, 2 to 6 percent slopes	5.0	250	350	3,500	6,000	300
Richford loamy fine sand, 2 to 6 percent slopes	5.5	275	400	4,000	7,000	300
Rosholt sandy loam, 0 to 2 percent slopes	6.0	275	400	4,000	7,000	500
Rosholt sandy loam, 2 to 6 percent slopes	5.5	260	375	3,000	6,000	400

[1] Yields are for areas that are adequately drained.

come or modified by planning, by design, or by special maintenance. A *severe* limitation means that costly soil reclamation, special design, intense maintenance, or a combination of these, is required. A *very severe* limitation indicates that the soils have limitations that generally preclude their use for a given purpose.

Camp areas are used intensively for tents and small camp trailers and the accompanying activities of outdoor living. Little preparation of the site is required, other than shaping and leveling for tent and parking areas. Camp areas are subject to heavy foot traffic and limited vehicular traffic. The best soils have gentle slopes, good drainage, a surface free of rocks and coarse fragments, freedom from flooding during periods of heavy use, and a surface that is firm after rains but not dusty when dry.

Playgrounds and athletic fields are areas used intensively for baseball, football, badminton, and similar organized games. Soils suitable for this use need to withstand intensive foot traffic. The best soils have a nearly level surface free of coarse fragments and rock outcrops, good drainage, freedom from flooding during periods of heavy use, and a surface that is firm after rains but not dusty when dry. If grading and leveling are required, depth to rock is important.

Picnic areas are attractive natural or landscaped tracts used mainly for preparing meals and eating outdoors. These areas are subject to heavy foot traffic. Most of the vehicular traffic, however, is confined to access roads. The best soils are firm when wet but not dusty when dry; are free of flooding during the season of use; and do not have slopes or stoniness that greatly increases cost of leveling sites or of building access roads.

Paths and trails are used for local and cross-country travel by foot or on horseback. Design and layout should require little or no cutting and filling. The best soils are at least moderately well drained, are firm when wet but not dusty when dry, are flooded not more than once during the season of use, have slopes of less than 12 percent, and have few or no rocks or stones on the surface.

Golf courses are rated only for fairways because most golf greens, traps, hazards, and tees are man-made. Soils used for fairways are rated as undisturbed. The best soils are at least moderately well drained, are able to support a good turf, are free of flooding during season of use, have slopes of less than 6 percent, and have few or no rocks or stones on the surface.

Wildlife [4]

The soils of Wisconsin are placed in 10 wildlife groups according to a standard statewide system of classification. Six of these groups are represented in Portage County.

Groups 1 and 3, the excessively drained, well drained, and moderately well drained soils, are most extensive in the county. These groups are capable of producing good habitat for most species of upland wildlife. Most of the white-tailed deer in Portage County inhabit areas of these groups.

Groups 6 and 7 consist of somewhat poorly drained and poorly drained soils. These groups are capable of producing good habitat for both upland and wetland wildlife. Included in the acreage of these groups is a remnant area inhabited by prairie chicken.

Groups 6, 7, and 8 consist of the wetlands in Portage County. These are the most important wildlife habitat areas remaining in the county. Originally there were 204,100 acres in these groups. According to an estimate

[4] By LAVERNE C. STRICKNER, biologist, Soil Conservation Service.

TABLE 4.—*Ratings and limitations of the soils for recreational purposes*

Recreation groups and mapping symbols	Camp areas	Playgrounds and athletic fields	Picnic areas	Paths and trails	Golf course fairways
Group 1: Well drained to moderately well drained loamy soils. Bt, DuB, MgB, MgC, MgD, MsB, NoB, NoC, PkB, RgB, RrA, RrB, RrC2, RsB, RsC2, Rt, RuD, RuE, RzB, WyB, WyC, WyD, WyE.	Slight where slopes are 0 to 6 percent; moderate where slopes are 6 to 12 percent; severe where slopes are more than 12 percent: erodible; stony or gravelly in places.	Slight where slopes are 0 to 2 percent; moderate where slopes are 2 to 6 percent; severe where slopes are more than 6 percent: stony or gravelly in places.	Slight where slopes are 0 to 6 percent; moderate where slopes are 6 to 12 percent; severe where slopes are more than 12 percent: stony or gravelly in places.	Slight where slopes are 0 to 12 percent; moderate where slopes are 12 to 20 percent: erodible; stony or gravelly in places.	Slight where slopes are 0 to 6 percent; moderate where slopes are 6 to 12 percent; severe where slopes are more than 12 percent: erodible; stony or gravelly in places.
Group 2: Moderately well drained to excessively drained sandy soils. CoB, CoC, FrA, KrB, KrC, KrD, MfB, MfC, MfD, PaA, PbB, PfA, PfB, PfC, PgB, Ph, RfA, RfB, RfC, Rk.	Moderate where slopes are 0 to 12 percent; severe where slopes are more than 12 percent: droughty; erodible.	Moderate where slopes are 0 to 6 percent; severe where slopes are more than 6 percent: droughty; erodible.	Moderate where slopes are 0 to 12 percent; severe where slopes are more than 12 percent: droughty; erodible.	Moderate where slopes are 0 to 12 percent; severe where slopes are more than 12 percent: droughty; erodible; difficult to maintain.	Moderate where slopes are 0 to 12 percent; severe where slopes are more than 12 percent: droughty; erodible; difficult to maintain a good turf.
Group 3: Somewhat poorly drained loamy soils. DoA, DxA, KeA, MeA, Mr, Oe, Ov, PoA.	Moderate: sites remain wet and soft for moderate periods.	Moderate: saturated at a depth of less than 3 feet during periods of wetness.	Moderate: saturated at a depth of less than 3 feet during periods of wetness; subject to ponding.	Moderate: wet for moderate periods.	Moderate: saturated at a depth of less than 3 feet during periods of wetness; turf easily damaged when wet.
Group 4: Somewhat poorly drained sandy soils. LeA, MnA, MoA, MpA, RhA.	Moderate: sites remain wet for moderate periods; erodible; subject to soil blowing.	Moderate: saturated at a depth of less than 3 feet during periods of wetness; sod easily damaged when wet; subject to soil blowing.	Moderate: saturated at a depth of less than 3 feet during periods of wetness; subject to ponding and soil blowing.	Moderate: wet for moderate periods; subject to soil blowing.	Moderate: saturated at a depth of less than 3 feet during periods of wetness; remains wet for moderate periods; subject to soil blowing.
Group 5: Poorly drained soils. Af, Da, Rm, Rn, Ro, Rp, Sh, Vs.	Severe: remains wet for long periods.	Severe: saturated at a depth of less than 1 foot during periods of wetness; sod easily damaged when wet.	Severe: saturated at a depth of less than 1 foot during periods of wetness; subject to ponding.	Severe: saturated at a depth of less than 1 foot during periods of wetness; subject to ponding.	Severe: saturated at a depth of less than 1 foot during periods of wetness; turf easily damaged when wet.
Group 6: Very poorly drained, organic soils and land types. Ab, Ca, Lu, Ma, Mb, Mc, Se.	Very severe: saturated at a depth of less than 1 foot during periods of wetness; subject to ponding; low trafficability.	Very severe: saturated at a depth of less than 1 foot during periods of wetness; subject to ponding; low trafficability.	Very severe: saturated at a depth of less than 1 foot during periods of wetness; subject to ponding.	Very severe: saturated at a depth of less than 1 foot during periods of wetness; subject to ponding; low trafficability.	Very severe: saturated at a depth of less than 1 foot during periods of wetness; low trafficability.

TABLE 5.—*Suitability of soil groups for*

[Group 2, 4, 5, and 9 soils are not

Wildlife group, description of soils, and map symbols	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants
Group 1: Well drained and moderately well drained soils that are loamy throughout and not subject to flooding. Bt, DuB, MgB, MgC, MgD, MsB, NoB, NoC, RrA, RrB, RrC2, RsB, RsC2, Rt, RuD, RuE, RzB, WyB, WyC, WyD, WyE.	Good where slopes are 0 to 6 percent; fair where slopes are 6 to 12 percent; poor where slopes are more than 12 percent: hazard of water erosion.	Good where slopes are 0 to 12 percent; fair where slopes are 12 to 20 percent; poor where slopes are more than 20 percent.	Good where slopes are 0 to 12 percent; fair where slopes are more than 20 percent.
Group 3: Excessively drained soils that are sandy throughout. CoB, CoC, FrA, KrB, KrC, KrD, MfB, MfC, MfD, PaA, PbB, PfA, PfB, PfC, PgB, Ph, PkB, RfA, RfB, RfC, RgB.	Fair: hazard of water erosion.	Good	Good
Group 6: Somewhat poorly drained soils and land types. Af, DoA, DxA, KeA, LeA, MeA, MnA, MoA, MpA, Mr, Oe, Ov, PoA, RhA.	Good where drained; fair where undrained and wet.	Good where soil has been drained; fair where soil is undrained and wet: few species suited.	Fair: wet; some species not suited.
Group 7: Poorly drained and very poorly drained soils and land types. Ab, Da, Mc, Rm, Rn, Ro, Rp, Sh, Vs.	Good where drained; unsuitable where undrained and wet.	Fair where drained; poor where undrained and wet.	Unsuitable: very wet; few species suited.
Group 8: Organic soils. Ca, Lu, Ma, Mb, Se.	Fair where drained; unsuitable where undrained and wet.	Fair where drained; unsuitable where undrained and wet: few species suited.	Unsuitable: wet; few species suited.
Group 10: Thin, droughty, or stony and rocky land types and very shallow soils. Rk.	Poor: hazard of water erosion; shallow to rock; very low available water capacity.	Fair where slopes are 0 to 12 percent; poor where slopes are more than 12 percent: some species not suited; very low available water capacity.	Fair where slopes are 0 to 20 percent; poor where slopes are more than 20 percent: some species not suited; very low available water capacity.

made in 1970, 38,600 acres of wetlands remain in the county. Thus, in Portage County 65,500 acres of wetlands has been drained or otherwise changed in character. This has had a significant effect on the capability to produce wildlife.

In table 5, the wildlife groups of soils in Portage County are rated according to their suitability for producing various elements of wildlife habitat.

Table 6 contains a list of the important kinds of wildlife in Portage County and rates the importance of the various habitat elements for the stated kinds of wildlife. The elements are grain and seed crops, grasses and legumes, wild herbaceous upland plants, hardwood trees and shrubs, coniferous trees, wetland plants for food and cover, and shallow water areas and deep water areas.

Grain and seed crops include such grain crops as corn, oats, sorghums, wheat, barley, rye, or soybeans that are used for food and cover by wildlife.

Grasses and legumes include such grasses as switchgrass, bromegrass, timothy, and fescue and such legumes as alfalfa, red clover, sweet clover, and vetch that are used by wildlife for food and cover.

Wild herbaceous upland plants include native or introduced grasses, legumes, and forbs that provide food and cover for upland wildlife and are mainly established by natural means. Such plants as bluegrass, prairie grasses, roundhead lespedeza, beggarstick, aster, and goldenrod are important in this group.

Woody plants include shrubs, hardwood trees, and coniferous trees. Shrubs are low-growing woody plants (including conifers less than 8 feet tall) that furnish fruit, seeds, browse, and cover for wildlife. Examples are viburnums, dogwood, and hazelnut. Such hardwood trees as oaks, maples, cherry, and nut trees furnish mast, fruit, seeds, dens, cover, and browse for wildlife. Such coniferous trees (more than 8 feet tall) as pines, firs, spruce, tamarack, and cedar furnish seeds, fruit, browse, and cover for wildlife.

Wetland plants for food and cover include forbs, grasses, sedges, aquatic plants, and woody plants that grow well in wet areas. They furnish fruit, seeds, browse, and cover for wildlife that live in wet areas and on or near open water. Examples are smartweed, canarygrass, sedges, sagittaria, alder, and willow. These plants grow well in types 1, 2, and 6 wetlands as

producing elements of wildlife habitat

represented in Portage County]

Woody plants		Wetland plants for food and cover	Shallow water and deep water developments
Hardwood trees and shrubs	Coniferous trees		
Good where slopes are 0 to 20 percent; fair where slopes are more than 20 percent.	Good where slopes are 0 to 20 percent; fair where slopes are more than 20 percent.	Poor where slopes are 0 to 2 percent; unsuitable where slopes are more than 2 percent: few species suited.	Poor where slopes are 0 to 2 percent; unsuitable where slopes are more than 2 percent: moderate permeability.
Good	Good	Poor where slopes are 0 to 2 percent; unsuitable where slopes are more than 2 percent: few species suited.	Unsuitable: shallow to very porous substratum.
Fair: wet; some species of hardwoods not suited.	Fair: wet; some species of conifers not suited.	Good	Good where slopes are 0 to 2 percent; fair where slopes are more than 2 percent: wet; moderately rapid or rapid permeability in some places.
Poor: very wet; few species of hardwoods suited.	Fair: wet; some species not suited.	Good	Good.
Poor: wet; some species suited.	Fair: wet; some species not suited.	Good	Good where slopes are 0 to 2 percent; fair where slopes are more than 2 percent: wet.
Poor: few species suited; very low available water capacity.	Poor: few species suited; very low available water capacity.	Unsuitable: very low available water capacity; insufficient soil moisture.	Unsuitable: shallow to fissured dolomite or gravel.

defined in U.S. Department of the Interior Circular 39 (USDI). Type 1 wetlands are seasonally flooded basins and nearly level areas that are covered with water or saturated with water during seasonal wet periods but are generally relatively dry during much of the growing season. Type 2 wetlands include fresh meadows that are ordinarily not covered with water during the growing season but are saturated within a few inches of the soil surface. Type 6 wetlands consist of shrub swamp areas in which the soil is commonly saturated during the growing season.

Shallow water areas are less than 5 feet deep and include natural and artificial water areas formed by dug-out areas or low embankments, or both. Common plants are cattails, bulrushes, sedges, and reeds. These are type 3 and 4 wetlands, as designated by the USDI. Type 3 wetlands consist of shallow marshes in which the soil is saturated or covered with as much as 6 inches of water during the growing season. Type 4 wetlands are defined as deep marshes that are covered with 6 inches to about 3 feet of water during the growing season.

Deep water areas are more than 5 feet deep and consist of both natural and manmade water areas. Common plants are coontail, water lilies, milfoil, and waterweed. The deep water areas consist of ponds, lakes, and type 5 wetlands, as defined by the USDI. Type 5 wetlands are open fresh water areas that include shallow ponds and reservoirs or wet areas where water is less than 10 feet deep.

In 1972 in Portage County types 2, 3, 4, and 5 wetlands covered 32,000 acres and type 6 covered 6,600 acres, or a total of 38,600 acres in wetlands.

Tables 5 and 6 can help in determining the suitability of a particular soil for a given species of wildlife. For example, critical parts of the habitat for ringnecked pheasant are grasses and legumes, wild herbaceous upland plants, and herbaceous wetland plants. Only a combination of soil groups would be well suited for all these habitat elements. An environment con-

TABLE 6.—*Importance of wildlife habitat for selected kinds of wildlife*

[Numerals in columns have the following meanings: 1, the element has little or no value for the stated kind of wildlife; 2, the element has some value; 3, the element has an important value; 4, the element is very important to wildlife. An asterisk before a numeral means that the element is of key or critical importance to the kind of wildlife stated. A dash in the column means that the element is not applicable to maintenance of wildlife]

Selected wildlife species	Grain and seed crops		Grasses and legumes		Wild herbaceous upland plants	Woody plants			Wetland plants for food and cover	Shallow-water areas	Deep water areas
						Hardwoods		Coniferous trees			
	Harvested	Unharvested	Harvested	Unharvested		Shrubs	Trees				
Migratory waterfowl:											
Ducks	3	3	1	3	3	----	1	----	*4	*4	4
Geese	4	*4	4	1	----	----	----	----	2	3	3
Upland game birds:											
Hungarian partridge	4	4	3	4	4	1	----	----	1	----	----
Pheasant	4	4	----	*4	*4	4	----	1	*4	3	----
Quail	4	4	2	4	4	*4	2	1	4	3	----
Woodcock	----	----	1	3	3	4	4	2	3	----	----
Small game:											
Rabbit (cottontail)	3	4	3	*4	*4	*4	3	1	2	3	----
Raccoon	3	4	----	1	1	2	4	----	1	*4	4
Squirrels (fox and gray)	3	4	----	1	1	2	*4	1	----	----	----
Large game: Deer	3	4	3	3	4	4	4	4	3	3	2
Furbearers:											
Beaver	----	----	----	----	----	4	*4	----	4	4	*4
Fox (red) [1]	2	3	2	3	3	3	2	1	3	3	1
Mink [1]	----	----	----	----	----	2	1	1	3	*4	*4
Muskrat	1	1	----	----	----	1	----	----	4	*4	*4

[1] Carnivorous species not strictly dependent on elements listed.

taining soils in group 1 (loamy, well-drained soils) and group 8 (organic soils) is desirable.

Engineering Uses of the Soils [5]

This section is useful to those who need information about soils used as structural material or as foundation upon which structures are built. Among those who can benefit from this section are planning commissions, town and city managers, land developers, engineers, contractors, and farmers.

Among properties of soils highly important in engineering are permeability, strength, compaction characteristics, soil drainage condition, shrink-swell potential, grain size, and soil reaction. Also important are depth to the water table, depth to bedrock, and soil slope. These properties, in various degrees and combinations, affect construction and maintenance of roads, airports, pipelines, foundations for small buildings, irrigation systems, ponds and small dams, and systems for disposal of sewage and refuse.

Information in this section of the soil survey can be helpful to those who—

1. Select potential residential, industrial, commercial, and recreational areas.
2. Evaluate alternate routes for roads, highways, pipelines, and underground cables.
3. Seek sources of gravel, sand, or clay.
4. Plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for controlling water and conserving soil.
5. Correlate performance of structures already built with properties of the kinds of soil on which they are built, for the purpose of predicting performance of structures on the same or similar kinds of soil in other locations.
6. Predict the trafficability of soils for cross-country movement of vehicles and construction equipment.
7. Develop preliminary estimates pertinent to construction in a particular area.

Most of the information in this section is presented in tables 7, 8, and 9, which show, respectively, several estimated soil properties significant to engineering; interpretations for various engineering uses; and results of engineering laboratory tests on soil samples.

This information, along with the soil map and other parts of this publication, can be used to make interpretations in addition to those given in tables 7 and 8, and it also can be used to make other useful maps.

This information, however, does not eliminate need for further investigations at sites selected for engineering works, especially works that involve heavy loads or that require excavations to depths greater than those shown in the tables, generally depths greater than 5 feet. Also, inspection of sites, especially the small ones, is needed because many delineated areas of a given soil mapping unit may contain small areas of other kinds of soil that have strongly contrasting properties and different suitabilities or limitations for soil engineering.

Some of the terms used in this soil survey have special meaning to soil scientists. The Glossary defines many of these terms commonly used in soil science.

[5] HARRY C. BROWN, engineer, Soil Conservation Service, assisted in preparing this section.

Engineering classification systems

The two systems most commonly used in classifying samples of soils for engineering are the Unified system, used by SCS engineers, Department of Defense, and others, and the AASHTO system, adopted by the American Association of State Highway and Transportation Officials.

In the Unified system soils are classified according to particle-size distribution, plasticity, liquid limit, and organic-matter content (*2*). Soils are grouped in 15 classes. There are eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes are designated by symbols for both classes; for example, SP–SM.

The AASHTO system is used to classify soils according to those properties that affect use in highway construction and maintenance (*1*). In this system, a soil is placed 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. In group A–1 are gravelly soils of high bearing strength, or the best soils for subgrade (foundation). At the other extreme, in group A–7, are clay soils that have low strength when wet and that are the poorest soils for subgrade. Where laboratory data are available to justify a further breakdown, the A–1, A–2, and A–7 groups are divided 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. As additional refinement, the engineering value of a soil material can be indicated by a group index number. Group indexes range from 0 for the best material to 20 or more for the poorest. The AASHTO classification for tested soils, with group index numbers in parentheses, is shown in table 9; the estimated classification, without group index numbers, is given in table 7 for all soils mapped in the survey area.

Estimated properties significant to engineering

Several estimated soil properties significant in engineering are given in table 7. These estimates are made for representative soil profiles, by layers sufficiently different to have different significance for soil engineering. The estimates are based on field observations made in the course of mapping, on test data for these and similar soils, and on experience with the same kinds of soil in other counties. Following are explanations of some of the columns in table 7.

Depth to bedrock is distance from the surface of the soil to the upper surface of the rock layer.

Depth to saturated soil refers to the distance from the surface of the soil to the highest level that the soil is saturated with water during wet periods. This level of water saturation remains for long enough to cause the soil to be mottled or gleyed at that level.

Soil texture is described in table 7 in the standard terms used by the United States Department of Agriculture (USDA). These terms take into account relative percentages of sand, silt, and clay in soil material that is less than 2 millimeters in diameter (*20*).

TABLE 7.—*Estimated soil properties*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The instructions for referring to other series that appear in the first column of

Soil series and map symbols	Depth to—		Depth from surface	Dominant USDA texture	Classification		Coarse fraction greater than 3 inches
	Bedrock	Saturated soil			Unified	AASHTO	
	Ft	*Ft*	*In*				*Pct*
Alluvial land, wet: Ab		[2] 0–1					
Altdorf: Af	5–20	[2] 0–1	0–17	Silt loam	ML	A–4	
			17–42	Silty clay loam	CL	A–6	
			42–60	Silt loam	CL-ML, ML	A–4	
Billett: Bt	>20	>5	0–9	Sandy loam	SM	A–2–4	
			9–16	Gravelly sandy loam	SM	A–2–4	0–4
			16–34	Sandy loam	SC	A–4	0–3
			34–60	Sand and gravel	SP	A–1	5–10
Cathro: Ca	>5	[2] 0–1	0–11	Muck (sapric)	Pt		
			11–18	Mucky peat (hemic)	Pt		
			18–35	Muck (sapric)	Pt		
			35–60	Sandy loam	SM	A–2	
Coloma: CoB, CoC	>20	>5	0–9	Loamy sand	SM	A–2	
			9–42	Sand	SP	A–3	
			42–70	Sand and fine sand	SP	A–3	
Dancy: Da	5–20	[2] 0–1	0–8	Sandy loam	SM	A–2–4	
			8–15	Loamy sand	SM	A–2–4	
			15–30	Loam	CL	A–6	1–7
			30–60	Loam	ML	A–4	1–8
Dolph: DoA	8–20	1–3	0–17	Silt loam	ML	A–4	
			17–20	Silty clay loam	CL	A–7	
			20–30	Clay	CH	A–7	
			30–60	Clay loam	CL	A–7	0–3
Dunnville: DuB	>10	>3	0–12	Very fine sandy loam	ML	A–4	
			12–30	Very fine sandy loam	ML	A–4	
			30–60	Fine sand	SM	A–2–4	
Dunnville variant: DxA	>10	[2] 1–3	0–10	Very fine sandy loam	ML	A–4	
			10–34	Very fine sandy loam	ML	A–4	
			34–60	Fine sand	SM	A–2	
Friendship: FrA	>10	3–5	0–7	Loamy sand	SM	A–2–4	
			7–19	Loamy sand	SP-SM	A–1	
			19–60	Medium sand	SP	A–3	
Kert: KeA	4–15	1–3	0–13	Silt loam	ML	A–4	0–2
			13–22	Silt loam	ML	A–4	0–2
			22–26	Sandy loam	SM	A–2–4	1–10
			26–60	Sandstone and shale			5–15
Kranski: KrB, KrC, KrD	>20	>5	0–11	Loamy sand	SM	A–2–4	1–5
			11–36	Loamy sand	SM	A–2–4	1–5
			36–60	Loamy sand	SM	A–2–4	5–10
Leola: LeA	>10	1–3	0–18	Loamy sand	SM	A–2–4	
			18–35	Sandy loam	SM	A–2–4	
			35–42	Loamy sand	SM	A–2–4	
			42–60	Medium and coarse sand.	SP	A–1	
Lupton: Lu	>20	[2] 0–1	0–60	Muck (sapric)	Pt		

significant to engineering

soils in such mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the this table. The symbol > means greater than; the symbol < means less than]

Percentage less than 3 inches passing sieve—			Liquid limit	Plasticity index	Permeability	Available water capacity [1]	Reaction	Shrink-swell potential	Corrosivity	
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 200 (0.074 mm)							Uncoated steel	Concrete
			Pct		*In per hr*	*In per in of soil*	*pH*			
									Moderate	Moderate.
95–100	95–100	70–75	30–40	5–10	0.6–2.0	0.22–0.24	5.6–6.5		Moderate	Low.
90–95	90–95	80–85	40–50	20–30	0.06–0.2	0.18–0.20	6.1–7.3	Moderate	High	Low.
90–95	85–90	70–75	20–30	5–7	0.2–0.6	0.20–0.22	6.6–7.5	Moderate	High	Low.
95–100	95–100	25–30		[2] NP	2.0–6.0	0.13–0.15	5.6–6.5		Low	Low.
85–90	75–80	25–30		NP	2.0–6.0	0.12–0.14	5.6–6.5	Low	Low	Moderate.
90–95	85–90	36–40	20–30	10–15	2.0–6.0	0.17–0.19	5.1–6.0	Low	Low	High.
65–70	55–60	1–3		NP	>20	0.02–0.04	5.6–6.5	Low	Low	Moderate.
					2.0–6.0	>0.24	5.6–6.5		Moderate	Moderate.
					2.0–6.0	>0.24	5.6–6.5		Moderate	Moderate.
					2.0–6.0	>0.24	6.6–7.5		Moderate	Low.
95–100	95–100	25–30		NP	0.6–2.0	0.11–0.13	7.1–8.0	Low	Moderate	Low.
90–95	85–90	15–20		NP	6.0–20	0.08–0.12	5.1–6.0		Low	Low.
95–98	90–95	1–2		NP	6.0–20	0.05–0.07	5.1–6.0	Low	Low	Moderate.
95–100	95–100	1–2		NP	6.0–20	0.06–0.08	5.1–6.0	Low	Low	Moderate.
95–100	85–90	30–32		NP	2.0–6.0	0.13–0.15	5.1–6.0		Moderate	Moderate.
95–100	85–90	15–20		NP	2.0–6.0	0.10–0.12	5.1–6.0	Low	Moderate	Moderate.
90–95	85–90	60–65	30–40	10–15	0.6–2.0	0.17–0.19	5.1–6.0	Low	Moderate	Moderate.
85–90	85–90	55–60	30–40	5–10	0.6–2.0	0.14–0.16	5.1–6.0	Low	Moderate	Moderate.
95–100	95–100	70–75	30–40	5–10	0.6–2.0	0.22–0.24	5.1–6.5		Moderate	Moderate.
95–100	95–100	80–85	40–50	25–30	0.06–0.2	0.18–0.20	5.1–6.0	Moderate	High	Moderate.
95–100	95–100	75–80	50–60	30–40	0.06–0.2	0.09–0.11	5.1–6.0	High	High	Moderate.
95–100	95–100	70–75	40–50	25–30	0.06–0.2	0.15–0.17	5.1–6.0	Moderate	High	Moderate.
95–100	95–100	51–55	25–30	1–3	2.0–6.0	0.20–0.22	5.1–6.5		Low	Low.
95–100	95–100	51–55	25–30	1–3	2.0–6.0	0.17–0.19	5.1–6.0	Low	Low	High.
95–100	90–95	15–20		NP	6.0–20	0.05–0.07	5.1–6.0	Low	Low	High.
95–100	95–100	51–55	25–30	1–3	2.0–6.0	0.20–0.22	5.1–6.5		Low	Moderate.
95–100	95–100	51–55	25–30	1–3	2.0–6.0	0.17–0.19	5.1–6.0	Low	Moderate	High.
95–100	90–95	15–20		NP	6.0–20	0.05–0.07	5.1–6.0	Low	Moderate	High.
95–100	90–95	15–20		NP	6.0–20	0.10–0.12	6.1–7.0		Low	Moderate.
95–100	90–95	6–9		NP	6.0–20	0.09–0.11	5.6–6.5	Low	Low	Moderate.
95–100	90–95	1–2		NP	6.0–20	0.05–0.07	5.1–6.0	Low	Low	High.
95–100	90–95	75–80	30–40	5–10	0.6–2.0	0.22–0.24	4.6–5.5		Low	High.
90–95	85–90	75–80	25–30	1–5	0.6–2.0	0.20–0.22	4.6–5.5	Low	Moderate	High.
90–95	85–90	25–30		NP	0.6–2.0	0.12–0.14	4.6–5.5	Low	Moderate	High.
90–95	85–90	36–40			0.06–0.2	0.08–0.10	4.6–5.5	Moderate	Moderate	High.
90–95	85–90	15–20		NP	6.0–20	0.10–0.12	5.6–6.5		Low	Low.
90–95	85–90	15–20		NP	2.0–6.0	0.09–0.11	5.6–6.5	Low	Low	Moderate.
90–95	85–90	15–20		NP	6.0–20	0.08–0.10	5.6–6.0	Low	Low	Moderate.
95–98	90–95	15–20		NP	6.0–20	0.10–0.12	5.1–6.5		Low	Moderate.
95–98	90–95	25–30	15–20	1–4	2.0–6.0	0.12–0.14	4.6–6.0	Low	Moderate	High.
95–98	90–95	15–20		NP	6.0–20	0.08–0.10	5.1–6.0	Low	Moderate	High.
95–100	95–100	1–2		NP	>20	0.03–0.05	5.6–6.5	Low	Moderate	Moderate.
					2.0–6.0	>0.24	7.1–8.0		Moderate	Moderate.

TABLE 7.—*Estimated soil properties*

Soil series and map symbols	Depth to—		Depth from surface	Dominant USDA texture	Classification		Coarse fraction greater than 3 inches
	Bedrock	Saturated soil			Unified	AASHTO	
	Ft	*Ft*	*In*				*Pct*
Markey:							
Ma	>20	[2] 0–1	0–35	Muck (sapric)	Pt		
			35–60	Medium sand	SP	A–1	
Mb	>20	[2] 0–1	0–21	Muck (sapric)	Pt		
			21–60	Medium sand	SP	A–1	
Marsh: Mc		[2] 0–1					
Meadland: MeA	5–20	1–3	0–15	Loam	ML	A–4	
			15–23	Loam	CL	A–6	0–5
			23–29	Sandy loam	SM	A–2–4	0–5
			29–60	Loam	CL	A–6	5–10
Mecan: MfB, MfC, MfD, MgB, MgC, MgD.	>20	>5	0–15	Sandy loam	SM	A–2–4	0–2
			15–49	Sandy loam	SM	A–2–4	0–2
			49–57	Loamy sand	SM	A–2–4	5–10
			57–60	Loamy sand	SM	A–2–4	5–10
Meehan:							
MnA, MpA	>10	1–3	0–9	Loamy sand	SM	A–2–4	
			9–31	Loamy sand	SP-SM	A–1	
			31–60	Medium and coarse sand.	SP	A–1	
MoA	>5	1–3	0–13	Loamy sand	SM	A–2–4	
			13–25	Loamy sand	SP-SM	A–1	
			25–29	Medium sand	SP	A–1	
			29–60	Sandstone			
Meehan variant: Mr	>10	1–3	0–7	Fine sandy loam	SM	A–4	
			7–12	Sandy loam	SM	A–2–4	
			12–18	Gravelly loamy sand	GM	A–1	
			18–60	Sand and gravel	GP	A–1	
Mosinee: MsB	4–10	>5	0–7	Sandy loam	SM	A–2–4	5–10
			7–24	Sandy loam	SM	A–2–4	5–10
			24–40	Gravelly sandy loam	SM	A–2–4	50–60
			40	Granite.			
Norgo variant: NoB, NoC	<3	>5	0–12	Silt loam	ML	A–4	0–5
			12–19	Loam	ML	A–4	5–10
			19–25	Loamy sand	SM	A–2–4	20–30
			25–60	Cemented sandstone.			
Oesterle: Oe	>10	1–3	0–11	Sandy loam	SM	A–2	
			11–31	Sandy loam	SM	A–2	
			31–60	Sand and gravel	SP	A–1	
Oesterle variant: Ov	>20	1–3	0–12	Loam	ML	A–4	
			12–22	Sandy loam	SM	A–2–4	
			22–43	Silt loam	ML	A–4	
			43–60	Very fine sand and coarse silt.	ML	A–4	
Pearl: PaA	>10	3–5	0–8	Loamy sand	SM	A–2–4	
			8–45	Loamy sand	SM	A–2–4	
			45–60	Coarse sand	SP	A–1	
Plainbo: PbB	>5	>3	0–8	Loamy sand	SM	A–2–4	
			8–20	Loamy sand	SM	A–2–4	
			20–36	Medium sand	SP	A–1	
			36–60	Consolidated sandstone			

significant to engineering—Continued

Percentage less than 3 inches passing sieve—			Liquid limit	Plasticity index	Permeability	Available water capacity [1]	Reaction	Shrink-swell potential	Corrosivity	
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 200 (0.074 mm)							Uncoated steel	Concrete
			Pct		*In per hr*	*In per in of soil*	*pH*			
					2.0–6.0	>0.24	6.6–7.5		Moderate	Moderate.
95–100	90–95	1–3		NP	6.0–20	0.02–0.04	6.6–7.5	Low	Moderate	Moderate.
					2.0–6.0	>0.24	6.6–7.5	Moderate	Moderate	Moderate.
95–100	90–95	1–3		NP	6.0–20	0.02–0.04	6.6–7.5	Low	Moderate	Moderate.
									Variable	Variable.
90–95	85–90	55–60	20–30	1–5	0.6–2.0	0.20–0.22	5.1–6.5		Low	High.
90–95	85–90	51–55	30–40	10–15	0.6–2.0	0.17–0.19	5.1–6.0	Low	Moderate	High.
90–95	90–95	30–35		NP	0.6–2.0	0.15–0.17	5.1–6.0	Low	Moderate	High.
90–95	85–90	65–70	35–40	10–15	0.6–2.0	0.17–0.19	4.6–5.5	Low	Moderate	High.
95–100	90–95	30–35		NP	2.0–6.0	0.13–0.15	5.6–6.5		Low	Low.
90–95	90–95	25–30		NP	2.0–6.0	0.12–0.14	6.1–7.0	Low	Low	Moderate.
95–100	95–100	20–25		NP	2.0–6.0	0.09–0.11	6.1–7.0	Low	Low	Moderate.
90–95	90–95	15–20		NP	2.0–6.0	0.08–0.10	6.1–7.0	Low	Low	Moderate.
95–100	95–100	15–20		NP	6.0–20	0.10–0.12	5.6–6.5		Low	Moderate.
95–100	95–100	5–10		NP	6.0–20	0.09–0.11	5.6–6.5	Low	Low	Moderate.
95–100	95–100	1–2		NP	6.0–20	0.05–0.07	5.6–6.5	Low	Low	Moderate.
95–100	95–100	15–20		NP	6.0–20	0.10–0.12	5.6–6.5		Low	High.
95–100	95–100	5–10		NP	6.0–20	0.09–0.11	5.1–6.0	Low	Low	High.
95–100	95–100	1–3		NP	6.0–20	0.05–0.09	4.6–5.5	Low	Low	High.
					6.0–20					
95–100	95–100	36–40		NP	2.0–6.0	0.16–0.18	5.1–6.5		Low	Moderate.
90–95	85–90	25–30		NP	6.0–20	0.12–0.14	5.6–6.5	Low	Moderate	Moderate.
65–70	40–45	5–10		NP	6.0–20	0.05–0.07	5.6–6.5	Low	Moderate	Moderate.
50–60	45–50	1–3		NP	>20	0.02–0.04	5.6–6.6	Low	Moderate	Moderate.
95–100	95–100	30–35		NP	2.0–6.0	0.13–0.15	5.1–6.0		Low	Low.
90–95	85–90	25–30		NP	0.6–2.0	0.12–0.14	5.1–6.0	Low	Low	High.
90–95	85–90	25–30		NP	2.0–6.0	0.09–0.11	5.1–6.0	Low	Low	High.
95–100	90–95	75–80	20–30	1–4	0.6–2.0	0.22–0.24	4.6–6.0		Low	Low.
90–95	90–95	65–70	20–30	1–4	0.6–2.0	0.17–0.19	4.6–5.5	Low	Low	High.
90–95	85–90	15–20		NP	2.0–6.0	0.09–0.11	4.6–5.5	Low	Low	High.
90–95	90–95	25–30		NP	0.6–2.0	0.13–0.15	5.6–6.5		Low	Moderate.
85–90	85–90	30–35	15–20	1–4	0.6–2.0	0.12–0.14	5.1–6.0	Low	Moderate	Moderate.
75–80	1–3			NP	6.0–20	0.02–0.04	5.6–6.5	Low	Low	Moderate.
95–100	90–95	60–65	20–30	1–4	0.6–2.0	0.20–0.22	5.6–6.5		Low	Moderate.
95–100	95–100	30–35		NP	0.6–2.0	0.12–0.14	5.6–6.5	Low	Moderate	Moderate.
95–100	95–100	75–80	35–40	5–10	0.6–2.0	0.20–0.22	6.1–7.0	Low	Moderate	Low.
95–100	95–100	55–60		NP	0.6–2.0	0.10–0.12	6.1–7.0	Low	Moderate	Low.
95–100	95–100	15–20		NP	6.0–20	0.10–0.12	5.1–6.0		Low	Moderate.
90–95	85–90	25–30	15–20	1–4	2.0–6.0	0.09–0.11	5.1–6.0	Low	Low	High.
90–95	90–95	1–3		NP	6.0–20	0.03–0.05	4.6–6.0	Low	Low	High.
95–100	95–100	15–20		NP	6.0–20	0.10–0.12	4.6–5.5		Low	Moderate.
95–100	95–100	15–20		NP	6.0–20	0.09–0.11	4.6–5.5	Low	Low	High.
95–100	95–100	1–3		NP	6.0–20	0.05–0.07	4.6–5.5	Low	Low	High.
				NP	(4)					

TABLE 7.—*Estimated soil properties*

Soil series and map symbols	Depth to—		Depth from surface	Dominant USDA texture	Classification		Coarse fraction greater than 3 inches
	Bedrock	Saturated soil			Unified	AASHTO	
	Ft	*Ft*	*In*				*Pct*
*Plainfield:							
PfA, PfB, PfC, Ph	>10	>5	0–5	Loamy sand	SM	A–2–4	
			5–14	Loamy sand	SP-SM	A–1	
			14–60	Coarse and medium sand.	SP	A–1	
For properties of Kranski part of Ph, see Kranski series.							
PgB	4–10	>3	0–5	Loamy sand	SM	A–2–4	
			5–14	Loamy sand	SP-SM	A–1	0–5
			14–45	Medium sand	SP	A–1	0–5
			45–60	Sandy loam	SM	A–2–4	10–15
Plainfield variant: PkB	>10	>3	0–7	Sandy loam	SM	A–2–4	
			7–14	Loamy sand	SP-SM	A–1	
			14–60	Sand and gravel	GP	A–1	
Point: PoA	4–20	1–3	0–10	Sandy loam	SM	A–2–4	0–5
			10–29	Sandy loam	SM	A–2–4	0–5
			29–38	Loam	CL	A–4	5–10
			38–60	Loam	CL	A–4	5–10
Richford:							
RfA, RfB, RfC	>10	>5	0–7	Loamy sand	SM	A–2–4	
			7–41	Loamy sand	SM	A–2–4	
			41–60	Medium and coarse sand.	SP	A–1	
RgB	>20	>5	0–30	Loamy fine sand	SM	A–2–4	
			30–42	Fine sandy loam	SM	A–2–4	
			42–60	Fine and very fine sand	SP	A–3	
Rockers: RhA	4–20	1–3	0–2	Loamy sand	SM	A–2–4	
			2–24	Loamy sand	SM	A–2–4	
			24–60	Gravelly loam	ML	A–4	5–10
Rock land: Rk	<3	>3					10–50
*Roscommon: Rm, Rn	>5	[2] 0–1	0–9	Muck (sapric)	Pt		
			9–26	Medium sand	SP-SM	A–1	
			26–60	Sand and gravel	SP	A–1	
For properties of Meehan part of Rn, see Meehan series.							
Roscommon variant:							
Ro	>10	[2] 0–1	0–11	Sandy loam	SM	A–2–4	
			11–26	Sandy loam	SM	A–2–4	
			26–60	Sand and gravel	SP-SM	A–1	
Rp	>20	[2] 0–1	0–11	Sandy loam	SM	A–2–4	
			11–26	Sandy loam	SM	A–2–4	
			26–36	Sand and gravel	SP-SM	A–1	
			36–60	Fine sand and coarse silt.	ML	A–4	
*Rosholt:							
RrA, RrB, RrC2, RuD, RuE	>20	>5	0–14	Sandy loam	SM	A–2–4	
			14–29	Gravelly sandy loam	SC	A–4	0–5
			29–60	Sand and gravel	SP	A–1	0–5
For properties of Rosholt variant part of RuD and RuE, see Rosholt variant.							
RsB, RsC2	>20	>5	0–12	Loam	ML	A–4	
			12–20	Loam	CL	A–4	
			20–34	Gravelly sandy loam	SM	A–2–4	0–5
			34–60	Sand and gravel	SP	A–1	0–5
Rt	>20	>3	0–8	Loam	ML	A–4	
			8–34	Fine sandy loam	SM	A–4	
			34–60	Banded silt and fine sand.	ML	A–4	

significant to engineering—Continued

Percentage less than 3 inches passing sieve—			Liquid limit	Plasticity index	Permeability	Available water capacity [1]	Reaction	Shrink-swell potential	Corrosivity	
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 200 (0.074 mm)							Uncoated steel	Concrete
			Pct		*In per hr*	*In per in of soil*	*pH*			
95–100	95–100	15–20		NP	6.0–20	0.10–0.12	5.1–6.5		Low	Low.
95–100	95–100	5–10		NP	6.0–20	0.09–0.11	5.6–6.5	Low	Low	Moderate.
95–100	95–100	1–2		NP	6.0–20	0.05–0.07	5.6–6.5	Low	Low	Moderate.
95–100	90–95	15–20		NP	6.0–20	0.10–0.12	5.1–6.5		Low	High.
90–95	85–90	5–10		NP	6.0–20	0.09–0.11	5.6–6.5	Low	Low	Moderate.
90–95	85–90	1–3		NP	6.0–20	0.05–0.07	5.6–6.5	Low	Low	Moderate.
90–95	85–90	30–35	20	1–4	0.6–2.0	0.11–0.13	5.1–6.5	Low	Low	High.
95–100	95–100	25–30		NP	6.0–20	0.13–0.15	5.1–6.0		Low	High.
95–100	90–95	5–10		NP	6.0–20	0.09–0.11	5.1–6.5	Low	Low	High.
40–45	36–40	1–3		NP	>20	0.02–0.04	5.6–6.5	Low	Low	Moderate.
95–100	95–100	25–30		NP	2.0–6.0	0.13–0.15	4.6–6.0		Low	Moderate.
90–95	85–90	25–30		NP	2.0–6.0	0.12–0.14	5.1–6.0	Low	Moderate	High.
95–100	95–100	60–65	25–30	2–6	0.6–2.0	0.17–0.19	5.1–6.0	Low	Moderate	High.
95–100	95–100	55–60	20–30	10–15	0.2–0.6	0.11–0.13	5.1–6.0	Low	Moderate	High.
95–100	95–100	15–20		NP	6.0–20	0.10–0.12	5.6–7.0		Low	Low.
85–90	85–90	20–25		NP	2.0–6.0	0.09–0.11	5.1–6.5	Low	Low	High.
85–90	85–90	1–5		NP	6.0–20	0.03–0.05	5.6–7.0	Low	Low	Moderate.
95–100	95–100	15–20		NP	2.0–6.0	0.11–0.13	5.5–6.5		Low	Low.
95–100	95–100	20–25		NP	2.0–6.0	0.15–0.17	5.5–6.5	Low	Low	Moderate.
95–100	95–100	1–4		NP	2.0–6.0	0.07–0.09	5.5–6.5	Low	Low	Moderate.
95–100	95–100	15–20		NP	2.0–6.0	0.10–0.12	5.1–6.0		Low	Moderate.
95–100	95–100	15–20		NP	2.0–6.0	0.09–0.11	4.6–5.5	Low	Low	High.
75–80	70–75	51–55	15–20	1–4	0.6–2.0	0.11–0.13	4.6–5.5	Low	Moderate	High.
									Low	Low.
					2.0–6.0	>0.24	5.6–6.5		Low	Moderate.
					6.0–20	0.05–0.07	6.1–7.0	Low	Low	Moderate.
95–100	95–100	1–3		NP	6.0–20	0.05–0.07	6.1–7.0	Low	Low	Moderate.
95–100	90–95	30–35		NP	2.0–6.0	0.13–0.15	5.6–6.5		Moderate	Moderate.
90–95	90–95	25–30		NP	2.0–6.0	0.12–0.14	5.1–6.0	Low	Moderate	High.
65–70	45–50	5–10		NP	>20	0.02–0.04	5.6–6.5	Low	Moderate	Moderate.
95–100	90–95	30–35		NP	2.0–6.0	0.13–0.15	5.6–6.5		Moderate	Moderate.
90–95	90–95	15–20		NP	2.0–6.0	0.12–0.14	5.1–6.0	Low	Moderate	High.
65–70	55–60	5–10		NP	>20	0.02–0.04	5.6–6.5	Low	Moderate	Moderate.
95–100	95–100	55–60		NP	0.6–2.0	0.10–0.12	6.1–7.0	Low	Moderate	Moderate.
90–95	85–90	25–30		NP	0.6–2.0	0.13–0.15	5.6–6.5		Low	Low.
85–90	75–80	35–40	25–30	10–15	2.0–6.0	0.09–0.11	5.1–6.0	Low	Low	High.
75–80	55–60	1–3		NP	>20	0.02–0.04	5.6–6.5	Low	Low	Moderate.
90–95	85–90	55–60	20–30	1–4	0.6–2.0	0.20–0.22	6.1–7.0		Low	Low.
90–95	90–95	55–60	25–30	10–15	0.6–2.0	0.17–0.19	5.6–6.5	Low	Low	Moderate.
85–90	75–80	25–30	15–20	1–4	2.0–6.0	0.09–0.11	5.1–6.0	Low	Low	High.
75–80	55–60	1–3		NP	>20	0.02–0.04	5.6–6.5	Low	Low	Moderate.
95–100	90–95	55–60	20–30	1–4	0.6–2.0	0.20–0.22	5.6–6.5		Low	Low.
95–100	95–100	45–50	15–20	1–4	0.6–2.0	0.15–0.17	5.6–6.5	Low	Low	Moderate.
95–100	95–100	55–60		NP	0.6–2.0	0.10–0.12	5.6–6.5	Low	Low	Moderate.

TABLE 7.—*Estimated soil properties*

Soil series and map symbols	Depth to—		Depth from surface	Dominant USDA texture	Classification		Coarse fraction greater than 3 inches
	Bedrock	Saturated soil			Unified	AASHTO	
	Ft	*Ft*	*In*				*Pct*
Rosholt variant ---------- Mapped only in complex with Rosholt soils.	>20	>5	0–6	Gravelly sandy loam ---	SM	A–2–4	----------
			6–11	Gravelly sandy loam ---	SM	A–2–4	----------
			11–17	Gravelly loamy sand ---	SM	A–2–4	----------
			17–60	Sand and gravel -------	SP	A–1	----------
Rozellville: RzB ----------	5–20	>3	0–6	Loam ----------	ML	A–4	----------
			6–20	Sandy clay loam -------	CL	A–6	----------
			20–60	Stony loam ----------	ML	A–4	20–30
Seelyeville: Se ----------	>20	[2] 0–1	0–60	Muck (sapric) --------	Pt	----------	----------
Sherry: Sh ----------	5–20	[2] 0–1	0–17	Silt loam ----------	ML	A–4	----------
			17–38	Loam ----------	ML	A–4	----------
			38–60	Loam ----------	ML	A–4	----------
Vesper: Vs ----------	5–20	[2] 0–1	0–11	Silt loam ----------	ML	A–4	----------
			11–23	Silt loam ----------	ML	A–4	----------
			23–44	Sandy loam ----------	SM	A–2–4	----------
			44–60	Medium sand ----------	SP	A–1	----------
Wyocena: WyB, WyC, WyD, WyE.	>20	>5	0–11	Sandy loam ----------	SM	A–2–4	1–5
			11–30	Sandy loam ----------	SC	A–2–4	1–5
			30–60	Loamy sand ----------	SM	A–2	5–10

[1] Soils that have an abrupt textural change between layers may have a higher available water capacity than is indicated.

[2] Subject to flooding or ponding.

"Loam," for example, is soil material that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the soil contains gravel or other particles coarser than sand, an appropriate modifier is added, as for example, "gravelly loamy sand." "Sand," "silt," and "clay," and some of the other terms used in the USDA textural classification are defined in the Glossary of this soil survey.

Permeability is that quality of a soil that enables it to transmit water or air. It is estimated on the basis of those soil characteristics observed in the field, particularly structure and texture.

Available water capacity is the ability of soil to hold water for use by most plants. It is commonly defined as the difference between the amount of water in the soil at field capacity and the amount at the wilting point of most crop plants.

Reaction is the degree of acidity or alkalinity of a soil, expressed in pH values. The pH value and terms used to describe soil reaction are explained in the Glossary.

Shrink-swell potential is the relative change in volume to be expected of soil material with changes in moisture content; that is, the extent to which the soil shrinks as it dries out or swells when it gets wet. Extent of shrinking and swelling is influenced by the amount and kind of clay in the soil. Shrinking and swelling of soils causes much damage to building foundations, roads, and other structures. A *high* shrink-swell potential indicates a hazard to maintenance of structures built in, on, or with material having this rating.

Corrosivity, as used in table 7, pertains to potential soil-induced chemical action that dissolves or weakens uncoated steel or concrete. Rate of corrosion of uncoated steel is related to soil properties such as drainage, texture, total acidity, and electrical conductivity of the soil material. Corrosivity to concrete is influenced mainly by the content of sodium or magnesium sulfate, but also by soil texture and acidity. Installations of uncoated steel that intersect soil boundaries or soil horizons are more susceptible to corrosion than installations entirely in one kind of soil or in one soil horizon. A corrosivity rating of *low* means that there is a low probability of soil-induced corrosion damage. A rating of *high* means that there is a high probability of damage, so that protective measures for steel and more resistant concrete should be used to avoid or minimize damage.

Engineering interpretations of the soils

The estimated interpretations in table 8 are based on the engineering properties of soils shown in table 7, on test data for soils in this survey area and others nearby or adjoining, and on the experience of engineers and soil scientists with the soils of Portage County. In table 8, ratings are used to summarize limitation or suitability of the soils for all listed purposes other than

significant to engineering—Continued

Percentage less than 3 inches passing sieve—			Liquid limit	Plasticity index	Permeability	Available water capacity	Reaction	Shrink-swell potential	Corrosivity	
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 200 (0.074 mm)							Uncoated steel	Concrete
			Pct		*In per hr*	*In per in of soil*	*pH*			
85–90	75–80	25–30	----------	NP	2.0–6.0	0.10–0.12	5.6–6.5	----------	Low -------	Low.
80–85	70–75	25–30	----------	NP	2.0–6.0	0.09–0.11	5.6–6.5	Low ------	Low -------	Moderate.
85–90	75–80	13–15	----------	NP	6.0–20	0.09–0.11	5.1–6.0	Low ------	Low -------	High.
75–80	70–75	1–3	---- -----	NP	>20	0.02–0.04	5.6–6.5	Low ------	Low -------	Moderate.
95–100	95–100	55–60	20–30	1–4	0.6–2.0	0.20–0.22	5.6–6.5	----------	Low -------	Moderate.
95–100	95–100	51–55	30–40	10–15	0.6–2.0	0.16–0.18	5.1–6.0	Low ------	Low -------	High.
95–100	95–100	55–60	35–40	10–15	0.6–2.0	0.08–0.10	5.1–6.0	Low ------	Low -------	High.
---	---	---	---	---	---	---	---	---	Moderate ---	Moderate.
95–100	95–100	75–80	25–30	1–4	0.6–20	0.22–0.24	5.6–6.5	----------	Low -------	Moderate.
95–100	95–100	60–65	25–30	1–4	0.6–20	0.17–0.19	5.1–6.0	Low ------	High -------	High.
90–95	90–95	55–60	15–20	1–4	0.2–0.6	0.17–0.19	5.1–6.0	Low ------	High -------	High.
95–100	95–100	75–80	25–30	1–4	0.6–2.0	0.22–0.24	4.6–6.0	----------	Moderate ---	Moderate.
95–100	95–100	75–80	25–30	1–4	0.6–2.0	0.20–0.22	5.1–6.0	Low ------	Moderate ---	High.
95–100	95–100	25–30	15–20	1–4	2.0–6.0	0.12–0.14	5.6–6.5	Low ------	Moderate ---	Moderate.
90–95	90–95	1–3	----------	NP	6.0–20	0.05–0.07	5.6–6.5	Low ------	Moderate ---	Moderate.
95–100	95–100	25–30	----------	NP	2.0–6.0	0.13–0.15	6.1–7.0	----------	Low -------	Low.
90–95	85–90	25–30	25–30	10–15	2.0–6.0	0.12–0.14	5.1–6.5	Low ------	Low -------	High.
90–95	85–90	15–20	----------	NP	2.0–6.0	0.08–0.10	6.1–7.0	Low ------	Low -------	Moderate.

[3] NP means nonplastic.

[4] Variable.

for drainage for crops and pasture; irrigation; pond reservoir areas; embankments, dikes, and levees; and terraces and diversions. For these particular uses, table 8 lists those soil features not to be overlooked in planning, installation, and maintenance.

Soil limitations are indicated by the ratings slight, moderate, and severe. *Slight* means that soil properties are generally favorable for the rated use or, in other words, that limitations are minor and easily overcome. *Moderate* means that some soil properties are unfavorable but can be overcome or modified by special planning and design. *Severe* means that soil properties are so unfavorable and so difficult to correct or overcome as to require major soil reclamation, special designs, or intensive maintenance. For some uses, the rating of severe is divided to obtain ratings of severe and very severe. *Very severe* means one or more soil properties are so unfavorable for a particular use that overcoming the limitations is most difficult and costly and commonly is not practical for the rated use.

Soil suitability is rated by the terms *good, fair, poor* and *unsuitable,* which have, respectively, meanings approximately parallel to the terms slight, moderate, severe, and very severe.

The natural drainage as used in table 8 is directly related to the depth from the surface that the soil is saturated with water during periods of wetness. Very poorly drained and poorly drained soils are saturated with water at a depth of 0 to 1 foot, somewhat poorly drained soils at 1 to 3 feet, and moderately well drained soils at 3 to 5 feet. Well-drained and excessively drained soils are not saturated within a depth of 5 feet. The depth to soil that is saturated with water means the highest level to which a seasonal or perched ground water table rises and remains for 1 month or more.

Following are explanations of the columns in table 8.

Septic tank absorption fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into natural soil. The soil material between depths of 18 inches and 5 feet is evaluated. The soil properties considered are those that affect both absorption of effluent and construction and operation of the system. Properties that affect absorption are permeability, depth to saturated soil or rock, and susceptibility to flooding. Slope affects difficulty of layout and construction and also the risk of erosion, lateral seepage, and downslope flow of effluent. Large rocks or boulders increase construction costs.

Sewage lagoons are shallow ponds constructed to hold sewage within a depth of 2 to 5 feet, long enough for bacteria to decompose the solids. A lagoon has a nearly level floor, and sides, or embankments, of compacted soil material. The assumption is made that the embankment is compacted to medium density and the pond is protected from flooding. Properties are considered that affect the pond floor and the embankment. Those that affect the pond floor are permeability, organic-matter content, and slope, and if the floor needs

TABLE 8.—*Interpretations of*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The instructions for referring to other series that

Soil series and map symbols	Degree and kind of limitation for—					
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings with basements	Sanitary landfill (trench type)	Local roads and streets
Alluvial land, wet: Ab.	Very severe: poorly drained and very poorly drained; frequent flooding.	Very severe: poorly drained and very poorly drained; frequent flooding.	Very severe: poorly drained and very poorly drained; frequent flooding; variable soil properties.	Very severe: poorly drained and very poorly drained; frequent flooding; variable soil properties.	Very severe: poorly drained and very poorly drained; frequent flooding.	Severe: poorly drained and very poorly drained; frequent flooding; variable soil properties.
Altdorf: Af	Very severe: poorly drained.	Moderate: poorly drained; slow permeability.	Severe: moderate shrink-swell potential; poorly drained.	Severe: moderate shrink-swell potential; poorly drained; low bearing capacity.	Very severe: poorly drained; slow permeability.	Severe: poorly drained; low bearing capacity; high frost heave potential.
Billett: Bt	Moderate: may contaminate ground water; very rapid permeability in substratum.	Severe: very rapid permeability in substratum.	Moderate: subject to sloughing.	Slight	Severe: little amelioration of leachate; very rapid permeability in substratum.	Slight
Cathro: Ca	Very severe: very poorly drained.	Very severe: very poorly drained.	Very severe: very poorly drained.	Very severe: very poorly drained; organic soil is unstable and has low bearing capacity.	Very severe: very poorly drained.	Very severe: organic soil is unstable and has low bearing capacity.
Coloma: CoB, CoC.	Moderate: may contaminate ground water; rapid permeability.	Severe: rapid permeability; difficult to compact.	Moderate: lacks stability; sandy material; subject to sloughing.	Slight where slopes are 2 to 6 percent. Moderate where slopes are 6 to 12 percent.	Severe: little amelioration of leachate; rapid permeability in substratum.	Slight where slopes are 0 to 6 percent. Moderate where slopes are 6 to 12 percent.
Dancy: Da	Very severe: poorly drained.	Severe: poorly drained; moderate permeability in substratum.	Severe: poorly drained; moderate bearing capacity.	Severe: poorly drained; moderate bearing capacity.	Very severe: poorly drained.	Severe: poorly drained; moderate frost-heave potential.

engineering properties of the soils

soils in such mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the appear in the first column of this table]

Suitability as a source of—			Soil features affecting—				
Road fill	Sand and gravel	Topsoil	Pond reservoir areas	Embankments, dikes, and levees	Drainage for crops and pasture	Irrigation	Terraces and diversions
Poor: not accessible when wet; variable soil properties.	Unsuitable: frequent flooding; variable soil properties.	Poor: poorly drained and very poorly drained; frequent flooding.	Poorly drained and very poorly drained; variable soil properties.	Frequent flooding; variable soil properties.	Frequent flooding; surface or subsurface drainage feasible in places.	Frequent flooding; poorly drained and very poorly drained.	Frequent flooding: poorly drained and very poorly drained; variable soil properties.
Poor: low bearing capacity and low stability when wet.	Unsuitable: little or no sand or gravel.	Good in surface layer. Fair in subsoil: low fertility; low stability.	Slow permeability; poorly drained; dugout ponds feasible.	Fair to good compaction and impervious in subsoil; low stability and moderate shrink-swell potential in substratum.	Poorly drained; slow permeability; surface drainage feasible.	Poorly drained; very high available water capacity; deep; nearly level.	Poorly drained; nearly level.
Good	Good	Good in surface layer. Poor in subsoil: gravelly; low fertility.	Moderately rapid permeability throughout solum; very rapid permeability in substratum.	Moderate stability and fair compaction in subsoil; poor compaction and very impervious in substratum.	Natural drainage adequate.	Medium available water capacity; rapid water intake; nearly level.	Moderately rapid permeability; sand and gravel at a depth of 20 to 40 inches.
Unsuitable in organic soil; low bearing capacity. Fair in substratum; very poorly drained.	Unsuitable: little or no sand or gravel.	Poor: very poorly drained; oxidizes rapidly.	Very poorly drained; moderate permeability; dugout ponds feasible.	Organic material unsuitable for embankment; fair stability, fair compaction, and semipervious in substratum.	Moderately rapid permeability in organic material; moderate permeability in substratum; subsurface drainage feasible.	Very poorly drained; moderately rapid permeability in organic material; high available water capacity; nearly level.	Very poorly drained; nearly level; generally concave.
Good	Good for sand. Poor for gravel: little or no gravel.	Poor: sandy; droughty; erodible.	Rapid permeability.	Low to moderate stability; poor compaction; pervious; piping hazard.	Natural drainage excessive.	Low available water capacity; very rapid water intake; soil blowing hazard; gently sloping to sloping.	Sandy material; difficult to revegetate and stabilize.
Fair in subsoil: moderately stable. Poor in substratum: moderate bearing capacity; poorly drained.	Poor for sand: poorly graded; excessive fines. Unsuitable for gravel: no gravel.	Fair in surface layer: sandy. Poor in substratum: loamy; stony; poorly drained.	Moderate permeability; poorly drained; dugout ponds feasible in places.	Moderate stability and fair compaction in subsoil and substratum; poorly drained; stony in places.	Poorly drained; surface drainage feasible.	High available water capacity; deep; poorly drained; nearly level.	Poorly drained; nearly level.

TABLE 8.—*Interpretations of engineering*

Soil series and map symbols	Degree and kind of limitation for—					
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings with basements	Sanitary landfill (trench type)	Local roads and streets
Dolph: DoA	Severe: somewhat poorly drained; slow permeability.	Moderate: slow permeability; somewhat poorly drained.	Severe: somewhat poorly drained.	Severe: moderate to high shrink-swell potential; somewhat poorly drained; low bearing capacity.	Severe: water ponds in pits; somewhat poorly drained; difficult to work during wet periods.	Moderate: somewhat poorly drained; moderate frost-heave potential; low bearing capacity; bedrock at a depth of 8 to 20 feet.
Dunnville: DuB.	Moderate: may contaminate ground water; rapid permeability in substratum; some areas subject to flooding.	Severe: rapid permeability in substratum.	Moderate: some areas subject to flooding; subject to sloughing.	Moderate: some areas subject to flooding.	Severe: little amelioration of leachate.	Slight: some areas subject to flooding.
Dunnville variant: DxA.	Severe: somewhat poorly drained; subject to flooding.	Severe: somewhat poorly drained; subject to flooding; rapid permeability in substratum.	Severe: subject to flooding; somewhat poorly drained.	Very severe: subject to flooding; somewhat poorly drained.	Very severe: subject to flooding; somewhat poorly drained; little amelioration of leachate.	Moderate: subject to flooding; moderate frost-heave potential; somewhat poorly drained.
Friendship: FrA.	Severe: moderately well drained; rapid permeability; may contaminate ground water.	Severe: rapid permeability; moderately well drained.	Moderate: moderately well drained; subject to sloughing.	Moderate: moderately well drained.	Severe: little amelioration of leachate; moderately well drained.	Slight
Kert: KeA	Severe: somewhat poorly drained; slow permeability in substratum.	Moderate: moderate permeability in subsoil; sandstone may allow lateral seepage.	Severe: moderate shrink-swell potential and bearing capacity.	Severe: shale and sandstone bedrock at a depth of 4 to 15 feet; subject to frost heave; somewhat poorly drained.	Severe: somewhat poorly drained; partial amelioration of leachate.	Moderate: sandstone and shale bedrock at a depth of 4 to 15 feet; somewhat poorly drained; subject to frost heave.

properties of the soils—Continued

Suitability as a source of—			Soil features affecting—				
Road fill	Sand and gravel	Topsoil	Pond reservoir areas	Embankments, dikes, and levees	Drainage for crops and pasture	Irrigation	Terraces and diversions
Poor: low bearing capacity; somewhat poorly drained; low stability when wet.	Unsuitable: little or none.	Good in surface layer. Poor in subsoil: clayey; low fertility.	Slow permeability; somewhat poorly drained.	Semipervious, fair compaction, and low stability in subsoil; semipervious, fair to poor compaction, and low stability in substratum.	Somewhat poorly drained; slow permeability; surface drainage feasible.	High available water capacity; deep; somewhat poorly drained; nearly level.	Somewhat poorly drained; nearly level; bedrock at a depth of 8 to 20 feet.
Good in subsoil. Fair in substratum: low stability; erodible.	Poor for gravel: little gravel. Fair for sand: poorly graded.	Good in surface layer. Fair in subsoil: sandy; low fertility.	Moderately rapid permeability in subsoil, rapid permeability in substratum.	Moderate stability and fair compaction in subsoil; low stability, poor compaction, and pervious in substratum.	Natural drainage adequate.	Medium available water capacity; medium water intake; gently sloping.	Sand at a depth of 20 to 40 inches; low stability in substratum; difficult to revegetate; highly erodible.
Fair: somewhat poorly drained.	Poor for gravel: little gravel. Poor for sand: poorly graded; subject to flooding.	Good in surface layer. Fair in subsoil: low fertility; subject to flooding; somewhat poorly drained.	Moderately rapid permeability in subsoil, rapid permeability in substratum; somewhat poorly drained.	Moderate stability and fair compaction in subsoil; low stability, poor compaction, and pervious in substratum.	Somewhat poorly drained; subject to flooding; moderately rapid permeability; surface drainage feasible.	Medium available water capacity; medium water intake; somewhat poorly drained; nearly level.	Somewhat poorly drained; nearly level.
Good	Good for sand. Unsuitable for gravel: little or no gravel.	Poor: sandy; droughty; erodible.	Rapid permeability.	Low stability and poor compaction; erodible; pervious; piping hazard.	Rapid permeability; erodible; plow layer is droughty.	Low available water capacity; deep; very rapid water intake; hazard of soil blowing; nearly level.	Sandy; difficult to vegetate and stabilize.
Fair in substratum: sandstone and shale bedrock. Poor in subsoil: moderate bearing capacity; unstable.	Poor for sand: sandstone has shale bands in substratum. Unsuitable for gravel: no gravel.	Good in surface layer. Fair in subsoil: low fertility; slopes unstable.	Moderate permeability throughout subsoil; slow permeability in substratum; sandstone may allow lateral seepage.	Low stability, fair compaction, and semipervious in subsoil; sandstone and shale in substratum.	Slow permeability; moderately deep; somewhat poorly drained; surface drainage feasible.	Medium available water capacity; medium water intake; somewhat poorly drained; nearly level.	Somewhat poorly drained; nearly level; sandstone and shale bedrock at a depth of 4 to 15 feet.

TABLE 8.—*Interpretations of engineering*

Soil series and map symbols	Degree and kind of limitation for—					
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings with basements	Sanitary landfill (trench type)	Local roads and streets
Kranski: KrB, KrC, KrD.	Moderate where slopes are 2 to 12 percent; severe where slopes are more than 12 percent: may contaminate ground water; rapid permeability in substratum.	Severe: rapid permeability in substratum; stony in places.	Moderate where slopes are 2 to 12 percent; severe where slopes are more than 12 percent: stones hinder excavation in places; subject to sloughing.	Slight where slopes are 2 to 6 percent; moderate where slopes are 6 to 12 percent; severe where slopes are more than 12 percent: high bearing capacity; low compressibility; stones hinder excavation in places.	Severe: partial amelioration of leachate; rapid permeability in substratum.	Slight where slopes are 2 to 6 percent; moderate where slopes are 6 to 12 percent; severe where slopes are more than 12 percent: stones may hinder hauling and grading in places; erodible.
Leola: LeA ----	Severe: somewhat poorly drained.	Very severe: rapid permeability in substratum; somewhat poorly drained.	Severe: somewhat poorly drained.	Severe: somewhat poorly drained.	Severe: little amelioration of leachate; somewhat poorly drained.	Moderate: somewhat poorly drained.
Lupton: Lu ---	Very severe: very poorly drained.	Very severe: very poorly drained.	Very severe: very poorly drained; organic material.	Very severe: very poorly drained; organic material.	Very severe: very poorly drained; organic material.	Very severe: very poorly drained; organic material.
Markey: Ma, Mb.	Very severe: very poorly drained.	Very severe: very poorly drained.	Very severe: moderate bearing capacity in substratum; very poorly drained.	Very severe: moderate bearing capacity in substratum; very poorly drained; liquefaction and piping hinder excavation.	Very severe: very poorly drained.	Severe: organic material less than 50 inches thick; very poorly drained.
Marsh: Mc ---	Very severe: flooded most of the year.	Very severe: flooded most of the year.	Very severe: flooded most of the year.	Very severe: flooded most of the year.	Very severe: flooded most of the year.	Very severe: flooded most of the year.
Meadland: MeA.	Severe: somewhat poorly drained; moderate permeability.	Severe: moderate permeability; somewhat poorly drained; bedrock at a depth of 5 to 20 feet may restrict use.	Severe: moderate bearing capacity; bedrock at a depth of 5 to 20 feet.	Severe: moderate bearing capacity; bedrock at a depth of 5 to 20 feet; somewhat poorly drained.	Severe: somewhat poorly drained; water ponds in pits during wet periods; bedrock at a depth of 5 to 20 feet.	Moderate: somewhat poorly drained; bedrock at a depth of 5 to 20 feet; subject to frost heave.

properties of the soils—Continued

Suitability as a source of—			Soil features affecting—				
Road fill	Sand and gravel	Topsoil	Pond reservoir areas	Embankments, dikes, and levees	Drainage for crops and pasture	Irrigation	Terraces and diversions
Good where slopes are 2 to 12 percent. Fair where slopes are 12 to 20 percent.	Fair for sand: poorly graded to well graded with some fines. Poor for gravel: pockets of well-graded gravel in places.	Fair in surface layer: thin; sandy; stony in places. Poor in subsoil: thin; sandy; erodible; stony; low fertility.	Rapid permeability in substratum.	Pervious; piping hazard; stony; moderate stability and fair to poor compaction.	Natural drainage excessive.	Low available water capacity; deep; very rapid water intake; gently sloping to moderately steep.	Sandy subsoil and substratum; erodible; difficult to vegetate and stabilize; gently sloping to moderately steep.
Fair: moderate stability; somewhat poorly drained.	Good for sand. Poor for gravel: some well-graded gravel in pockets.	Fair in surface layer: thin. Poor in subsoil: gravelly; sandy.	Moderately rapid permeability throughout subsoil; rapid permeability in substratum; somewhat poorly drained.	Moderate stability and fair compaction in subsoil; rapid permeability; erodible, piping hazard, and pervious in substratum.	Moderately rapid permeability; somewhat poorly drained; surface drainage feasible.	Low available water capacity; deep; somewhat poorly drained; very rapid water intake; nearly level.	Somewhat poorly drained; nearly level.
Unsuitable: organic material.	Unsuitable: no sand or gravel; organic material.	Poor: erodible; oxidizes rapidly.	Moderately rapid permeability; very poorly drained; dugout ponds feasible.	Unsuitable: organic material.	Moderately rapid permeability; very poorly drained; surface or subsurface drainage feasible.	Very high available water capacity; rapid water intake; soil blowing hazard; very poorly drained; nearly level.	Unstable material; practices generally not applicable.
Unsuitable in subsoil: organic material. Poor in substratum: low stability; very poorly drained.	Fair for sand: poorly graded sand in substratum. Unsuitable for gravel: little or no gravel.	Poor: erodible; oxidizes rapidly.	Moderately rapid permeability; very poorly drained; dugout ponds feasible.	Organic material not suitable for embankment; low stability, poor compaction, very pervious, and piping hazard in substratum.	Moderately rapid permeability; very poorly drained; subsurface drainage feasible.	Medium to high available water capacity; rapid water intake; soil blowing hazard; very poorly drained; nearly level.	Unstable material; practices generally not applicable.
Unsuitable: flooded most of the year.	Unsuitable: little or no sand and gravel.	Unsuitable: flooded most of the year.	Flooded most of the year.	Features variable; flooded most of the year.	Drainage generally not feasible or practical.	Flooded most of the year.	Flooded most of the year.
Fair: moderate bearing capacity; unstable where wet; somewhat poorly drained.	Unsuitable: little or no sand and gravel.	Good in surface layer. Fair in subsoil: low fertility; stony in places.	Moderate permeability; somewhat poorly drained; bedrock at a depth of 5 to 20 feet.	Low stability; fair compaction; somewhat poorly drained; semipervious; bedrock may restrict use.	Moderate permeability; somewhat poorly drained; surface drainage feasible.	High available water capacity; deep; medium water intake; somewhat poorly drained.	Somewhat poorly drained; nearly level; bedrock at a depth of 5 to 20 feet.

TABLE 8.—*Interpretations of engineering*

Soil series and map symbols	Degree and kind of limitation for—					
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings with basements	Sanitary landfill (trench type)	Local roads and streets
Mecan: MfB, MfC, MfD, MgB, MgC, MgD.	Slight where slopes are 2 to 6 percent; moderate where slopes are 6 to 12 percent; severe where slopes are more than 12 percent: moderately rapid permeability; slopes may hinder installation in places.	Severe: moderately rapid permeability.	Slight where slopes are 2 to 6 percent; moderate where slopes are 6 to 12 percent; severe where slopes are more than 12 percent: stones hinder excavation in places.	Slight where slopes are 2 to 6 percent; moderate where slopes are 6 to 12 percent; severe where slopes are more than 12 percent: high bearing capacity; low compressibility; stones hinder excavation in places.	Severe: partial amelioration of leachate; moderately rapid permeability.	Slight where slopes are 2 to 6 percent; moderate where slopes are 6 to 12 percent; severe where slopes are more than 12 percent: stones hinder hauling and grading in places; high bearing capacity.
Meehan: MnA, MpA	Severe: somewhat poorly drained; may contaminate ground water; rapid permeability.	Severe: rapid permeability; somewhat poorly drained.	Severe: somewhat poorly drained; subject to liquefaction and piping.	Severe: somewhat poorly drained; subject to liquefaction and piping.	Severe: somewhat poorly drained; little amelioration of leachate.	Moderate: somewhat poorly drained.
MoA	Severe: somewhat poorly drained; may contaminate ground water; rapid permeability.	Severe: rapid permeability; sandstone bedrock at a depth of less than 5 feet; somewhat poorly drained.	Severe: somewhat poorly drained; subject to liquefaction; sandstone bedrock at a depth of less than 5 feet.	Severe: sandstone bedrock at a depth of less than 5 feet; somewhat poorly drained.	Severe: somewhat poorly drained; little amelioration of leachate; sandstone bedrock at a depth of less than 5 feet.	Moderate: somewhat poorly drained; sandstone bedrock at a depth of less than 5 feet.
Meehan variant: Mr.	Severe: somewhat poorly drained; may contaminate ground water; very rapid permeability in substratum; subject to occasional flooding.	Very severe: very rapid permeability in substratum; somewhat poorly drained; occasional flooding.	Severe: somewhat poorly drained; subject to liquefaction and piping; occasional flooding.	Very severe: subject to occasional flooding; somewhat poorly drained.	Very severe: somewhat poorly drained; very rapid permeability in substratum; little amelioration of leachate.	Moderate: occasional flooding; somewhat poorly drained.
Mosinee: MsB	Moderate: moderate permeability; bedrock outcrops in places.	Severe: moderate permeability; bedrock at a depth of 4 to 10 feet.	Moderate: bedrock outcrop hinders excavation in places.	Moderate: bedrock at a depth of 4 to 10 feet; bedrock outcrop in places.	Severe: moderate permeability; bedrock at a depth of 4 to 10 feet; partial amelioration of leachate.	Slight: bedrock outcrop in places.

properties of the soils—Continued

Suitability as a source of—			Soil features affecting—				
Road fill	Sand and gravel	Topsoil	Pond reservoir areas	Embankments, dikes, and levees	Drainage for crops and pasture	Irrigation	Terraces and diversions
Good where slopes are 2 to 12 percent; fair where slopes are 12 to 20 percent.	Poor: pockets of well to poorly graded sand and gravel in places.	Fair in surface layer: stony. Poor in subsoil: stony; low fertility.	Moderately rapid permeability.	Moderate stability; fair to poor compaction; pervious.	Natural drainage adequate.	Medium available water capacity; deep; rapid water intake; gently sloping to moderately steep.	Erodible; gently sloping to moderately steep.
Fair: low stability unless confined; somewhat poorly drained; erodible.	Good for sand. Unsuitable for gravel: little or no gravel.	Poor: sandy; droughty; erodible.	Rapid permeability; somewhat poorly drained; dugout ponds feasible.	Low stability and poor compaction; very pervious; piping hazard.	Rapid permeability; somewhat poorly drained; low stability.	Low available water capacity; somewhat poorly drained; deep; very rapid water intake; soil blowing hazard; nearly level.	Somewhat poorly drained; nearly level; soil blowing hazard.
Fair: substratum is weekly cemented sandstone; somewhat poorly drained.	Good for sand: weakly cemented sandstone; poorly graded. Unsuitable for gravel: little or none present.	Poor: sandy; droughty; erodible.	Rapid permeability; sandstone bedrock at a depth of less than 5 feet; somewhat poorly drained.	Low stability; poor compaction, very pervious, and piping hazard in subsoil; weakly cemented sandstone in substratum.	Rapid permeability; very rapid water intake; sandstone bedrock at a depth of less than 5 feet.	Low available water capacity; somewhat poorly drained; soil blowing hazard; nearly level.	Sandy; somewhat poorly drained; sandstone bedrock at a depth of less than 5 feet; nearly level.
Good ----------	Good ----------	Fair in surface layer: gravelly in places. Unsuitable in subsoil: gravelly; low fertility; erodible.	Rapid permeability throughout subsoil; very rapid permeability in substratum; somewhat poorly drained.	Low stability and poor compaction; very pervious.	Rapid permeability throughout subsoil; very rapid permeability in substratum; somewhat poorly drained; surface drainage feasible in places.	Low available water capacity; soil blowing hazard; very rapid water intake; somewhat poorly drained; nearly level.	Sandy; somewhat poorly drained; nearly level.
Good ----------	Good for gravel used for gravel roads. Poor for gravel used for concrete. Unsuitable for sand: low sand content.	Fair in surface layer: stony; thin. Poor in subsoil: low fertility; gravelly.	Moderate permeability.	Moderate stability and fair to poor compaction; pervious; stony and gravelly in places.	Natural drainage adequate.	Low available water capacity; gently sloping; rapid water intake.	Moderate permeability; gently sloping; subsoil gravelly; bedrock outcrops in places.

TABLE 8.—*Interpretations of engineering*

Soil series and map symbols	Degree and kind of limitation for—					
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings with basements	Sanitary landfill (trench type)	Local roads and streets
Norgo variant: NoB, NoC.	Severe: may contaminate ground water; sandstone bedrock at a depth of less than 3 feet; moderate permeability to bedrock.	Severe: sandstone bedrock at a depth of less than 3 feet; sandstone has rapid permeability in some places.	Moderate where slopes are 2 to 6 percent. Severe where slopes are 6 to 12 percent or where bedrock must be excavated.	Severe: sandstone bedrock at a depth of less than 3 feet.	Severe: sandstone bedrock at a depth of less than 3 feet; little amelioration of leachate.	Moderate: cemented sandstone bedrock at a depth of less than 3 feet.
Oesterle: Oe.	Severe: somewhat poorly drained; rapid permeability in substratum; may contaminate ground water.	Severe: rapid permeability in substratum; somewhat poorly drained.	Severe: somewhat poorly drained; wetness hinders excavation in places.	Severe: somewhat poorly drained; subject to liquefaction and piping where wet.	Severe: somewhat poorly drained; rapid permeability in substratum; little amelioration of leachate.	Moderate: somewhat poorly drained; low stability when wet.
Oesterle variant: Ov.	Severe: somewhat poorly drained; may contaminate ground water.	Severe: low stability; poor compaction; somewhat poorly drained.	Severe: moderate bearing capacity; subject to liquefaction and piping.	Severe: moderate bearing capacity; subject to liquefaction, piping, and frost heave.	Severe: somewhat poorly drained; little amelioration of leachate.	Moderate: somewhat poorly drained; low stability; subject to liquefaction, piping, and frost heave.
Pearl: PaA	Moderate: moderately well drained; rapid permeability in substratum; may contaminate ground water.	Severe: rapid permeability in substratum; moderately well drained.	Moderate: moderately well drained; subject to sloughing.	Moderate: moderately well drained.	Severe: moderately well drained; rapid permeability in substratum; little amelioration of leachate.	Slight
Plainbo: PbB	Severe: rapid permeability; may contaminate ground water; permeability in sandstone bedrock.	Severe: permeability in sandstone bedrock; rapid permeability in subsoil.	Moderate: subject to sloughing.	Slight: weakly cemented sandstone at a depth of less than 5 feet.	Severe: little amelioration of leachate; rapid permeability.	Slight

properties of the soils—Continued

Suitability as a source of—			Soil features affecting—				
Road fill	Sand and gravel	Topsoil	Pond reservoir areas	Embankments, dikes, and levees	Drainage for crops and pasture	Irrigation	Terraces and diversions
Fair in subsoil: moderate bearing capacity and stability. Fair in substratum: cemented sandstone.	Fair for sand: sandstone is cemented; poorly graded sand. Poor for gravel: cemented sandstone.	Good in surface layer. Fair in subsoil: thin over bedrock; erodible on slopes.	Moderate permeability throughout subsoil; sandstone bedrock in substratum; rapid permeability in places.	Moderate stability and fair compaction in subsoil; cemented sandstone in substratum.	Natural drainage adequate.	Low available water capacity; moderately deep soil; medium water intake; gently sloping to sloping.	Sandstone bedrock at a depth of less than 3 feet; gently sloping to sloping.
Fair: somewhat poorly drained.	Fair: poorly graded to well-graded sand and gravel in substratum; somewhat poorly drained; may contain lenses of fines.	Good in surface layer. Fair in subsoil: low fertility; gravelly in places.	Moderate permeability throughout subsoil; rapid permeability in substratum; somewhat poorly drained; dugout ponds feasible in places.	Moderate stability, fair compaction, and semipervious in subsoil; very pervious and poor compaction in substratum.	Moderate permeability; somewhat poorly drained; surface drainage feasible.	Low available water capacity; medium water intake; moderately deep to sand and gravel; somewhat poorly drained; nearly level.	Sand and gravel at a depth of 20 to 40 inches; somewhat poorly drained; nearly level; wetness hinders construction in places.
Fair: moderate bearing capacity; subject to liquefaction, piping, and frost heave.	Poor for sand: poorly graded sand with silt bands in substratum. Unsuitable for gravel: little or no gravel.	Good in surface layer. Fair in subsoil: low fertility; erodible.	Moderate permeability; somewhat poorly drained; dugout ponds feasible in places.	Low stability and poor compaction; semipervious; somewhat poorly drained.	Moderate permeability; somewhat poorly drained; substratum generally unstable; surface drainage feasible.	High available water capacity; deep; nearly level; medium water intake; somewhat poorly drained.	Low stability; highly erodible; nearly level; somewhat poorly drained; wetness hinders construction in places.
Good	Good for sand. Fair for gravel: few well graded gravel pockets in substratum.	Poor: sandy; droughty; erodible.	Moderately rapid permeability throughout subsoil; rapid permeability in substratum.	Moderate stability, fair compaction, and pervious in subsoil; low stability, poor compaction, and very pervious in substratum.	Moderately rapid permeability; moderately well drained; plow layer droughty.	Low available water capacity; nearly level; very rapid water intake; moderately well drained; moderately deep to sand and gravel.	Sandy; difficult to stabilize and vegetate; nearly level.
Good	Good for sand: sandstone weakly cemented; poorly graded sand. Poor for gravel: little or no gravel.	Poor in surface layer: sandy. Unsuitable in subsoil: sandy; droughty; erodible.	Rapid permeability; sandstone at a depth of less than 5 feet.	Low stability, poor compaction, very pervious, and piping hazard in subsoil; weakly cemented sandstone in substratum.	Natural drainage excessive.	Low available water capacity; very rapid water intake; gently sloping.	Sandy; difficult to vegetate and stabilize; soil blowing hazard.

TABLE 8.—*Interpretations of engineering*

Soil series and map symbols	Degree and kind of limitation for—					
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings with basements	Sanitary landfill (trench type)	Local roads and streets
*Plainfield: PfA, PfB, PfC, Ph. For properties of Kranski part of Ph, see Kranski series.	Moderate where slopes are 0 to 12 percent; severe where slopes are more than 12 percent: rapid permeability; may contaminate ground water.	Severe: rapid permeability.	Moderate where slopes are 0 to 12 percent; severe where slopes are more than 12 percent: slopes hinder machinery; subject to sloughing.	Slight where slopes are 0 to 6 percent. Moderate where slopes are 6 to 12 percent. Severe where slopes are more than 12 percent.	Severe: little amelioration of leachate.	Slight where slopes are 0 to 6 percent. Moderate where slopes are 6 to 12 percent. Severe where slopes are more than 12 percent.
PgB	Moderate: rapid permeability in subsoil; moderate permeability in substratum; bedrock at a depth of 4 to 10 feet.	Moderate: rapid permeability in subsoil; moderate permeability in substratum; bedrock at a depth of 4 to 10 feet.	Moderate: bedrock at a depth of 4 to 10 feet hinders excavation in places; subject to sloughing in upper part.	Moderate: bedrock at a depth of 4 to 10 feet.	Moderate: moderately permeable substratum; bedrock at a depth of 4 to 10 feet.	Slight: bedrock hinders excavation in cuts in places.
Plainfield variant: PkB.	Moderate: very rapid permeability in substratum; may contaminate ground water.	Very severe: very rapid permeability in substratum.	Moderate: subject to sloughing.	Slight	Severe: very rapid permeability in substratum; little amelioration of leachate.	Slight
Point: PoA	Severe: somewhat poorly drained; bedrock at a depth of 4 to 20 feet.	Moderate: moderately rapid permeability in subsoil; moderately slow permeability in substratum; somewhat poorly drained; bedrock at a depth of 4 to 20 feet.	Severe: moderate bearing capacity; somewhat poorly drained; bedrock at a depth of 4 to 20 feet.	Severe: moderate bearing capacity; somewhat poorly drained; stony; bedrock at a depth of 4 to 20 feet.	Severe: somewhat poorly drained; bedrock at a depth of 4 to 20 feet.	Moderate: somewhat poorly drained; stony.

properties of the soils—Continued

Suitability as a source of—			Soil features affecting—				
Road fill	Sand and gravel	Topsoil	Pond reservoir areas	Embankments, dikes, and levees	Drainage for crops and pasture	Irrigation	Terraces and diversions
Good	Good for sand. Poor for gravel: little or no gravel.	Poor: sandy; droughty; erodible.	Rapid permeability; piping hazard; very pervious; poor compaction.	Low stability; piping hazard; very pervious; poor compaction.	Natural drainage excessive.	Low available water capacity; deep; very rapid water intake; soil blowing hazard; nearly level to very steep.	Sandy; difficult to vegetate and stabilize; bedrock at a depth of 4 to 10 feet.
Good: bedrock hinders excavation in some places.	Good for sand: poorly graded sand in subsoil and upper part of substratum. Poor for gravel: lower part of substratum may have disintegrated granite.	Poor: sandy; droughty; erodible.	Rapid permeability throughout subsoil; moderate permeability in substratum; bedrock at a depth of 4 to 10 feet.	Low stability and poor compaction in subsoil; moderate stability and fair compaction in substratum; bedrock at a depth of 4 to 10 feet.	Natural drainage adequate.	Low available water capacity; deep; very rapid water intake; soil blowing hazard; gently sloping.	Sandy; difficult to vegetate and stabilize; bedrock at a depth of 4 to 10 feet.
Good	Good	Fair in surface layer: sandy. Unsuitable in subsoil: sandy and gravelly.	Rapid permeability throughout subsoil; very rapid permeability in substratum.	Poor compaction; very pervious.	Natural drainage excessive.	Low available water capacity; shallow to sand and gravel; very rapid water intake; gently sloping.	Shallow to sand and gravel; droughty; difficult to vegetate and stabilize; gently sloping.
Fair in subsoil: moderate stability and high bearing capacity. Fair in substratum: moderate stability and bearing capacity; somewhat poorly drained.	Unsuitable: loamy.	Fair in surface layer: sandy. Poor in subsoil: low fertility; stony in places.	Moderately rapid permeability throughout upper subsoil; moderate permeability in lower subsoil and substratum; dugout ponds feasible in places; somewhat poorly drained.	Moderate stability and fair to good compaction; semipervious.	Moderately rapid permeability in upper part of subsoil; moderately slow permeability in lower part of subsoil and in substratum; stony; somewhat poorly drained; surface drainage feasible.	Medium available water capacity; medium water intake; somewhat poorly drained; deep; nearly level.	Loamy; moderate stability; somewhat poorly drained; nearly level; stony.

TABLE 8.—*Interpretations of engineering*

Soil series and map symbols	Degree and kind of limitation for—					
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings with basements	Sanitary landfill (trench type)	Local roads and streets
Richford: RfA, RfB, RfC.	Moderate: rapid permeability in substratum; may contaminate ground water.	Severe: rapid permeability in substratum; poor compaction.	Moderate: subject to sloughing; slopes hinder machinery.	Slight where slopes are 0 to 6 percent. Moderate where slopes are 6 to 12 percent.	Severe: rapid permeability in substratum; little amelioration of leachate.	Slight where slopes are 0 to 6 percent. Moderate where slopes are 6 to 12 percent.
RgB	Slight	Severe: moderately rapid permeability; poor compaction.	Moderate: subject to sloughing.	Slight	Moderate: partial amelioration of leachate.	Moderate: frost heave hazard; subject to liquefaction and piping.
Rockers: RhA	Severe: somewhat poorly drained; bedrock at a depth of 4 to 20 feet.	Moderate: moderately rapid permeability in upper subsoil; moderate permeability in lower subsoil and substratum; bedrock at a depth of 4 to 20 feet; somewhat poorly drained.	Severe: somewhat poorly drained; moderate bearing capacity; bedrock at a depth of 4 to 20 feet.	Severe: somewhat poorly drained; moderate bearing capacity; bedrock at a depth of 4 to 20 feet.	Severe: moderate permeability in substratum; somewhat poorly drained.	Moderate: somewhat poorly drained; stony.
Rock land: Rk	Very severe: bedrock covers 50 to 90 percent of the surface.	Very severe: bedrock covers 50 to 90 percent of the surface.	Severe: bedrock covers 50 to 90 percent of the surface.	Severe: bedrock covers 50 to 90 percent of the surface.	Very severe: bedrock covers 50 to 90 percent of the surface.	Severe: bedrock covers 50 to 90 percent of the surface.
*Roscommon: Rm, Rn. For properties of Meehan part of Rn, see Meehan series.	Very severe: poorly drained.	Very severe: poorly drained.	Severe: poorly drained; piping hazard.	Severe: poorly drained; wetness may restrict installation; subject to liquefaction and piping where wet.	Severe: poorly drained.	Severe: poorly drained; hauling and excavation difficult.

properties of the soils—Continued

Suitability as a source of—			Soil features affecting—				
Road fill	Sand and gravel	Topsoil	Pond reservoir areas	Embankments, dikes, and levees	Drainage for crops and pasture	Irrigation	Terraces and diversions
Good	Good for sand. Poor for gravel: few well-graded gravel pockets.	Poor: sandy; droughty; erodible.	Moderately rapid permeability throughout subsoil; rapid permeability in substratum.	Moderate stability and fair compaction in subsoil; low to moderate stability, poor compaction, and very pervious in substratum.	Natural drainage adequate.	Low available water capacity; moderately deep to sand and gravel; very rapid water intake; soil blowing hazard; nearly level to sloping.	Sandy; difficult to vegetate and stabilize; nearly level to sloping.
Fair: low stability where wet; poor compaction; erodible on slopes; frost heave hazard.	Poor for sand: poorly graded sand in substratum. Unsuitable for gravel: no gravel.	Fair in surface layer: erodible; droughty. Poor in subsoil: low fertility; erodible; droughty.	Moderately rapid permeability; pervious.	Low stability and poor compaction; subject to liquefaction, piping, and frost heave.	Natural drainage adequate.	Low available water capacity; gently sloping; rapid water intake; deep.	Sandy material; difficult to vegetate and stabilize.
Fair: somewhat poorly drained.	Poor for sand: poorly graded to well-graded sand that has fines in upper part of subsoil. Poor for gravel: disintegrated granite in substratum.	Poor: sandy; droughty; low fertility.	Moderately rapid permeability in upper subsoil; moderate permeability in lower subsoil and substratum; dugout ponds feasible in places.	Moderate stability and good compaction; semipervious.	Moderately rapid permeability in upper part of subsoil; moderate permeability in lower part of subsoil and in substratum; stony; somewhat poorly drained; surface drainage feasible.	Medium available water capacity; rapid water intake; somewhat poorly drained; deep; nearly level.	Sandy material; difficult to vegetate and stabilize; somewhat poorly drained; nearly level; stony.
Unsuitable: 50 to 90 percent of surface covered with bedrock.	Unsuitable: no sand and gravel.	Unsuitable: very little soil.	Bedrock outcrop covers 50 to 90 percent of the surface.	Bedrock outcrop covers 50 to 90 percent of the surface.	Natural drainage excessive.	Nonarable	Nonarable.
Poor: poorly drained; low stability unless confined; erodible.	Fair for sand: poorly graded sand in substratum. Unsuitable for gravel: little or no gravel.	Poor: sandy; droughty; erodible; poorly drained.	Rapid permeability; poorly drained; dugout ponds feasible.	Low stability and poor compaction; very pervious; erodible; piping hazard.	Rapid permeability; poorly drained; substratum generally unstable; subsurface or surface drainage feasible.	Low available water capacity; deep; very rapid water intake; soil blowing hazard; poorly drained; nearly level.	Poorly drained; nearly level; practices generally not applicable.

TABLE 8.—*Interpretations of engineering*

Soil series and map symbols	Degree and kind of limitation for—					
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings with basements	Sanitary landfill (trench type)	Local roads and streets
Roscommon variant: Ro	Very severe: poorly drained.	Very severe: poorly drained; very rapid permeability in substratum.	Severe: poorly drained; wetness restricts excavation.	Severe: poorly drained; wetness restricts installation.	Very severe: poorly drained.	Severe: poorly drained.
Rp	Very severe: poorly drained.	Very severe: poorly drained.	Severe: poorly drained; wetness restricts excavations; lower substratum subject to liquefaction and piping.	Severe: poorly drained; wetness restricts installation; lower substratum subject to liquefaction and piping.	Very severe: poorly drained.	Severe: poorly drained; subject to frost heave.
*Rosholt: RrA, RrB, RrC2, RsB, RsC2, RuD, RuE. For properties of Rosholt variant parts of RuD and RuE, see Rosholt variant.	Moderate where slopes are 0 to 12 percent; severe where slopes are more than 12 percent: very rapid permeability in substratum; may contaminate ground water.	Severe: very rapid permeability in substratum.	Moderate where slopes are 0 to 12 percent; severe where slopes are more than 12 percent; subject to sloughing.	Slight where slopes are 0 to 6 percent. Moderate where slopes are 6 to 12 percent. Severe where slopes are more than 12 percent.	Severe: very rapid permeability in substratum; little amelioration of leachate.	Slight where slopes are 0 to 6 percent. Moderate where slopes are 6 to 12 percent. Severe where slopes are more than 12 percent.
Rt	Moderate: moderately well drained; may contaminate ground water.	Severe: moderately well drained; moderate permeability.	Moderate: subject to liquefaction, piping, and frost heave; moderately well drained.	Moderate: moderate bearing capacity; subject to liquefaction, piping, and frost heave; moderately well drained.	Moderate: moderately well drained; moderate permeability; partial amelioration of leachate.	Moderate: moderately well drained; subject to frost heave.

properties of the soils—Continued

Suitability as a source of—			Soil features affecting—				
Road fill	Sand and gravel	Topsoil	Pond reservoir areas	Embankments, dikes, and levees	Drainage for crops and pasture	Irrigation	Terraces and diversions
Poor: poorly drained.	Fair: poorly graded to well-graded sand and gravel in substratum; poorly drained.	Good in surface layer. Fair in subsoil: sandy; low fertility; poorly drained.	Moderately rapid permeability throughout subsoil; very rapid permeability in substratum; poorly drained.	Moderate stability, fair compaction, and pervious in subsoil; poor compaction and very pervious in substratum.	Moderately rapid permeability in subsoil; very rapid permeability in substratum; poorly drained; surface or subsurface drainage feasible.	Low available water capacity; rapid water intake; poorly drained; nearly level.	Poorly drained; nearly level; practices generally not applicable.
Poor: poorly drained; lower substratum subject to liquefaction, piping, and frost heave.	Poor: thin area of poorly graded to well-graded sand and gravel in upper part of substratum.	Good in surface layer. Fair in subsoil: sandy; low fertility; poorly drained.	Moderately rapid permeability throughout subsoil; moderate permeability in lower part of substratum; poorly drained.	Moderate stability, fair compaction, and pervious in subsoil; low stability, poor compaction, and pervious in lower part of substratum.	Moderately rapid permeability in subsoil; moderate permeability in lower part of substratum; generally unstable; surface drainage feasible.	Low available water capacity; rapid water intake; poorly drained; nearly level.	Poorly drained; nearly level; practices generally not applicable.
Good where slopes are 0 to 12 percent. Fair where slopes are 12 to 20 percent. Severe where slopes are more than 20 percent.	Fair: well-graded to poorly graded sand and gravel in substratum.	Good in surface layer. Poor in subsoil: gravelly; low fertility.	Moderately rapid permeability throughout subsoil; very rapid permeability in substratum.	Moderate stability, fair to poor compaction, and pervious in subsoil; poor compaction and very pervious in substratum.	Natural drainage excessive.	Low available water capacity; rapid water intake; nearly level to very steep.	Moderately rapid permeability in subsoil; very rapid permeability in substratum; sand and gravel at a depth of 20 to 40 inches.
Fair in subsoil: moderate stability and bearing capacity. Poor in substratum: low stability; poor compaction; erodible; subject to frost heave.	Fair for sand: layers of poorly graded sand and silt in substratum. Poor for gravel: poorly graded sand and gravel in upper part of substratum; thin.	Good in surface layer. Fair in subsoil: low fertility; gravelly in places.	Moderately rapid permeability in upper part of substratum; moderate permeability in lower part of substratum; moderately well drained.	Moderate stability and fair compaction in subsoil; low stability, poor compaction, and semipervious in lower part of substratum.	Moderate permeability in lower part of substratum; moderately well drained; surface drainage feasible.	Medium available water capacity; medium water intake; moderately well drained; nearly level.	Moderate permeability; moderately well drained; nearly level.

TABLE 8.—*Interpretations of engineering*

Soil series and map symbols	Degree and kind of limitation for—					
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings with basements	Sanitary landfill (trench type)	Local roads and streets
Rosholt variant—Mapped only in complexes with Rosholt soils.	Severe: may contaminate ground water; very rapid permeability in substratum.	Severe: very rapid permeability in substratum.	Severe: slopes hinder excavation.	Severe: leveling exposes sand and gravel substratum; high bearing capacity; low compressibility; slopes hinder construction.	Severe: little amelioration of leachate.	Severe: slopes hinder construction.
Rozellville: RzB.	Moderate: moderately well drained and well drained; bedrock at a depth of 5 to 20 feet.	Moderate: bedrock restricts use in places; moderate permeability.	Moderate: bedrock at a depth of 5 to 20 feet; well drained and moderately well drained.	Moderate: bedrock at a depth of 5 to 20 feet; well drained to moderately well drained.	Slight	Slight: bedrock at a depth of 5 to 20 feet.
Seelyeville: Se.	Very severe: very poorly drained.	Very severe: organic material; very poorly drained.	Very severe: very poorly drained; high compressibility.	Very severe: very poorly drained; high compressibility.	Very severe: very poorly drained.	Severe: very poorly drained; organic material more than 51 inches thick.
Sherry: Sh.	Very severe: poorly drained.	Severe: moderately slow permeability; poorly drained.	Severe: poorly drained; moderate bearing capacity; wetness hinders excavation.	Severe: moderate bearing capacity; poorly drained; wetness hinders installation.	Very severe: poorly drained.	Severe: poorly drained; frost heave hazard; hauling and excavation difficult.
Vesper: Vs	Very severe: poorly drained.	Very severe: poorly drained; rapid permeability in substratum.	Severe: poorly drained; bedrock at a depth of 5 to 20 feet; wetness hinders excavation; subject to liquefaction.	Severe: poorly drained; high bearing capacity; subject to liquefaction and piping; wetness hinders installation.	Very severe: poorly drained.	Severe: poorly drained; bedrock at a depth of 5 to 20 feet; hauling and excavation difficult.

properties of the soils—Continued

Suitability as a source of—			Soil features affecting—				
Road fill	Sand and gravel	Topsoil	Pond reservoir areas	Embankments, dikes, and levees	Drainage for crops and pasture	Irrigation	Terraces and diversions
Fair where slopes are 12 to 20 percent. Severe where slopes are more than 20 percent.	Good	Poor in surface layer: thin; gravelly. Poor in subsoil: thin; gravelly or sandy.	Moderately rapid permeability throughout subsoil; very rapid permeability in substratum.	Moderate stability and fair compaction in subsoil; low stability, poor compaction, and very pervious in substratum.	Natural drainage excessive.	Low available water capacity; shallow to sand and gravel; rapid water intake; moderately steep to very steep.	Shallow to sand and gravel; moderately steep to very steep.
Fair: more than 30 percent fines; bedrock at a depth of 5 to 20 feet.	Unsuitable: no sand and gravel.	Good in surface layer. Fair in subsoil: low fertility.	Moderate permeability; well drained and moderately well drained; bedrock may restrict use.	High stability and good compaction; semipervious; bedrock at a depth of 5 to 20 feet.	Natural drainage adequate.	Medium available water capacity; medium water intake; gently sloping.	Moderate permeability; gently sloping; bedrock at a depth of 5 to 20 feet.
Unsuitable: organic material.	Unsuitable: no sand and gravel.	Poor: oxidizes rapidly; soil blowing hazard.	Moderately rapid permeability; very poorly drained; dugout ponds feasible.	Organic material unsuitable for embankment.	Moderately rapid permeability; very poorly drained; subsurface drainage feasible.	Very high available water capacity; very poorly drained; rapid water intake; nearly level.	Unsuitable material; practices generally not applicable.
Poor: poorly drained.	Unsuitable: no sand and gravel.	Good in surface layer. Fair in subsoil: low fertility.	Moderately slow permeability; poorly drained; dugout ponds feasible.	Moderate stability; fair compaction; semipervious.	Moderately slow permeability; poorly drained; surface drainage feasible.	High available water capacity; poorly drained; medium water intake; deep; nearly level.	Poorly drained; deep; nearly level.
Poor in subsoil: low bearing capacity in upper part; moderate bearing capacity in lower part. Fair in substratum: low stability unless confined; poorly drained.	Fair for sand: substratum is poorly graded sand. Unsuitable for gravel: no gravel; poorly drained.	Good in surface layer. Poor in subsoil: low fertility; sandy; poorly drained.	Moderate permeability throughout subsoil; rapid permeability in substratum; poorly drained; dugout ponds feasible.	Moderate stability and pervious in subsoil; low stability, very pervious, and poorly drained in substratum.	Moderate permeability throughout subsoil; rapid permeability in substratum; surface or subsurface drainage feasible; poorly drained.	Medium available water capacity; poorly drained; medium water intake; nearly level.	Poorly drained; nearly level; sand at a depth of 30 to 48 inches.

TABLE 8.—*Interpretations of engineering*

Soil series and map symbols	Degree and kind of limitation for—					
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings with basements	Sanitary landfill (trench type)	Local roads and streets
Wyocena: WyB, WyC, WyD, WyE.	Moderate where slopes are 2 to 12 percent; severe where slopes are more than 12 percent: moderately rapid permeability.	Severe: moderately rapid permeability in substratum; stony in places.	Slight where slopes are 2 to 6 percent; moderate where slopes are 6 to 12 percent; severe where slopes are more than 12 percent: stones hinder excavation in places.	Severe where slopes are 2 to 6 percent; moderate where slopes are 6 to 12 percent; severe where slopes are more than 12 percent: stones hinder installation in places.	Moderate: moderately rapid permeability; stony; partial amelioration of leachate.	Slight where slopes are 2 to 6 percent; moderate where slopes are 6 to 12 percent; severe where slopes are more than 12 percent: stony; erodible.

to be leveled, depth to bedrock becomes important. The soil properties that affect the embankment are the engineering properties of the embankment material as interpreted from the Unified soil classification and the amount of stones, if any, that influence the ease of excavation and compaction of the embankment material.

Shallow excavations are those that require digging or trenching to a depth of less than 6 feet, as for example, excavations for pipelines, sewerlines, phone and power transmission lines, open ditches, and cemeteries. Desirable soil properties are good workability, moderate resistance to sloughing, gentle slopes, absence of rock outcrops or big stones, and freedom from flooding and wetness.

Dwellings with basements are not more than three stories high and are supported by foundation footings placed in undisturbed soil. The features that affect the rating of a soil for dwellings are those that relate to capacity to support load and resist settlement under load, and those that relate to ease of excavation. Basements are affected by ease of excavation and soil drainage. Basements in very poorly drained, poorly drained, and somewhat poorly drained soils are generally wet unless precautions have been taken to remove the water or to waterproof the basement walls and floor. Soil properties that affect capacity to support load are wetness, susceptibility to flooding, density, plasticity, texture, and shrink-swell potential. Those that affect excavation are wetness, slope, depth to bedrock, and content of stones and rocks.

Sanitary landfill is a method of disposing of refuse in dug trenches. The waste is spread in thin layers, compacted, and covered with soil throughout the disposal period. Landfill areas are subject to heavy vehicular traffic. Some soil properties that affect suitability for landfill are ease of excavation, hazard of polluting ground water, and trafficability. The best soils have moderately slow permeability, withstand heavy traffic, and are friable and easy to excavate. Unless otherwise stated, the ratings in table 7 apply only to a depth of about 5 feet, and therefore limitation ratings of *slight* or *moderate* may not be valid if trenches are to be much deeper than that.

Local roads and streets, as rated in table 8, have an all-weather surface expected to carry automobile traffic all year. They have a subgrade of underlying soil material; a base consisting of gravel, crushed rock, or soil material stabilized with lime or cement; and a flexible or rigid surface, commonly of asphalt or concrete. These roads are graded to shed water and have ordinary provisions for drainage. They are built mainly from soil at hand, and most cuts and fills are less than 6 feet deep.

Soil properties that most affect design and construction of roads and streets are load supporting capacity and stability of the subgrade and the workability and quantity of available cut and fill material. The AASHTO and Unified classifications of the soil material, and also the shrink-swell potential, indicate traffic supporting capacity. Wetness and flooding affect stability of the material. Slope, depth to hard rock, content of stones and rocks, and wetness affect ease of excavation and amount of cut and fill needed to reach an even grade.

Road fill is soil material used in embankments for roads. The suitability ratings reflect (1) the predicted performance of soil after it has been placed in an embankment that has been properly compacted and provided with adequate drainage and (2) the relative ease of excavating the material at borrow areas.

Sand and gravel are used in great quantities in many kinds of construction. The ratings in table 8 provide guidance about where to look for probable sources. A soil rated as a *good* or *fair* source generally has a layer of sand or gravel at least 3 feet thick, the top of which is within a depth of 5 feet. The ratings do not take into account thickness of overburden, or other factors that affect mining of the materials.

Topsoil is used for topdressing an area where vegetation is to be established and maintained. Suitability is affected mainly by ease of working and spreading the soil material, as for preparing a seedbed, and the natural fertility of the material. Texture of the soil material and its content of stone fragments are char-

properties of the soils—Continued

Suitability as a source of—			Soil features affecting—				
Road fill	Sand and gravel	Topsoil	Pond reservoir areas	Embankments, dikes, and levees	Drainage for crops and pasture	Irrigation	Terraces and diversions
Good where slopes are 2 to 12 percent. Fair where slopes are 12 to 20 percent. Poor where slopes are more than 20 percent.	Poor: pockets of poorly graded sand and gravel that has fines.	Good in surface layer. Fair in subsoil: stony; low fertility.	Moderately rapid permeability.	Moderate stability and fair to poor compaction; pervious.	Natural drainage adequate.	Medium available water capacity; deep; medium water intake; gently sloping to steep.	Moderately rapid permeability; stony in places; gently sloping to steep.

acteristics that affect suitability, but also considered in the ratings is damage that will result at the area from which topsoil is taken.

Pond reservoir areas hold water behind a dam or embankment. Soils suitable for pond reservoir areas have low seepage, which is related to their permeability and depth to fractured or permeable bedrock or other permeable material.

Embankments, dikes, and levees require soil material resistant to seepage and piping and of favorable stability, shrink-swell potential, shear strength, and compactibility. Presence of stones or organic material in a soil are among factors that are unfavorable.

Drainage for crops and pasture is affected by such soil properties as permeability, texture, and structure; depth to rock or other layers that influence rate of water movement; depth to the water table; slope; stability in ditchbanks; susceptibility to stream overflow; and availability of outlets for drainage.

Irrigation of a soil is affected by such features as slope; susceptibility to stream overflow; water erosion or soil blowing; soil texture; content of stones; depth of root zone; rate of water intake at the surface; permeability of soil layers below the surface layer that restrict movement of water; amount of water held available to plants; and depth to water table or bedrock.

Terraces and diversions are embankments, or ridges, constructed across the slope to intercept runoff so that it flows slowly to a prepared outlet. Features that affect suitability of a soil for terraces are uniformity and steepness of slope; depth to bedrock or other unfavorable material; presence of stones; permeability; and resistance to water erosion, soil slipping, and soil blowing. A soil suitable for these structures provides outlets for runoff and is not difficult to vegetate.

Engineering test data

Table 9 contains engineering test data for some of the major soils in Portage County. These tests were made to help evaluate the soils for engineering purposes. The engineering classifications given are based on data obtained by mechanical analyses and by tests to determine liquid limits and plastic limits. The mechanical analyses were made by combined sieve and hydrometer methods.

Compaction (or moisture-density) data are important in earthwork. If a soil material is compacted at successively higher moisture content, assuming that the compactive effort remains constant, the density of the compacted material increases until the *optimum moisture content* is reached. After that, density decreases with increase in moisture content. The highest dry density obtained in the compactive test is termed *maximum dry density*. As a rule, maximum strength of earthwork is obtained if the soil is compacted to the maximum dry density.

Liquid limit and plasticity index indicate the effect of water on the strength and consistence of soil material. As the moisture content of a clayey soil is increased from a dry state, the material changes from a semisolid to a plastic state. If the moisture content is further increased, the material changes from a plastic to a liquid state. The plastic limit is the moisture content at which the soil material changes from the semisolid to plastic state; and the liquid limit, from a plastic to a liquid state. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which a soil material is plastic.

Woodland [6]

Forest cover in Portage County varies widely with the soils. In the northern part of the county, such northern hardwood trees as sugar maple, red oak, basswood, soft maple, elm, scattered white pine trees are on the Meadland, Rozellville, Dolph, Point, Dancy, Wyocena, and Rosholt soils. Such organic soils as Markey and Seelyeville soils support northern white cedar in the northwestern part of the county and a mixture of aspen, tamarack, and paper birch in other parts of the county.

[6] By GEORGE W. ALLEY, forester, Soil Conservation Service.

TABLE 9.—*Engineering*

[Tests performed by the State Highway Commission of Wisconsin, in cooperation with the Bureau of Public Roads, in accordance with test data for soil samples provided by the USDA, Soil Conservation

Soil name and location	Parent material	SCS report number	Depth	Moisture-density [1]		Mechanical analysis			
				Maximum dry density	Optimum moisture	Percentage passing sieve—			
						3 in	2 in	1½ in	1 in
			In	*Lb per cu ft*	*Pct*				
Billett sandy loam: SW¼SE¼ sec. 20, T. 23 N., R. 9 E. (Modal)	Loamy deposits over outwash.	S71-WI-49-3-1	23–31						
		S71-WI-49-3-2	36–60			100	99	96	92
Coloma loamy sand: SE¼SE¼ sec. 11, T. 21 N., R. 10 E. (Modal)	Glacial drift.	S71-WI-49-4-1	42–60						
		S71-WI-49-4-2	60–70						
Meadland loam: SE¼NE¼ sec. 30, T. 25 N., R. 6 E. (Modal)	Loamy deposits over loamy residuum from igneous bedrock.	S71-WI-49-1-1	15–23						
		S71-WI-49-1-2	29–60						
Meehan loamy sand: NW¼NW¼ sec. 14, T. 22 N., R. 7 E. (Modal)	Sandy deposits.	S71-WI-49-5-1	18–31						
		S71-WI-49-5-2	31–60						
Richford loamy fine sand: SW¼SE¼ sec. 21, T. 24 N., R. 9 E. (Modal)	Lacustrine deposits.	S71-WI-49-2-1	30–42						
		S71-WI-49-2-2	49–60	109.8	12.9				

[1] Based on AASHTO Designation T99–57, Method C (*1*).
[2] NP means nonplastic.

Large areas of Roscommon and Meehan soils, which are sandy and wet, are forested with aspen in the southwest part of Portage County. Well-drained and excessively drained sandy soils, such as Plainfield, Kranski, and Mecan soils, are forested with northern pin oak or pines, mostly jack pine and some red pine and white pine.

According to data compiled by the Forest Service, in 1968 about 31 percent of the county, or about 161,000 acres, was in commercial timber. Of this acreage, about 23,000 acres was in red, white, and jack pines, and the rest was in hardwoods.

A considerable acreage that was once farmed has been planted to native pine trees, mainly red, white, and jack pines, and to Scotch pine. These plantings aid in conserving soil and water, provide habitat for wildlife, and add esthetic qualities to the land. Many of these plantings are intended for use as Christmas trees, especially the Scotch pine plantings. These plantings have been most common on soils of the Plainfield, Friendship, Mecan, Meehan, and Wyocena series.

Woodland suitability groups

In table 10, the soils of Portage County have been placed in woodland suitability groups to assist owners in planning the use of the soils for wood crops. Each group is made up of soils that are suited to the same kinds of trees, that need about the same kind of management if the vegetation is similar, and that have about the same potential productivity. The soils in each woodland suitability group can be found by referring to the "Guide to Mapping Units" at the back of this report.

Each woodland group is identified by a three-part symbol, such as 2d1 or 3s1. The first part of the symbol, a number, indicates the woodland suitability class and the relative potential productivity of the soils. Number 1 indicates high productivity; 2, moderately high; 3, moderate; 4, moderately low; 5, low; and 6, unproductive.

The classes are based on growth potential expressed as site index, which is defined as the average height of dominant and codominant trees of a given species at 50 years of age. In table 10, the site indexes for some of the more important species on certain soils have been measured, and for others they have been estimated from measurements made on similar soils and species.

Site indexes used in this survey are based on recognized site index curves for red oak (*18*), jack pine (*7*), aspen (*8*), red maple (*6*), white pine (*10*), red pine

test data

with standard procedures of the American Association of State Highway and Transportation Officials (AASHTO) (*1*). Engineering Service. Absence of an entry indicates that no determination was made]

Mechanical analysis—Continued											Liquid limit	Plasticity index	USDA texture	Classification	
Percentage passing sieve—Continued							Percentage smaller than—							AASHTO	Unified
¾ in	⅜ in	No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 60 (0.25 mm)	No. 200 (0.074 mm)	0.05 mm	0.02 mm	0.005 mm	0.002 mm					
											Pct				
------	------	100	96	87	74	38	35	26	19	16	23.9	9.3	Sandy loam -----	A-4-(1)	SC
88	81	74	67	38	11	1	1	1	1	1	------	[2] NP	Sand and gravel.	A-1-b-(0)	SP
------	------	------	100	98	53	2	2	1	1	1	------	NP	Sand ----------	A-3-(0)	SP
------	------	------	100	85	31	2	1	1	1	1	------	NP	Sand ----------	A-3-(0)	SP
------	------	------	100	90	73	52	49	40	26	23	30.6	13.4	Sandy clay loam.	A-6-(5)	CL
------	------	------	100	87	82	70	65	51	30	21	37.2	12.7	Loam ----------	A-6-(8)	ML
------	------	------	100	88	40	9	8	7	4	3	------	NP	Medium sand ---	A-3-(0)	SM-SP
------	------	------	100	89	47	2	2	2	1	1	------	NP	Medium sand ---	A-3-(0)	SP
------	------	------	100	96	72	22	20	14	8	5	------	NP	Loamy sand ----	A-2-4-(0)	SM
------	------	------	100	95	65	5	5	4	3	2	------	NP	Fine sand ------	A-3-(0)	SP

(*11*), black oak (*18*), northern white cedar (*9*), and tamarack (*12*).

Annual yields for tree species were estimated from yield tables based on site indexes for upland oaks (*18*), jack pine (*4*), aspen (*13*), soft maples (*14*), white pine (*3*), and red pine (*5*). Northern white cedar and tamarack yields were estimated without benefit of reference tables.

The second part of the symbol that identifies a woodland group is a small letter. This letter indicates the subclass and an important soil property that imposes a slight to severe limitation in managing wood crops. Definitions of the subclasses follow:

Subclass w (excessive wetness).—Soils in which excessive water, either seasonal or yearlong, causes significant limitations for woodland use or management. These soils have restricted drainage, a high water table, or an overflow hazard which adversely affects stand development or management.

Subclass d (restricted rooting depth).—Soils that have limitations for woodland use or management because of a restricted rooting depth. Examples are soils that are shallow to hard rock, hardpan, or other restrictive layers.

Subclass c (clayey soils).—Soils that have limitations for woodland use or management because of the kind or amount of clay in the upper part of the soil profile.

Subclass s (sandy soils).—Dry sandy soils that have little or no textural B horizon and moderate or severe limitation for woodland use or management. These soils have equipment limitations, have low available water capacity, and normally are low in available plant nutrients.

Subclass f (fragmental or skeletal soils).—Soils that have limitations for woodland use or management because the profile contains many coarse fragments more than 2 millimeters and less than 10 inches in diameter, including flaggy soils.

Subclass r (relief or slope steepness).—Soils that have restrictions or limitations for woodland use or management because of steepness of slope.

Subclass o (slight or no limitations).—Soils that have no significant limitations for woodland use or management.

The third part of the symbol that identifies a woodland group indicates the degree of hazard or limitation to be considered in management.

The numerals 1, 2, and 3 involve slope factors and apply to subclasses *o*, *c*, *s*, *d*, *f*, and *r*.

The numeral *1* indicates that the slopes are less than 12 percent and, therefore, the erosion hazard and

TABLE 10.—*Productivity and limitations*

Woodland groups and map symbols	Potential productivity			
	Tree species	Average site index	Number of plots	Yearly growth per acre
				Board feet
Group 2o1: Af, KeA, RrA, RrB, RrC2, RsB, RsC2, Rt, RzB.	Northern red oak	70	1	250
	Red maple	74	1	130
Group 2r2: RuD, RuE	Northern red oak	65	(1)	220
Group 3w4: Da, LeA, MnA, MoA, MpA, Mr, RhA.	Jack pine	55	(1)	80
	Golden aspen	60	(1)	150
Group 3w5: Sh	Red maple	60	4	90
	Northern red oak	60	(1)	190
Group 3d1: MsB, NoB, NoC, PkB	Northern red oak	57	4	170
Group 3s1: CoB, CoC, FrA, PaA, PbB, PfA, PfB, PfC, PgB.	Eastern white pine	50	4	220
	Red pine	49	3	210
	Jack pine	59	7	90
	Northern red oak	53	2	150
Group 3s2: Ph	Jack pine	59	(1)	90
Group 3o1: Bt, DoA, DuB, DxA, KrB, KrC, MeA, MfB, MfC, MgB, MgC, Oe, Ov, PoA, RfA, RfB, RfC, RgB, WyB, WyC.	Northern red oak	55	(1)	160
Group 3r2: KrD, MfD, MgD, WyD, WyE	Northern red oak	55	(1)	160
Group 4w4: Rm, Rn, Ro, Rp	Golden aspen	50	(1)	80
Group 4w5: Ab	Red maple	50	(1)	70
Group 5w5: Vs	Red maple	45	(1)	60
Group 6s1: Mc, Rk. Unsuitable for forestry.				
Organic soils that may support forest growth: [2] Ca, Lu, Ma, Mb, Se.	Northern white cedar	35	3	50
	Tamarack	51	2	100

[1] Productivity estimated.

[2] These soils are so variable in their response to forest management that they are not included in the ordination system. In addition to the coniferous species listed above, these soils sometimes support stands of red maple, silver maple, American elm, white

equipment limitations are generally slight.

The numeral *2* indicates that the slopes are between 12 and 30 percent and, therefore, the erosion hazard and equipment limitations are moderate to severe, depending on the subclass involved.

The numeral *3* indicates that the slopes are more than 30 percent and, therefore, the erosion hazard and equipment limitations are severe.

The numerals *4*, *5*, and *6*, involve soil factors and apply only to subclass *w*.

The numeral *4* indicates deep sandy soils that are poorly drained or somewhat poorly drained.

The numeral *5* indicates soils that have a loamy or clayey subsoil and are poorly drained or somewhat poorly drained.

The numeral *6* indicates deep organic soils.

of the soils for woodland

Suitable species for reforestation	Management hazards or limitations		
	Equipment limitations	Erosion hazard	Seedling mortality
Eastern white pine, red pine, white spruce.	Slight	Slight	Slight.
Eastern white pine, red pine	Moderate	Moderate	Slight where slopes face north and east. Moderate where slopes face east and west.
Jack pine, poplar species	Slight	Slight	Moderate.
Eastern white pine, white spruce, black spruce.	Slight	Slight	Moderate.
Red pine, eastern white pine	Slight	Slight	Slight.
Red pine, eastern white pine, jack pine.	Slight	Slight	Slight.
Red pine, eastern white pine, jack pine.	Moderate	Moderate	Slight where slopes face north and east. Moderate where slopes face south and west.
Red pine, eastern white pine, jack pine.	Slight	Slight	Slight.
Red pine, eastern white pine, jack pine.	Moderate	Moderate	Slight where slopes face north and east. Moderate where slopes face south and west.
Poplar species, jack pine	Slight	Slight	Moderate.
Red maple, silver maple, white ash, green ash, poplar species.	Slight	Slight	Moderate.
Poplar species, willows	Severe	Slight	Severe.
Unsuitable for planting	Severe	Slight	Severe.

ash, quaking aspen, and other water-tolerant broad-leaved species. Growth of these species is extremely variable on these organic soils.

The hazards of limitations that affect management of soils for woodland in Portage County are equipment limitations, erosion hazard, and seedling mortality. Table 10 gives a rating for these hazards or limitations for each woodland suitability group. These ratings are *slight, moderate,* or *severe.*

Equipment limitations are rated on the basis of soil characteristics that restrict or prohibit the use of equipment commonly used in tending and harvesting the trees. In Portage County, soil factors that have the most limiting effect are excessive wetness, slope, and texture of the surface layer. *Slight* means there is no restriction in the kind of equipment or in the time of year it is used; *moderate* means that use of equipment is restricted for less than 3 months of the year; and *severe* means that special equipment is needed and its use is restricted for more than 3 months of the year.

Erosion hazard refers to the potential hazard of soil

losses in woodland. The hazard is *slight* if expected soil losses are small; *moderate* if some soil losses are expected and care is needed during logging and construction to reduce soil losses; and *severe* if special methods of operation are needed to prevent excessive soil losses.

Seedling mortality refers to the expected degree of mortality of planted seedlings as influenced by kinds of soil. Considered in the ratings are excessive wetness, hazard of flooding, slope and aspect, texture, structure, and plant competition. Normal rainfall, good planting stock, and proper planting are assumed. A rating of *slight* indicates an expected loss of less than 25 percent of the planted seedlings; *moderate*, a loss of 25 to 50 percent; and *severe*, a loss of more than 50 percent.

Landscaping and windbreaks

This section gives information about some of the trees, shrubs, and vines used in landscaping sites for homes, schools, industry, and recreation areas. In addition, it provides information on species suitable for use in windbreaks around farmsteads or open fields.

A significant acreage in Portage County is subject to soil blowing. Soils of the Billett, Coloma, Friendship, Plainfield, and Richford series need protecting by windbreaks and by careful cropping to hold down soil losses by blowing. Portage County farmers have been planting tree windbreaks, generally of native pines, since the 1930's.

Growth of trees in windbreaks has been measured on several of the more important soils in Wisconsin, including Plainfield and Billett soils. On these and similar soils, white pine and red pine can be expected to be about 30 feet tall at 20 years of age. Jack pine at 20 years of age is about 25 feet tall.[7]

Trees and shrubs of different species vary widely in suitability to different soils and to the site conditions. The soils in the county have been placed in four tree and shrub groups, mainly on the basis of the degree and length of time that soil is saturated with water and on the available water capacity.

Each of the soils in a specific group has similar suitability for tree, shrub, and vine plantings. The soils in a tree and shrub group can be identified by referring to the "Guide to Mapping Units" at the back of this survey.

Table 11 lists trees suitable for specified uses on soils in the four tree and shrub groupings. Table 12 gives the uses, growth characteristics, and esthetic value of shrubs and vines by tree and shrub planting group. Plants listed in the tables are only a partial list of the plants suited to soils in the county. Many of the plants serve a dual purpose of landscaping and of providing food and cover for wildlife.

Formation and Classification of Soils

This section tells how the factors of soil formation have affected the development of the soils in Portage County. It also explains the system of soil classification currently used and places each soil series in some of the classes of that system.

[7] Windbreak-Soil Site Study, Soil Conservation Service, Madison, Wis., 1972. [Unpublished].

Factors of Soil Formation

Soils are formed by weathering and other processes that act on the parent material. There are five major factors that interact to determine the characteristics of soils. They are (1) parent material, (2) climate, (3) living organisms, (4) relief, and (5) time. The active forces are climate and living organisms. Climate, and its effect on soils and living organisms, is modified by the characteristics of the parent material and by relief. Relief, in turn, strongly influences drainage, aeration, runoff, erosion, and exposure of the soil surface to sun and wind.

Parent material

The Wisconsin glacier was the source of a large part of the parent material for the soils of Portage County (*16*). The advances of the glacier stopped along the eastern part of the county. This resulted in a terminal moraine in that area, east of which lies a series of recessional moraines and pitted outwash plains. The melt water of the glacier produced an outwash plain to the west of the terminal moraine. The southwestern part of the county is a sand plain that was once covered by Glacial Lake Wisconsin. The northwestern part of the county was unaffected by the Wisconsin glacier and is part of the driftless area of Wisconsin.

The morainic area has glacial till and outwash parent material. The till is loamy sand and sandy loam. Large stones are common on the surface. Wyocena soils are examples of soils that formed in glacial till. The outwash is sand and gravel and has many cobbles and a few stones. Rosholt soils are examples of soils that formed in the outwash within the moraine. The outwash plain west of the moraine has sand and gravel parent material. Richford soils are examples of soils that formed in this outwash material.

The sand plain in the southwestern part of the county has sand parent material. This area is characterized by high ground water. As a result the soils are mottled and gleyed. Meehan soils are examples of soils that formed in the sand.

The driftless area has residual parent material, which has weathered from shale, sandstone, and igneous bedrock. Sandy and loamy deposits cover the residual material in most of this area. Dolph soils are examples of soils that formed in loamy deposits and clayey residuum. There are two types of sandstone in the county, cemented and consolidated. Norgo variant soils are examples of soils that formed in loamy deposits and sandy residuum from cemented sandstone. Plainbo soils are examples of soils that formed in sandy residuum from consolidated sandstone. The igneous bedrock weathered into a loamy residuum and is overlain by sandy and loamy deposits. Rockers soils are examples of soils that formed in sandy deposits and loamy igneous residuum. Meadland soils are examples of soils that formed in loamy deposits and loamy igneous residuum.

Two other types of parent material are in Portage County: alluvium and organic-matter deposits.

The alluvium materials have been deposited on river terraces, flood plains, and islands mainly along the Wisconsin River. The materials are generally sandy and loamy. Dunnville soils are examples of soils that

formed in loamy alluvium on river terraces and islands. On the flood plains, soil materials are of mixed origin and texture. They have not been subjected to soil-forming processes, because deposition by floods is a continuing process.

The organic-matter deposits occur in depressional areas and drainageways throughout the county. These deposits largely consist of sedges and grasses in various stages of decomposition, from peat to muck. A few consist of woody material. Depth of the organic deposits ranges from 16 inches to more than 51 inches. Sandy or loamy materials, or both, are below the organic deposits. The Markey soils are examples of soils that formed in 16 to 51 inches of organic material over sand.

Climate

In general, climate affects soil formation through the moisture and heat it contributes to an environment. It has a direct effect on the weathering of rocks and the alteration of parent material through the mechanical action of freezing and thawing. Also, the leaching by water affects the formation and movement of clay in soils. Climate has an indirect effect through its influence on plant and animal life.

Portage County has a humid, temperate, continental climate. The county is in a zone of transition for soil classification. The area east of the moraine generally averages 45° to 46° F. West of the moraine, the temperature averages 43° to 45°. This difference in temperature affects the degree of soil weathering in each area. The soils in the cooler area are more weathered than those in the warmer area.

Living organisms

Vegetation has been the most important of the living organisms in influencing soil formation in Portage County. This county is in a transitional zone between the southern hardwoods and the pine, hemlock, maple, and yellow birch forests of the north. All of the mineral soils in Portage County developed under forest vegetation.

Marsh vegetation made up about 10 to 15 percent of the plant cover of the county. Most of the organic soils formed under such marsh vegetation as sedges and grasses. In the northeastern part of the county the organic soils formed under woody vegetation.

Man's activities have had an important influence on the soils. The original nature of some soils has been changed by clearing, burning, and cultivating. The sand plain area that has a high water table in southwestern Portage County is one area that has been greatly influenced by man. Drainage ditches have been dug throughout the area, resulting in a lowering of the natural water table by several feet.

Relief

Relief influences soil formation by its effect on drainage, runoff, and erosion.

The eastern part of the county is a glacial moraine area that is dissected by drainageways and depressions. The soils in this area are nearly level to very steep. They are generally well drained, but in the drainageways and depressions they are somewhat poorly drained or very poorly drained. Organic soils have formed in many of the depressions and drainageways. The soils on the slopes are subject to water erosion, resulting in the formation of shallower soils than in the nonsloping areas. Runoff is medium to rapid.

The soils on the outwash plain are nearly level to sloping. They are generally well drained, except in drainageways and depressions.

The soils on the sand plain also are nearly level to sloping. These soils are characterized by a high water table. Drainage ranges from excessive at the highest elevations to very poor at the lowest elevations. Many depressional areas are filled with organic deposits. Soil blowing is a serious hazard in this area. Runoff is slow.

The relief of the northwestern part of the county is generally controlled by the bedrock. The soils in this area are generally nearly level to gently sloping, but in a few areas they are sloping. The nearly level soils are somewhat poorly drained or poorly drained. The gently sloping soils are well drained or moderately well drained. The few areas of sloping soils are well drained and are subject to water erosion.

Time

Time is required by the active agents of soil formation to form soils from parent material. Most of the soils in Portage County have formed since the time of the Wisconsin glaciation. The glacial drift areas have been exposed to soil-forming factors long enough to allow distinct horizons to develop within the profile. The northwestern part of the county was unaffected by the Wisconsin glaciation. It has been subject to a longer period of soil formation. This is evidenced by the depth to which the bedrock has weathered, in places as deep as 20 feet. The soils that have least development are the alluvial soils, because of the recent depositions of alluvium.

Classification of the Soils

Soils are classified so that we can more easily remember their significant characteristics. Classification enables us to assemble knowledge about the soils, to see their relationship to one another and to the whole environment, and to develop principles that help us to understand their behavior and their response to manipulation. First through classification, and then through use of soil maps, we can apply our knowledge of soils to specific fields and other tracts of land.

The narrow categories of classification, such as those used in detailed soil surveys, allow us to organize and apply knowledge about soils in managing farms, fields, and woodlands; in developing rural areas; in engineering work; and in many other ways. Soils are placed in broad classes to facilitate study and comparison in large areas such as countries and continents.

The system of soil classification currently used was adopted by the National Cooperative Soil Survey in 1965 (*21*). Because this system is under continual study, readers interested in developments of the current system should search the latest literature available (*19*).

The current system of classification has six categories. Beginning with the broadest, these categories are the order, the suborder, the great group, the subgroup, the family, and the series. In this system

TABLE 11.—*Tree*

[The letters in parentheses following each species indicate the general height and shape of that species at maturity. The first letter oval; P, pyramidal; Pe,

Tree and shrub groups and map symbols	Shade trees		Street trees	
	Sunny sites	Partial shade	Sunny sites	Partial shade
Group 1: Moderately deep and deep, moderately well drained or well drained, medium-textured soils that have high available water capacity. BtB, DuB, MfB, MfC, MfD, MgB, MgC, MgD, RrA, RrB, RrC2, RsB, RsC2, RtB, RuD, RuE, RzB, WyB, WyC, WyD, WyE.	American beech (LO) Sugar maple (LO) Red maple (MO) Red oak (LR) White oak (LR) Basswood (LO) Hackberry (MR) White ash (LO) Sycamore (LO) Bur oak (LR) Norway maple (MR) Silver maple (LO) Thornless honeylocust (MO)	American beech (LO) Sugar maple (LO) Red maple (MO) Red oak (LR) Hackberry (MR) White ash (LO) Basswood (LO)	Norway maple (MR) Southern pin oak (MP) Thornless honeylocust (MO) Basswood (LO) White ash (LO) Sugar maple (LO) Hackberry (MR) Red maple (MO)	Norway maple (MP) White ash (LO) Basswood (LO) Sugar maple (LO)
Group 2: Somewhat excessively drained and excessively drained, coarse-textured or shallow soils that have low available water capacity. CoB, CoC, FrA, KrB, KrC, KrD, MsB, NoB, NoC, PaA, PbB, PfA, PfB, PfC, PgB, Ph, PkB, RfA, RfB, RfC, RgB, Rk.	Bur oak (LR) Hackberry (MR) Black oak (LR) Silver maple (LO) Green ash (MO) Thornless honeylocust (MO)	Hackberry (MR)	Green ash (MO) White ash (LO) Hackberry (MR) Thornless honeylocust (MO)	Hackberry (MR)
Group 3: Somewhat poorly drained and poorly drained mineral soils and land types. Ab, Af, Da, DoA, DxA, KeA, LeA, MeA, MnA, MoA, MpA, Mr, Oe, Ov, PoA, RhA, Rm, Rn, Ro, Rp, Sh, Vs.	Swamp white oak (LR) Hackberry (MR) Red maple (MO) Basswood (LO) Green ash (MO) White ash (LO) Silver maple (LO) Cottonwood (LO)	Swamp white oak (LR) Hackberry (MR) Red maple (MO) Basswood (LO) Green ash (MO) White ash (LO)	Green ash (MO) Basswood (LO) Red maple (MO)	Green ash (MO) Basswood (LO) Red maple (MO)
Group 4: Very poorly drained organic soils. Ca, Lu, Ma, Mb, Mc, Se.	Silver maple (LO) Red maple (MO)	Red maple (MO)	Red maple (MO) Laurel willow (MO)	None

the criteria used as a basis for classification are soil properties that are observable and measurable. The properties are chosen, however, so that the soils of similar genesis, or mode of origin, are grouped. The same property or subdivisions of this property may be used in several different categories. In table 13, the soil series of Portage County are placed in four categories of the current system. Classes of the current system are briefly defined in the following paragraphs.

ORDER: Ten soil orders are recognized. The properties used to differentiate among soil orders are those that tend to give broad climatic groupings of soils. Three exceptions to this are the Entisols, Histosols, and Vertisols which occur in many different climates. Each order is named with a word of three or four syllables ending in *sol* (Moll-i-sol).

SUBORDER: Each order is divided into suborders using those soil characteristics that seem to produce classes with the greatest genetic similarity. The suborders are more narrowly defined than are the orders. The soil properties used to separate suborders are mainly those that reflect either the presence or absence of a water table at a shallow depth, soil climate, the accumulation of clay, iron, or organic carbon in the

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indicates height: S, less than 30 feet; M, 30 to 60 feet; L, more than 60 feet. The second letter indicates shape: C, columnar; O, pendulous; R, round]

Lawn trees		Hedges and screens		Windbreaks	
Sunny sites	Partial shade	Sunny sites	Partial shade	Sunny sites	Partial shade
Flowering crab (SR) Mountain ash (SO) Blue beech (SR) Paper birch (MO) River birch (MO) Russian-olive (SR) Southern pin oak (MP) Serviceberry (SR) Horse chestnut (LR) Norway spruce (LP) Red pine (LP) White pine (LP) White spruce (MP) Black cherry (LO) Blue spruce (LP) Norway spruce (LP) Hawthorn (SR)	Blue beech (SP) Serviceberry (SR) White pine (LP) White spruce (MP) Blue spruce (LP) Norway spruce (LP)	Redcedar (SP) White cedar (MC, P) White pine (LP) White spruce (MP) Lombardy poplar (LC) Russian-olive (SR) Upright yew (SP)	White cedar (MC) White pine (LP) White spruce (MP) Upright yew (SP)	White spruce (MP) White cedar (MC, P) White pine (LP) Red pine (LP) Norway spruce (LP)	White cedar (MC, P) White pine (LP) White spruce (MP)
Flowering crab (SR) Paper birch (MO) Redcedar (SP) White pine (LP) White spruce (MP) Red pine (LP) Russian-olive (SR)	White pine (LP) White spruce (MP)	Redcedar (SP) Russian-olive (SR) Red pine (LP) White pine (LP) Upright yew (SP) White spruce (MP)	Upright yew (SP) White pine (LP) White spruce (MP)	Red pine (LP) White pine (LP) Redcedar (SP)	White pine (LP)
White spruce (MP) Paper birch (MO) Mountain ash (SO) Weeping willow (MPe) White cedar (MP) River birch (MO)	White spruce (MP) Mountain ash (SO)	White cedar (MC) White spruce (MP) Lombardy poplar (LC) Laurel willow (MO)	White cedar (MC) White spruce (MP)	White cedar (MC) White spruce (MP) White pine (LP)	White cedar (MC) White spruce (MP)
White cedar (MC) White spruce (MP) Weeping willow (MPe)	White cedar (MC) White spruce (MP)	White cedar (MC) Laurel willow (MO)	White cedar (MC)	Laurel willow (MO) Poplar selections (LP) Tree lilac (SO) White cedar (MC)	White cedar (MC)

upper part of the solum, cracking of soils caused by a decrease in soil moisture, and fine stratification. The names of suborders have two syllables. The last syllable indicates the order. An example is *Aquoll* (*Aqu*, meaning water or wet, and *oll*, from Mollisol).

GREAT GROUP: Soil suborders are separated into great groups on the basis of uniformity in the kinds and sequence of soil horizons and features. The horizons used to make separations are those in which clay, carbonates, and other constituents have accumulated or have been removed; and those that have pans that interfere with growth of roots, movement of water, or both. Some features used are soil acidity, soil climate, soil composition, and soil color. The names of great groups have three or four syllables and are made by adding a prefix to the name of the suborder. An example is Haplaquoll (*Hapl*, meaning simple horizons, *aqu* for wetness or water, and *oll*, from Mollisols).

SUBGROUP: Great groups are divided into subgroups, one representing the central (typic) segment of the group, and others called intergrades that have properties of the group and also one or more properties of another great group, suborder, or order. Other subgroups may have soil properties unlike those of any

TABLE 12.—*Shrub and*

Common name	Botanical name	Shrub and vine group	Uses			
			Landscaping	Hedges, screens, windbreaks	Roadside planting	Ground cover
Arborvitae (shrub types)	*Thuja* species	1,2,3,4	Yes	Yes	No	No
Barberry, Japanese	*Berberis thunbergi*	1,2	Yes	Yes	No	No
Bayberry (waxmyrtle)	*Myrica pensylvanica*	2,3	Yes	No	No	Yes
Bittersweet	*Celastrus scandens*	1,2	Yes	No	Yes	Yes
Blackberry, dewberry, blackcap raspberry.	*Rubus* species	1,2	No	No	Yes	Yes
Chokeberry, black	*Aronia melanocarpa*	1,3	Yes	No	Yes	Yes
Cotoneaster	*Cotoneaster* species	1,2	Yes	Yes	No	No
Crabapple	*Malus* species	1,2	Yes	Yes	Yes	No
Currant, alpine	*Ribes alpinum*	1,2	Yes	Yes	No	No
Dogwood, gray	*Cornus racemosa*	1,2,3	No	No	Yes	No
Dogwood, pagoda	*Cornus alternifolia*	1,3	No	No	Yes	No
Dogwood, red-osier	*Cornus stolonifera*	1,3,4	Yes	No	No	No
Dogwood, roundleaf	*Cornus rugosa*	1,3,4	No	No	Yes	Yes
Dogwood, silty	*Cornus amomum*	1,3,4	No	Yes	Yes	No
Elder, American	*Sambucus canadensis*	1,3,4	No	No	Yes	No
Filbert (hazelnut)	*Corylus americana*	1,2	No	No	Yes	No
Forsythia	*Forsythia* species	1,2	Yes	No	No	No
Grape	*Vitis* species	2	No	No	Yes	Yes
Grape, wild	*Vitis* species	1	No	No	Yes	Yes
Hawthorne (thornapple)	*Crataegus* species	1,2,3	Yes	No	Yes	No
Honeysuckle (shrub types)	*Lonicera* species	1,2,3,4	Yes	Yes	No	No
Juniper, creeping	*Juniperus horizontalis*	1,2	Yes	No	Yes	Yes
Juniper, Pfitzer	*J. chinensis pfitzeriana*	1,2	Yes	No	No	No
Lilac	*Syringa* species	1,2	Yes	Yes	Yes	No
Maple, Amur	*Acer ginnala*	1,2	Yes	Yes	No	No
Mockorange	*Philadelphus* species	1	Yes	Yes	No	No
Mockorange variety	*Philadelphus* species	2	Yes	Yes	No	No
Myrtle (periwinkle)	*Vinca minor*	1,2	Yes	No	Yes	Yes
Ninebark, common	*Physocarpus opulifolius.*	1,2,3,4	Yes	Yes	Yes	No
Olive, autumn	*Elaeagnus umbellata*	2,3	Yes	Yes	No	No
Peashrub, Siberian	*Caragana arborescens*	2	Yes	Yes	Yes	No
Pine, mugho	*Pinus mugo mughus*	2	Yes	No	No	No
Plum, American	*Prunus americana*	2,3	No	Yes	Yes	No
Russian-olive	*Elaeagnus angustifolia.*	3	Yes	Yes	No	No
Spirea, narrowleaf meadowsweet.	*Spiraea alba*	3,4	No	No	Yes	No
Spirea, Vanhoutte	*Spiraea vanhouttei*	3	Yes	Yes	No	No
Viburnum, American cranberrybush.	*Viburnum trilobum*	3,4	Yes	Yes	Yes	No
Viburnum, mapleleaf	*Viburnum acerifolium*	3,4	No	No	Yes	No
Viburnum, nannyberry	*Viburnum lentago*	3,4	No	Yes	Yes	No
Viburnum, wayfaringtree	*Viburnum lantana*	3,4	No	Yes	Yes	No
Willows (shrubby types including pussywillows).	*Salix* species	3,4	No	Yes	Yes	No
Winterberry, common	*Ilex verticillata*	3,4	No	No	Yes	No

other great group, suborder, or order. The names of subgroups are derived by placing one or more adjectives before the name of the great group. An example is Typic Haplaquolls (a typical Haplaquoll).

FAMILY: Soil families are separated within a subgroup primarily on the basis of properties important to the growth of plants or to the behavior of soils when used for engineering. Among the soil properties considered are texture, mineralogy, reaction, temperature, permeability, depth, and consistence. A family name consists of a series of adjectives preceding the subgroup name. The adjectives are the class names for texture, mineralogy, and so on, that are used as family differentiae (see table 13). An example is the coarse-loamy, mixed, frigid family of Typic Haplaquolls.

General Nature of the County

This section provides general information about Portage County. It discusses climate, early settlement and development, farming, and other subjects of general interest.

vine planting guide

Growth characteristics					Esthetic value		
Height	Type of plant	Shade tolerant	Thorns	Thicket forming	Flowers	Fruit or berries	Leaves color in fall
Ft							
3–7	Shrub	Yes	No	No	No	No	Yes
6	Shrub	Yes	Yes	No	No	Yes	Yes
5–9	Shrub	Yes	No	No	No	Yes	Yes
Climbs	Vine	Yes	No	No	No	Yes	Yes
1–5	Bramble	No	Yes	Yes	Yes	Yes	Yes
1–3	Shrub	Yes	No	Yes	No	Yes	Yes
4–8	Shrub	No	No	No	No	Yes	Yes
Up to 25	Shrub	No	No	No	Yes	Yes	Yes
6–7	Foliage shrub	Yes	No	No	Yes	No	No
6–10	Shrub	Yes	No	No	Yes	Yes	Yes
10–15	Shrub	Yes	No	No	Yes	Yes	Yes
3–9	Shrub	Yes	No	Yes	Yes	Yes	Yes
3–9	Shrub	Yes	No	No	Yes	Yes	Yes
6–10	Shrub	Yes	No	No	Yes	Yes	Yes
3–10	Shrub	No	No	Yes	Yes	Yes	No
5–8	Shrub	Yes	No	Yes	No	Yes	Yes
4–8	Shrub	Yes	No	No	Yes	No	No
Climbs	Vine	Yes	No	No	No	Yes	Yes
Climbs	Vine	Yes	No	No	No	Yes	Yes
5–20	Shrub	Yes	Yes	No	No	Yes	Yes
6–12	Shrub	Yes	No	No	Yes	Yes	Yes
1–2	Shrub	No	To touch	No	No	Yes	Yes
8–10	Shrub	No	No	No	No	No	Yes
8–10	Shrub	No	No	Yes	Yes	No	No
15+	Tall shrub	No	No	No	No	No	Yes
6–9	Shrub	No	No	No	Yes	No	No
6–9	Shrub	No	No	No	Yes	No	No
1	Short vine	Yes	No	Forms mat	Yes	No	No
6–9	Shrub	Yes	No	Yes	Yes	No	Yes
10–15	Shrub	Yes	No	No	No	Yes	Yes
10–15	Shrub	No	No	No	No	Yes	Yes
6–9	Shrub	No	No	No	No	No	Yes
10–15	Shrub	Yes	Yes	Yes	Yes	Yes	Yes
15+	Shrub	No	Yes	No	No	Yes	Yes
3–4	Shrub	No	No	No	Yes	No	Yes
5–6	Shrub	Yes	No	No	Yes	No	Yes
7–9	Shrub	Yes	No	No	Yes	Yes	Yes
3–5	Shrub	Yes	No	No	Yes	Yes	Yes
9–12	Shrub	Yes	No	No	Yes	Yes	Yes
8–10	Shrub	Yes	No	No	Yes	Yes	Yes
2–8	Shrub	No	No	No	No	No	No
6–9	Shrub	Yes	No	No	No	Yes	Yes

Climate[8]

The climate of Portage County is continental and is characterized by marked changes in weather common to locations in the interior of large land masses of the middle latitudes. The length of a day varies from about 15½ hours late in June to 9 hours late in December.

Winters are cold and snowy; summers are generally warm and have periods that are hot and humid. Spring and fall are sometimes short and are often a mixture of summer and winter climatic conditions. Weather changes can be expected every few days in winter and in spring. Climatological information in this section is based on observations taken at Stevens Point and should be fairly representative of the entire county. Table 14 provides average temperature and precipitation data, and table 15 gives the probability for the occurrence of specified temperatures in spring and in fall.

During the period of record the extreme highest temperature has been 108° F and the lowest −38°. The number of days with temperatures of 90° and higher

[8] HANS E. ROSENDAL, climatologist for Wisconsin, National Weather Service, U.S. Department of Commerce.

TABLE 13.—*Classification of soil series*

Series	Family	Subgroup	Order
Altdorf	Fine, mixed, frigid	Aeric Glossaqualfs	Alfisols.
Billett	Coarse, loamy, mixed, mesic	Mollic Hapludalfs	Alfisols.
Cathro	Loamy, mixed, euic	Terric Borosaprists	Histosols.
Coloma	Mixed, mesic	Alfic Udipsamments	Entisols.
Dancy	Fine-loamy, mixed, frigid	Aeric Glossaqualfs	Alfisols.
Dolph	Fine, mixed	Aquic Glossoboralfs	Alfisols.
Dunnville	Coarse-loamy, mixed	Udic Haploborolls	Mollisols.
Dunnville variant	Coarse-loamy, mixed	Aquic Haploborolls	Mollisols.
Friendship	Mixed, frigid	Typic Udipsamments	Entisols.
Kert	Fine-loamy, mixed	Aquic Glossoboralfs	Alfisols.
Kranski	Sandy, mixed, mesic	Typic Hapludalfs	Alfisols.
Leola	Sandy, mixed, mesic	Arenic Ochraqualfs	Alfisols.
Lupton	Euic	Typic Borosaprists	Histosols.
Markey	Sandy or sandy-skeletal, mixed, euic	Terric Borosaprists	Histosols.
Meadland	Fine-loamy, mixed	Aquic Glossoboralfs	Alfisols.
Mecan	Coarse-loamy, mixed, mesic	Typic Hapludalfs	Alfisols.
Meehan	Mixed, frigid [1]	Aquic Udipsamments	Entisols.
Meehan variant	Sandy, mixed, frigid	Aquic Udorthents	Entisols.
Mosinee	Coarse-loamy, mixed, frigid	Typic Dystrochrepts	Inceptisols.
Norgo variant	Coarse-loamy, mixed	Typic Glossoboralfs	Alfisols.
Oesterle	Coarse-loamy, mixed	Aquic Glossoboralfs	Alfisols.
Oesterle variant	Coarse-loamy, mixed	Aquic Glossoboralfs	Alfisols.
Pearl	Sandy, mixed, mesic	Arenic Hapludalfs	Alfisols.
Plainbo	Mixed, frigid	Typic Udipsamments	Entisols.
Plainfield	Mixed, mesic [2]	Typic Udipsamments	Entisols.
Plainfield variant	Sandy-skeletal, mixed, frigid	Typic Udorthents	Entisols.
Point	Fine-loamy, mixed	Aquic Glossoboralfs	Alfisols.
Richford	Sandy, mixed, mesic	Arenic Hapludalfs	Alfisols.
Rockers	Coarse-loamy, mixed, frigid	Aqualfic Haplorthods	Spodosols.
Roscommon	Mixed, frigid	Mollic Psammaquents	Entisols.
Roscommon variant	Coarse-loamy, mixed, frigid	Typic Haplaquolls	Mollisols.
Rosholt	Coarse-loamy, mixed	Typic Glossoboralfs	Alfisols.
Rosholt variant	Mixed, frigid	Typic Udipsamments	Entisols.
Rozellville	Fine-loamy, mixed	Typic Glossoboralfs	Alfisols.
Seelyeville	Euic	Typic Borosaprists	Histosols.
Sherry	Fine-loamy, mixed, frigid	Udollic Ochraqualfs	Alfisols.
Vesper	Fine-loamy, mixed, acid, frigid	Humic Haplaquepts	Inceptisols.
Wyocena	Coarse-loamy, mixed, mesic	Typic Hapludalfs	Alfisols.

[1] The red surface phase of the Meehan series in Portage County is a taxadjunct to the series because it has a surface layer of sandy loam. This layer is quite thin and only very slightly affects the use and management of this phase as compared with the use and management of the other Meehan soils.

[2] This soil is a taxadjunct in Portage County because it is several degrees cooler than is typical for the series. This slight difference in temperature does not affect use and management.

has averaged 11 per year, ranging from 40 days in 1937 to 0 in 1962. The average annual number of days with temperatures of 0° or below is 31, ranging from 49 days in 1963 to 6 in 1931.

Precipitation ordinarily is adequate for the farming needs of the county. About 60 percent of the annual amount falls in the period May through September. Since records were begun in 1893, only the months of December 1913 and December 1943 have been without a measurable amount of precipitation. Of the summer months, June is the wettest and the end of August the driest. The likelihood of 1 inch or more of rain in a 7-day period in June is about 2 years in 5 and for August 23 to 29 is only 1 year in 5. Intensities of about 1.25 inches in 1 hour, 1.95 inches in 6 hours, and 2.70 inches in 24 hours can be expected about once in 2 years. The greatest amount of rain in 24 hours was 5.01 inches on August 18, 1947. Annual snowfall has varied from 9 inches in 1958 to 85 inches in 1945.

The number of days in which thunderstorms occur averages 32 per year, ranging from 20 to 45 days. Hail falls on an average of 2 days per year; the number of days hail falls ranges from 0 to as many as 8 days.

In table 15, freeze data are calculated for Stevens Point. The average date of the last 32° freeze in spring is May 11, and the first in fall is October 1. Minimum temperatures may vary considerably across the county on calm, clear nights, depending on such physical characteristics as the relief and kinds of soil. Valley land is generally several degrees cooler than land on higher elevation. The growing season, the number of days between the last 32° freeze in spring and first in fall, averages 142 days.

Wind, sunshine, and humidity records are not available for the Stevens Point station, but the following information on wind and sunshine from records at Wausau in Marathon County and on relative humidity from records at Madison in Dane County should be similar to that for Portage County.

River flooding is not a major problem in Portage County. The power dams on the Wisconsin River and its tributaries act to give limited flood control at Ste-

TABLE 14.—*Temperature and precipitation data*

[Data from Stevens Point]

Month	Temperature				Precipitation				
	Average daily maximum	Average daily minimum	Average monthly high	Average monthly low	Average monthly	One year in 10 will have—		Days with snow cover 1 inch or more	Average depth of snow on days with snow cover
						Less than—	More than—		
	°F	°F	°F	°F	Inches	Inches	Inches		Inches
January	25	7	41	−22	1.4	0.4	2.0	27	6.9
February	28	8	43	−14	1.3	.3	2.0	25	8.9
March	39	19	59	− 4	1.8	.7	2.9	19	8.0
April	56	33	76	18	2.7	1.5	4.1	4	2.4
May	70	45	85	28	3.7	1.8	5.7	(1)	(2)
June	80	55	89	38	4.7	2.4	6.4	0	0
July	85	60	90	44	3.1	1.8	4.9	0	0
August	83	58	91	42	3.6	1.9	5.4	0	0
September	74	49	87	29	3.6	1.3	6.9	0	0
October	61	39	78	21	2.2	.6	4.3	(1)	(2)
November	42	25	62	4	2.2	.7	3.9	6	3.0
December	29	13	45	−13	1.3	.4	2.0	20	4.5
Year	56	34	[3] 93	[4] −24	31.6	24.5	42.0	101	6.7

[1] Less than 0.5 day.

[2] Trace.

[3] Average annual highest temperature.

[4] Average annual lowest temperature.

vens Point as well as at other points along the Wisconsin River. Some urban and street damage occurs when a river stage of 12 feet occurs at Wisconsin Rapids.

Prevailing winds are from the west and northwest in winter and from a southerly direction in summer. Annually, the wind blows from the northwest about 20 percent of the time and from the southwest about 15 percent. The windspeed has averaged less than 4 miles per hour about 77 percent of the time, from 4 to 15 miles per hour 67 percent, from 16 to 31 miles per hour 25 percent, and more than 31 miles per hour less than 1 percent. The highest speed winds are generally from a westerly direction.

Sunshine has averaged about 40 percent of possible for October through December and 60 percent or more for April through September.

The approximate range in relative humidity in each season of the year is shown in table 16.

Early Settlement and Development

The first permanent settlement in Portage County began in 1836 after the treaty between the United States and the Indians was signed (*17*). Early settlers were attracted to the county by the timber resources.

In 1841 Portage County included Columbia, Adams, Juneau, Wood, and Lincoln Counties and parts of many other counties. Successive boundary changes occurred in the years that followed. In 1856, Portage County assumed its present boundaries.

In 1850 the population of the county was 1,250. The population increased to 7,507 by 1860 and to 10,634 by 1870. In 1970 the population was 47,541.

Farming

Early farming in Portage County was conducted mainly to supply food to lumber camps. In 1850 there were 5 farms in the county; in 1860, 573; in 1870, 1,300; and in 1964, 1,921. By 1969 the number of farms had declined to 1,352.

Farming in Portage County has gone through four important phases. The first phase was growing food for home use and for use in logging camps. The second phase was the wheat-growing stage. The third phase was raising livestock. The fourth phase was the great growth of dairying and the growing of potatoes and canning crops.

In 1969, 300,563 acres, or 58.3 percent of the land, was in farms (*22*). Of this, 121,216 acres was in harvested crops, 39,021 in pasture, 70,037 in woodland, and 70,209 in other farmland. A total of 25,123 acres was irrigated for common farm crops and specialty crops. Of the specialty crops, potatoes accounted for the largest acreage, 14,281 acres.

According to a study made to determine the soil and water conservation needs of the county, the amount of land for crops is expected to decrease. The study indicates that pastureland and established woodland will decrease in acreage. Roads, water impoundments, and urban areas will increase in acreage.

The average farm in 1969 was 222.3 acres. The size of farms has continually increased over the years, and the number of farms has decreased since 1959.

About 81 percent of the farms in the county were operated by owners in 1969. Part owners operated 16 percent, and tenants operated 3 percent.

TABLE 15.—*Probabilities of last freezing temperatures in spring and first in fall*

[Data from Stevens Point]

Probability	Dates for given probability and temperature				
	16° F or lower	20° F or lower	24° F or lower	28° F or lower	32° F or lower
Spring:					
1 year in 10 later than	April 12	April 21	May 1	May 14	May 26
2 years in 10 later than	April 7	April 15	April 26	May 8	May 21
5 years in 10 later than	March 27	April 3	April 15	April 28	May 11
Fall:					
1 year in 10 earlier than	October 31	October 22	October 9	September 25	September 15
2 years in 10 earlier than	November 5	October 27	October 15	October 1	September 20
5 years in 10 earlier than	November 16	November 4	October 27	October 12	October 1

Industries

Manufacturing provides more jobs than farming or forestry in Portage County. In 1964 there were 58 manufacturing jobs per 6,000 population. Paper mills provided the major part of the employment.

Among the most important manufactures are paper products, furniture, mill products, bakery products, and fishing equipment. Printing and publishing are also important. The largest service industries are insurance, telephone service, and wholesaling.

The majority of the industry is located in or near Stevens Point.

Lying near the geographic center of the State, Portage County is well supplied by rail and highway transportation. Air transportation is also available at Stevens Point.

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TABLE 16.—*Relative humidity by seasons*

Season	Percentage of time relative humidity is—		
	Less than 50 percent	50 to 80 percent	More than 80 percent
Winter	5	55	40
Spring	20	50	30
Summer	15	45	40
Fall	20	50	30

Glossary

Acidity. See Reaction, soil.

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Available water capacity (also termed available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil.

Blowout. An excavation produced by wind action in loose soil, usually sand.

Bottom land. Low land formed by alluvial deposits along a river.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material, and tends to stretch somewhat and pull apart, rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard and brittle; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour or are parallel to terraces or diversions. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Diversion, or diversion terrace. A ridge of earth, generally a terrace, that is built to divert runoff from its natural course and, thus, to protect areas downslope from the effects of such runoff.

Drainage class (natural). Refers to the conditions of frequency and duration of periods of saturation or partial saturation that existed during the development of the soil, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven different classes of natural soil drainage are recognized.

Excessively drained soils are commonly very porous and rapidly permeable and have a low available water capacity.

Somewhat excessively drained soils are also very permeable and are free from mottling throughout their profile.

Well-drained soils are nearly free from mottling and are commonly of intermediate texture.

Moderately well drained soils commonly have a slowly permeable layer in or immediately beneath the solum. They have uniform color in the A and upper B horizons and mottling in the lower B and the C horizons.

Somewhat poorly drained soils are wet for significant periods but not all the time, and some soils commonly have mottling at a depth below 6 to 16 inches.

Poorly drained soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be absent or nearly so in some soils.

Very poorly drained soils are wet nearly all the time. They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile.

Erosion. The wearing away of the land surface by wind (sandblast), running water, and other geological agents.

Glacial drift (geology). Rock material transported by glacial ice and then deposited; also includes the assorted and unassorted materials deposited by streams flowing from glaciers.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Gleyed soil. A soil in which waterlogging and lack of oxygen have caused the material in one or more horizons to be neutral gray in color. The term "gleyed" is applied to soil horizons with yellow and gray mottling caused by intermittent waterlogging.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major horizons:

O horizon.—The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon.—The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and therefore is marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

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 some combination of these; (2) by prismatic or blocky structure; (3) by redder or stronger colors than the A horizon; or (4) by some combination of these. Combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Lacustrine deposit (geology). Material deposited in lake water and exposed by lowering of the water level or elevation of the land.

Moraine. Accumulation of boulders, gravel, sand, and clay left on the ground by a glacier.

Mottling, soil. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of drainage. Descriptive terms are as follows: abundance—*few*, *common*, and *many;* size—*fine*, *medium*, and *coarse;* and contrast—*faint*, *distinct*, and *prominent*. The size measurements are these: *fine*, less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; *medium*, ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and *coarse*, more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

Muck. An organic soil consisting of fairly well decomposed organic material that is relatively high in mineral content, finely divided, and dark in color.

Munsell notation. A system for designating color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with a hue of 10YR, a value of 6, and a chroma of 4.

Peat. Unconsolidated soil material, largely undecomposed organic matter that has accumulated where there has been excess moisture.

Permeability. The quality that enables the soil to transmit water or air. Terms used to describe permeability are as follows: *very slow*, *slow*, *moderately slow*, *moderate*, *moderately rapid*, *rapid*, and *very rapid*.

pH value. A numerical means for designating acidity and alkalinity in soils. A pH value of 7.0 indicates precise neutrality; a higher value, alkalinity; and a lower value, acidity.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction;

an alkaline soil is one that is alkaline in reaction. In words, the degrees of acidity or alkalinity are expressed thus:

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

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

Residuum. Soil material that remains from weathered rocks.

Sand. Individual rock or mineral fragments in a soil that range in diameter from 0.05 to 2.0 millimeters. Most sand grains consist of quartz, but they may be of any mineral composition. The textural class name of any soil that contains 85 percent or more sand and not more than 10 percent clay.

Silt. Individual mineral particles in a soil that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). Soil of the silt textural class is 80 percent or more silt and less than 12 percent clay.

Soil. A natural, three-dimensional body on the earth's surface that supports plants and that 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.

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Subsidence. Depression or lowering of the surface of a soil as the result of oxidation, drying, or compaction.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. Technically, the part of the soil below the solum.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness. The plowed layer.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that it may soak into the soil or flow slowly to a prepared outlet without harm. Terraces in fields are generally built so they can be farmed. Terraces intended mainly for drainage have a deep channel that is maintained in permanent sod.

Terrace (geological). An old alluvial plain, ordinarily flat or undulating, bordering a river, lake, or the sea. Stream terraces are frequently called second bottoms, as contrasted to flood plains, and are seldom subject to overflow. Marine terraces were deposited by the sea and are generally wide.

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 loam*, *silt*, *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."

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

Upland. Land that lies above the stream terraces and that is underlain by bedrock at a fairly shallow depth; generally, all areas that are not on terraces or bottom land.

Variant, soil. A soil having properties sufficiently different from those of other known soils to suggest establishing a new soil series, but a soil of such limited known area that creation of a new series is not believed to be justified.

Water table. The highest part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone.

Weathering, soil. The physical and chemical disintegration and decomposition of rocks and minerals. Soil is the result of weathering and other chemical, physical, and biological alterations that have changed the upper part of the earth's crust through various periods of time.

GUIDE TO MAPPING UNITS

For a full description of a mapping unit, read both the description of the mapping unit and the soil series to which the mapping unit belongs. In referring to a capability unit, a recreation group, or to any other group, read the introduction to the section it is in for general information about its management. Other information is given in tables as follows:

Acreage and extent of the soils, table 1, p. 10.
Predicted average yields of crops, tables 2 and 3, pp. 46 to 48.
Ratings and limitations of the soils for recreational purposes, table 4, p. 49.
Suitability of soil groups for producing elements of wildlife habitat, table 5, p. 50 to 51.
Importance of wildlife habitat for selected kinds of wildlife, table 6, p. 52.
Engineering uses of soils, tables 7, 8, and 9, pp. 54 to 83.
Productivity and limitations of the soils for woodland, table 10, pp. 84 to 85.
Tree planting guide, table 11, pp. 88 to 89.
Shrub and vine planting guide, table 12, pp. 90 to 91.

Map symbol	Mapping unit	Page	Capability unit		Recreation group	Wildlife group	Woodland group	Tree and shrub group
			Symbol	Page	Number	Number	Symbol	Number
Ab	Alluvial land, wet	9	Vw-14	44	6	7	4w5	3
Af	Altdorf silt loam	11	IIIw-3	43	5	6	2o1	3
Bt	Billett sandy loam, 0 to 2 percent slopes	11	IIIs-4	43	1	1	3o1	1
Ca [1/]	Cathro muck	12	IVwc-9	44	6	8	---	4
CoB	Coloma loamy sand, 2 to 6 percent slopes	12	IVs-3	44	2	3	3s1	2
CoC	Coloma loamy sand, 6 to 12 percent slopes	13	VIs-3	45	2	3	3s1	2
Da	Dancy sandy loam	13	IVw-3	44	5	7	3w4	3
DoA	Dolph silt loam, 1 to 3 percent slopes	14	IIw-3	41	3	6	3o1	3
DuB	Dunnville very fine sandy loam, 2 to 6 percent slopes	14	IIIs-4	43	1	1	3o1	1
DxA	Dunnville very fine sandy loam, mottled subsoil variant, 1 to 3 percent slopes	15	IIw-5	42	3	6	3o1	3
FrA	Friendship loamy sand, 0 to 3 percent slopes	16	IVs-3	44	2	3	3s1	2
KeA	Kert silt loam, 1 to 3 percent slopes	17	IIw-3	41	3	6	2o1	3
KrB	Kranski loamy sand, 2 to 6 percent slopes	17	IIIe-4	42	2	3	3o1	2
KrC	Kranski loamy sand, 6 to 12 percent slopes	17	IVe-4	43	2	3	3o1	2
KrD	Kranski loamy sand, 12 to 20 percent slopes	17	VIe-4	45	2	3	3r2	2
LeA	Leola loamy sand, 0 to 3 percent slopes	18	IIIw-6	43	4	6	3w4	3
Lu [1/]	Lupton muck	19	IVwc-9	44	6	8	---	4
Ma [1/]	Markey muck	19	IVwc-9	44	6	8	---	4
Mb [1/]	Markey muck, shallow	19	IVwc-9	44	6	8	---	4
Mc	Marsh	19	VIIIw-15	47	6	7	6s1	4
MeA	Meadland loam, 1 to 3 percent slopes	20	IIw-4	42	3	6	3o1	3
MfB	Mecan loamy sand, 2 to 6 percent slopes	21	IIIe-4	42	2	3	3o1	1
MfC	Mecan loamy sand, 6 to 12 percent slopes	21	IVe-4	43	2	3	3o1	1
MfD	Mecan loamy sand, 12 to 20 percent slopes	21	VIe-4	45	2	3	3r2	1
MgB	Mecan sandy loam, 2 to 6 percent slopes	21	IIIe-4	42	1	1	3o1	1
MgC	Mecan sandy loam, 6 to 12 percent slopes	22	IVe-4	43	1	1	3o1	1

GUIDE TO MAPPING UNITS--Continued

Map symbol	Mapping unit	Page	Capability unit		Recreation group	Wildlife group	Woodland group	Tree and shrub group
			Symbol	Page	Number	Number	Symbol	Number
MgD	Mecan sandy loam, 12 to 20 percent slopes	22	VIe-4	45	1	1	3r2	1
MnA	Meehan loamy sand, 0 to 3 percent slopes	22	IVw-5	44	4	6	3w4	3
MoA	Meehan loamy sand, sandstone substratum, 0 to 3 percent slopes	22	IVw-5	44	4	6	3w4	3
MpA	Meehan sandy loam, red surface, 0 to 3 percent slopes	22	IVw-5	44	4	6	3w4	3
Mr	Meehan fine sandy loam, gravelly variant	23	IVw-5	44	3	6	3w4	3
MsB	Mosinee sandy loam, 2 to 6 percent slopes	24	IIe-2	41	1	1	3d1	2
NoB	Norgo silt loam, moderately deep variant, 2 to 6 percent slopes	24	IIe-2	41	1	1	3d1	2
NoC	Norgo silt loam, moderately deep variant, 6 to 12 percent slopes	24	IIIe-2	42	1	1	3d1	2
Oe	Oesterle sandy loam	25	IIw-5	42	3	6	3o1	3
Ov	Oesterle loam, silty subsoil variant	26	IIw-5	42	3	6	3o1	3
PaA	Pearl loamy sand, 1 to 3 percent slopes	26	IIIs-4	43	2	3	3s1	2
PbB	Plainbo loamy sand, 2 to 6 percent slopes	27	IVs-3	44	2	3	3s1	2
PfA	Plainfield loamy sand, 0 to 2 percent slopes	27	IVs-3	44	2	3	3s1	2
PfB	Plainfield loamy sand, 2 to 6 percent slopes	28	IVs-3	44	2	3	3s1	2
PfC	Plainfield loamy sand, 6 to 12 percent slopes	28	VIs-3	45	2	3	3s1	2
PgB	Plainfield loamy sand, granite substratum, 2 to 6 percent slopes	28	IVs-3	44	2	3	3s1	2
Ph	Plainfield and Kranski soils	28	VIIs-3	45	2	3	3s2	2
PkB	Plainfield sandy loam, gravelly variant, 2 to 6 percent slopes	29	IIIe-3	42	1	3	3d1	2
PoA	Point sandy loam, 1 to 3 percent slopes	30	IIIw-6	43	3	6	3o1	3
RfA	Richford loamy sand, 0 to 2 percent slopes	30	IIIs-4	43	2	3	3o1	2
RfB	Richford loamy sand, 2 to 6 percent slopes	31	IIIs-4	43	2	3	3o1	2
RfC	Richford loamy sand, 6 to 12 percent slopes	31	IIIe-7	43	2	3	3o1	2
RgB	Richford loamy fine sand, 2 to 6 percent slopes	31	IIIs-4	43	1	3	3o1	2
RhA	Rockers loamy sand, 1 to 3 percent slopes	31	IIIw-6	43	4	6	3w4	3
Rk	Rock land	32	VIIIs-10	47	2	10	6s1	2
Rm	Roscommon muck	33	IVw-5	44	5	7	4w4	3
Rn	Roscommon-Meehan complex, 0 to 3 percent slopes	33	IVw-5	44	5	7	4w4	3
Ro	Roscommon sandy loam, loamy variant	33	IVw-3	44	5	7	4w4	3
Rp	Roscommon sandy loam, loamy variant, loamy substratum	33	IVw-3	44	5	7	4w4	3
RrA	Rosholt sandy loam, 0 to 2 percent slopes	34	IIIs-4	43	1	1	2o1	1
RrB	Rosholt sandy loam, 2 to 6 percent slopes	34	IIIs-4	43	1	1	2o1	1
RrC2	Rosholt sandy loam, 6 to 12 percent slopes, eroded	35	IIIe-7	43	1	1	2o1	1
RsB	Rosholt loam, 2 to 6 percent slopes	35	IIIs-4	43	1	1	2o1	1

GUIDE TO MAPPING UNITS--Continued

Map symbol	Mapping unit	Page	Capability unit		Recreation group	Wildlife group	Woodland group	Tree and shrub group
			Symbol	Page	Number	Number	Symbol	Number
RsC2	Rosholt loam, 6 to 12 percent slopes, eroded	35	IIIe-7	43	1	1	2o1	1
Rt	Rosholt loam, loamy substratum, 0 to 2 percent slopes	36	IIIs-4	43	1	1	2o1	1
	Rosholt gravelly variant[2]	--	--------	--	---	---	---	---
RuD	Rosholt complex, 12 to 20 percent slopes	36	VIe-3	45	1	1	2r2	1
RuE	Rosholt complex, 20 to 40 percent slopes	36	VIIe-3	45	1	1	2r2	1
RzB	Rozellville loam, 2 to 6 percent slopes	38	IIe-1	41	1	1	2o1	1
Se[1]	Seelyeville muck	38	IVwc-9	44	6	8	---	4
Sh	Sherry silt loam	38	IIIw-3	43	5	7	3w5	3
Vs	Vesper silt loam	39	IIIw-3	43	5	7	5w5	3
WyB	Wyocena sandy loam, 2 to 6 percent slopes	40	IIIe-4	42	1	1	3o1	1
WyC	Wyocena sandy loam, 6 to 12 percent slopes	40	IVe-4	43	1	1	3o1	1
WyD	Wyocena sandy loam, 12 to 20 percent slopes	40	VIe-4	45	1	1	3r2	1
WyE	Wyocena sandy loam, 20 to 30 percent slopes	40	VIIe-4	45	1	1	3r2	1

[1] Organic soils have not been placed in the ordination system.

[2] Mapped only in Rosholt complex.

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