United States
Department of
Agriculture

Natural
Resources
Conservation
Service

In cooperation with
the Research Division of
the College of Agricultural
and Life Sciences,
University of Wisconsin

Soil Survey of Jackson County, Wisconsin

How to Use This Soil Survey

General Soil Map

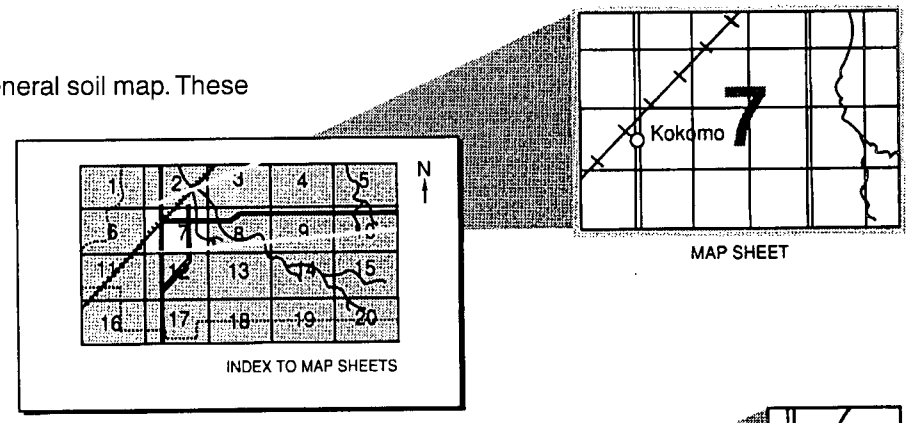
The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

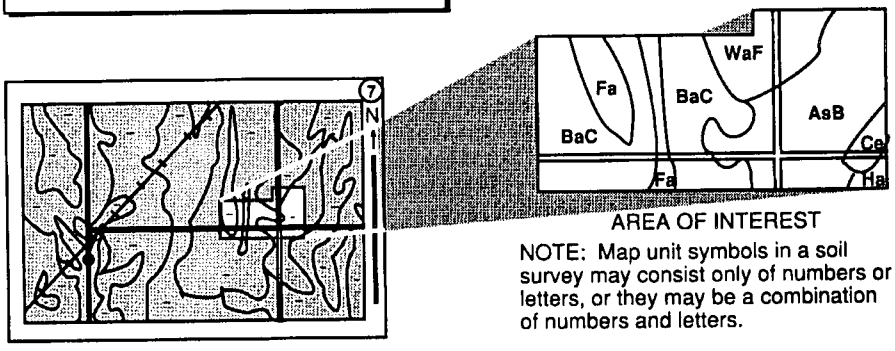
Detailed Soil Maps

The detailed soil maps follow the general soil map. These maps can be useful in planning the use and management of small areas.

To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet and turn to that sheet.



Locate your area of interest on the map sheet. Note the map units symbols that are in that area. Turn to the **Index to Map Units** (see Contents), which lists the map units by symbol and name and shows the page where each map unit is described.



NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.

The **Contents** shows which table has data on a specific land use for each detailed soil map unit. Also see the **Contents** for sections of this publication that may address your specific needs.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1991. Soil names and descriptions were approved in 1992. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1992. This survey was made cooperatively by the Natural Resources 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 Jackson County Land Conservation Committee, which helped to finance the fieldwork.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: Grassed waterways and contour stripcropping in an area of gently sloping farmland near Melrose in Jackson County.

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Foreword

This soil survey contains information that can be used in land-planning programs in Jackson County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. The information in this report is intended to identify soil properties that are used in making various land use or land treatment decisions. Statements made in this report are intended to help the land users identify and reduce the effects of soil limitations that affect various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are only moderately deep to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

Patricia S. Leavenworth
State Conservationist
Natural Resources Conservation Service

Soil Survey of
Jackson County, Wisconsin

By John E. Langton and Duane T. Simonson, Natural Resources Conservation Service

Fieldwork by Roger A. Dahl, Dale E. Jakel, Richard M. Johannes, John E. Langton, Howard E. Lorenz, Theron A. Meyer III, and Duane T. Simonson, Natural Resources Conservation Service

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

JACKSON COUNTY is in west-central Wisconsin (fig. 1). At the widest points, it is about 36 miles from north to south and 42 miles from east to west. It has a total land area of about 639,879 acres, or about 1,000 square miles. In 1991, the population of Jackson County was estimated at 16,661 (Wisconsin Department of Administration). Black River Falls, along the Black River in the west-central part of the county, is the county seat.

Jackson County is about equally divided by the Black River. Approximately 41 percent of the area west of the river is farmland, and about 97 percent of the area east of the river is woodland. Dairying is the leading enterprise in the county (Wisconsin Department of Agriculture, Trade, and Consumer Protection/USDA, 1990). Service and industrial developments are expanding. The county provides opportunities for a wide variety of recreational activities.

This soil survey updates the survey of Jackson County made in about 1918 by the U.S. Department of Agriculture, Bureau of Soils, and the Wisconsin Geological and Natural History Survey. Each agency published a separate report (USDA, 1922; Wisconsin Geological and Natural History Survey, 1923). The present survey provides additional information and has larger maps, which show the soils in greater detail.

General Nature of the County

This section provides information regarding some of the physical and cultural characteristics of the county. It describes history and development; climate; physiography, relief, and drainage; water supply; and transportation facilities and industry.

History and Development

Indians lived in the area that is now Jackson County for many years before the arrival of French explorers, missionaries, and fur traders. In about 1795, a fur trading post was located near the falls of the Black River. As early as 1819, some logging was done along the Black River. This activity was interrupted, however, by hostilities over logging rights on Indian lands.

In 1837, the land that included the survey area was ceded to the United States by the Winnebago Indians. In 1839, Robert Douglas established the first farm in the Melrose area, and at about the same time Jacob Spaulding built the first permanent sawmill near the falls of the Black River. During the peak lumbering period, almost 5 billion board feet was cut and tallied from the pineries of the area. A State road from Prairie du Chien to Hudson, by way of Black River Falls and Eau Claire, hastened the settlement

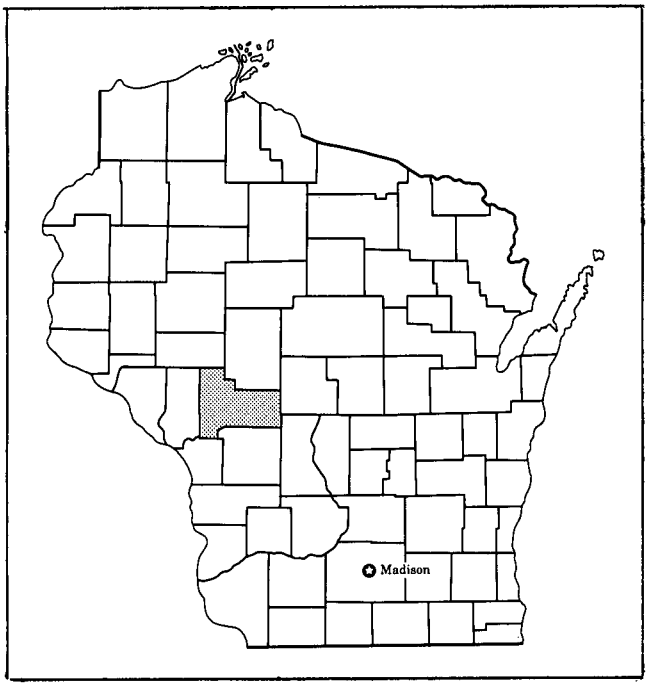

Figure 1.—Location of Jackson County in Wisconsin.

of west-central Wisconsin. In 1854, Jackson County was established as a separate jurisdiction. Originally, the county included areas now known as Trempealeau County, Clark County, and parts of Buffalo County. Six boundary changes between 1854 and 1883 established the present boundaries of Jackson County (American Bicentennial Project, 1976).

Development in Jackson County was hastened by railroad construction. The West Wisconsin Railroad was completed in 1868. Later it was sold to the Chicago and North Western Railroad and now passes through the county en route from Chicago to St. Paul. The Green Bay and Western Railroad was completed in 1874. It passes from east to west through the county, en route from Green Bay to Winona, Minnesota. The Green Bay and Western joins the Chicago and North Western at Merrillan. Jackson County has a good network of county, State, and Federal roads. Interstate 94 passes through the county from northwest to southeast.

The eastern part of the county consists of nearly level and gently sloping land with scattered, steep and very steep mounds of sandstone. Some of these mounds are as much as 300 feet high, and some have cores of low-grade iron ore. Periodically, mining of the ore has been a marginal operation. This mining first occurred in the 1850's, later in the 1880's, and most recently in the 1970's (American Bicentennial Project, 1976).

The earliest farmers raised crops primarily for their own needs. As more land was cleared, wheat became the main crop until the depletion of soil fertility and an infestation of insects caused widespread crop failures. Many farmers turned to raising large starchy potatoes for a starch factory in Black River Falls. After 1920, dairy farming increased and hay, small grain, and corn became important crops. At present, about 50 percent of the farm income in the county comes from dairy products. The remaining farm income is derived from the sale of meat animals, poultry, eggs, field crops, vegetables, fruits, sphagnum moss, and forest products (Wisconsin Department of Agriculture, Trade, and Consumer Protection/USDA, 1990). Jackson County is the third leading producer of cranberries in Wisconsin. Farming is still an important source of revenue, but the importance of recreation, retailing, and the service industry is increasing.

Population trends in Jackson County are generally similar to those of the State as a whole. That is, rural areas have lost population but the population in urban areas has increased. In Jackson County, however, the losses in rural areas are greater and the gains in urban areas are lower than those typical for the State. Most of the population in Jackson County is west of the Black River.

Climate

Winters in Jackson County are cold, and summers are short and warm, with several hot and humid periods. Precipitation is fairly well distributed throughout the year, reaching a slight peak in summer. Snow covers the ground during much of the period from late fall through early spring.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Blair in the period 1951 to 1981. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter, the average temperature is 16 degrees F and the average daily minimum temperature is 6 degrees. The lowest temperature during the period of record, which occurred on January 30, 1951, is -43 degrees. In summer, the average temperature is 69 degrees and the average daily maximum temperature is 81 degrees. The highest temperature during the period of record, which occurred on August 3, 1964, is 104 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The growing season averages 128 days at the weather station in Blair, near the western border of Jackson County. It varies greatly where there are significant differences in relief. Generally, it is shorter in low depressions and longer on high ridgetops. Also, the number of growing degree days varies significantly throughout the county. It is about 4,333 at Blair, which has climate conditions similar to those in the western part of Jackson County, and about 2,175 at Mather, which has climate conditions similar to those in the eastern part of the county.

The total annual precipitation is about 33 inches. Of this, 24 inches, or about 73 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 13 inches. The heaviest 1-day rainfall during the period of record was 6.08 inches on August 23, 1975. Thunderstorms occur on about 42 days each year.

The average seasonal snowfall is about 44 inches. The greatest snow depth at any one time during the period of record was 29 inches. On the average, 61 days of the year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 61 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 65 percent of the time possible in summer and 45 percent in winter. The prevailing wind is from the south. Average windspeed is highest, 10 miles per hour, in spring.

Physiography, Relief, and Drainage

Robert N. Cheetham, geologist, Natural Resources Conservation Service, helped prepare this section.

Jackson County is in two physiographic regions—the Western Upland, which makes up about 40 percent of the county, and the Central Plain, which makes up about 60 percent. The Western Upland, west of the Black River, is a dissected plateau with relief of several hundred feet. It is composed of Paleozoic marine sandstones. Much of the friable sandstone has been reduced by mass wastage and forms long slopes mantled by windblown silts and sands. A few high ridges near the Trempealeau County line are capped by remnants of a more resistant calcitic dolomite at elevations more than 1,300 feet above mean sea level.

The Central Plain, which extends from the eastern county boundary to a few miles west of the Black River, is a much eroded landscape of Upper Cambrian sandstone. The area is mostly level and swampy with occasional sandstone mounds and a few knobs of Precambrian rock ranging from a few to several hundred feet above the plain. At Black River Falls the valley bottom is a Precambrian granite; a fall line marks the transition from a resistant granite to an erodible sandstone.

The total relief in Jackson County is about 790 feet. The elevation is highest, about 1,400 feet, at Saddle Mound, just north of Highway 54 in the east-central part of the county. It is lowest, about 610 feet, at the point where the Black River leaves the county. About 64 percent of the county is drained by the Black River and its tributaries. The Black River flows toward the southwest through the middle of the county. It enters Jackson County (Lake Arbutus) at an elevation of 833 feet and leaves the county at an elevation of 610 feet at the Trempealeau County line. The Black River joins the Mississippi River about 20 miles downstream from the Jackson County line. About 25 percent of Jackson County, most of the northwestern part, is within the Trempealeau River Basin. The Trempealeau River drains southwest to the Mississippi River. About 6 percent of the county, the northwestern part bordering Eau Claire County, is drained by the Buffalo River. The Buffalo River flows west and southwest to join the Mississippi River. About 5 percent of the county, the southeastern part, is within the Lemonweir River Basin. The Lemonweir River drains southeast to the Wisconsin River.

Water Supply

Robert N. Cheetham, geologist, Natural Resources Conservation Service, helped prepare this section.

Jackson County has about 8,430 acres of surface water. Water quality is generally fair. In the eastern part of the county, the Black River and other surface water areas are darkly colored by organic substances from bogs and swamps. The water is soft, with generally less than 250 milligrams of dissolved solids per liter.

Jackson County has a large supply of good quality ground water. The Cambrian sandstones are the principal source. Also, less extensive areas of sand and gravel along the Black River and in the Central Sand Plain along the eastern boundary of the county

are very good sources of ground water. The Precambrian bedrock, which underlies the sandstone and the sand and gravel, is mostly granitic and metamorphic rocks. It is not an important water source.

Wells in Jackson County have been monitored for water quality by the U.S. Geological Survey (Kammerer, 1984). Most of the ground water in the sandstone and sand and gravel aquifers has a relatively low content of dissolved solids, sulfates, and chlorides. It is mostly soft but ranges to hard in some sandstones. Some water use problems are caused by locally high concentrations of iron and manganese. Also, concentrations of nitrates have been detected in a few wells.

Generally, the ground-water flow is toward local streams and rivers through seepage and spring discharge. Flow is controlled by local topography. It is well defined in areas of high narrow ridges and deep narrow valleys. Flow is greatest where valleys are deeply entrenched into the aquifer. Regional flow of deep aquifers is toward the Mississippi or Wisconsin Rivers (Zaporozec and Cotter, 1985). Probable well yields in thick sandstone and sand and gravel aquifers range from 100 to more than 1,000 gallons per minute. Yields are lower where the aquifers are thin.

Transportation Facilities and Industry

Jackson County has more than 1,000 miles of local roads, about 230 miles of county roads, 145 miles of State and Federal roads, and 40 miles of Interstate highways (Wisconsin Department of Transportation, 1990). Interstate 94 crosses the county from northwest to southeast.

The county has about 60 miles of railroad. The Chicago and North Western Railroad provides daily service to Fairchild, Merrillan, and Millston. The Green Bay and Western Railroad provides daily service to Merrillan, Hixton, and Taylor. An airport for small planes is in Black River Falls. There is no regular commercial air service in the county.

Early industry of Jackson County consisted of lumbering and agricultural activities. Agriculture, especially dairying, was the center around which most other commerce and industry revolved. Over the past 24 years, the number of farms has declined from 1,087 farms with an average size of 250 acres to about 850 farms with an average size of about 296 acres (University of Wisconsin-Madison, 1986; Wisconsin Department of Agriculture, Trade, and Consumer Protection/USDA, 1990).

How This Survey Was Made

This survey was made to provide information about the soils in the survey area. The information includes a description of the soils and their location and a discussion of their suitability, limitations, and management for specified uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils in the survey area are in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil is associated with a particular kind of landform or with a segment of the landform. By observing the soils in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept or model of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based

mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Some of the descriptions, names, and delineations of the soils in this survey area do not agree with those of the soils in adjacent survey areas. Differences are the result of variations in the intensity of mapping or in the extent of the soils in the survey areas.

General Soil Map Units

The general soil map in this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, it consists of one or more major soils and some minor soils. It is named for the major soils. The components of one map unit can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

Soil Descriptions

1. Absco-Northbend-Kalmarville Association

Very deep, nearly level and gently sloping, moderately well drained to poorly drained, sandy and silty soils; on flood plains

These soils are on the flood plains along rivers and large streams. Absco soils are on the higher parts of the flood plain that are subject to scour erosion and deposition of sand, Northbend soils are in the slightly lower positions, and Kalmarville soils are in the lowest positions on the flood plain. In some places the soils in this association are dissected by abandoned stream and river channels that are partially filled with water.

This association makes up about 2 percent of the county. It is about 35 percent Absco and similar soils, 25 percent Northbend and similar soils, 20 percent Kalmarville and similar soils, and 20 percent soils of minor extent.

Absco soils are subject to occasional flooding for brief periods. They formed in siliceous, dominantly sandy alluvium. They are moderately well drained. Permeability is rapid. The available water capacity is low. Typically, the surface layer is dark brown loamy sand about 4 inches thick. The subsoil is brown, very friable sand about 10 inches thick. The upper part of the substratum is pale brown sand about 21 inches thick. The next part is about 7 inches thick. It is pale brown, mottled loamy sand with thin strata of silt loam and fine sandy loam. The lower part of the substratum to a depth of about 60 inches is very pale brown, mottled sand.

Northbend soils are subject to frequent flooding for brief periods. They formed in mostly silty and loamy alluvium and in the underlying sandy alluvium. They are somewhat poorly drained. Permeability is moderate or moderately rapid in the silty and loamy alluvium and rapid in the sandy alluvium. The available water capacity is moderate. Typically, the surface layer is dark brown silt loam about 7 inches thick. The subsoil is about 29 inches thick. It is mottled. The upper part is dark brown, friable silt loam; the next part is dark brown, friable loam; and the lower part is dark brown, very friable loamy fine sand. The substratum to a depth of about 60 inches is brown and very pale brown, mottled sand with a few thin strata of dark brown loamy sand.

Kalmarville soils are subject to frequent flooding for brief periods. They formed in recent loamy alluvium underlain by sandy alluvium. They are poorly drained. Permeability is moderate or moderately rapid in the loamy alluvium and rapid in the sandy alluvium. The available water capacity is high. Typically, the surface layer is very dark brown, mottled silt loam about 6 inches thick. The next layer is dark gray, mottled very fine sandy loam about 31 inches thick. It has strata of grayish brown and dark grayish brown silt loam and fine sandy loam. The upper part of the subsoil is light brownish gray, mottled fine sandy loam about 5 inches thick. It has strata of grayish brown very fine sandy loam and silt loam. The lower part of the substratum to a depth of about 60 inches is light brownish gray sand.

Some of the minor soils in this association are Adder, Dunnville, Impact, Newlang, Tint, and Sparta

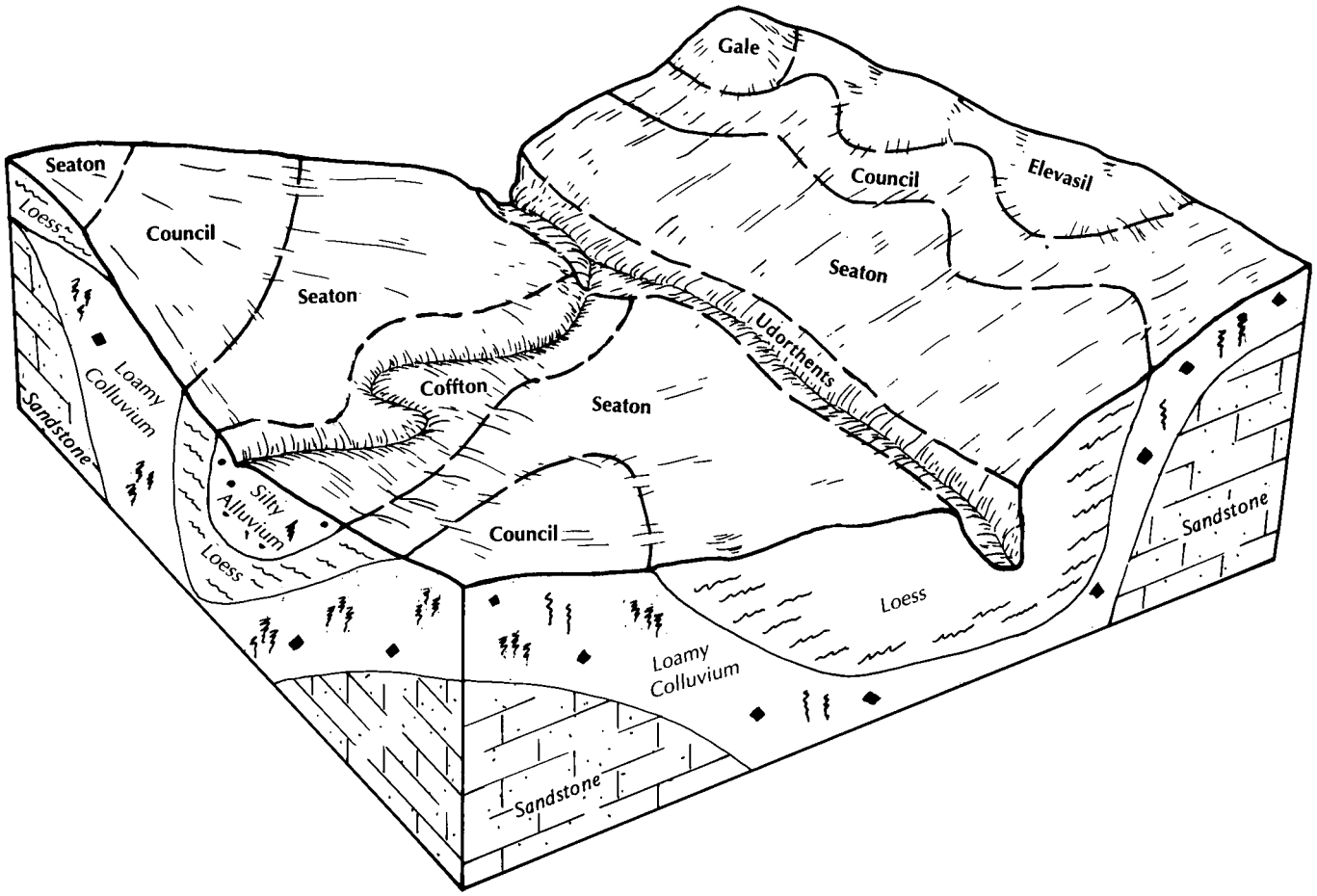

Figure 2.—Relationship of soils, topography, and parent material in the Seaton-Council association.

soils. The very poorly drained Adder and poorly drained Newlang soils are in positions on the flood plain similar to those of the Kalmarville soils. Adder soils formed in organic material overlying siliceous sandy alluvium. Newlang soils formed dominantly in siliceous sandy alluvium. The well drained Dunnville soils formed in loamy alluvium overlying sandy alluvium on low stream terraces. The excessively drained Impact and moderately well drained Tint soils are on stream terraces and pediments. They formed in siliceous sandy alluvium or residuum derived from sandstone. The excessively drained Sparta soils are on low stream terraces. They formed in sandy outwash.

Most areas of the Absco and Northbend soils are wooded. A few areas are used as pasture or cropland. Most areas of the Kalmarville soils support native wetland vegetation. A few areas are used as pasture. The Absco and Northbend soils are suited to trees, but most areas of the Kalmarville soils are not forested or managed for trees.

A few areas of the Absco and Northbend soils are cultivated. The Kalmarville soils are generally not suited to cultivated crops because of the flooding and wetness.

The major soils in this association are generally unsuited to septic tank absorption fields and dwellings because of the flooding and the wetness.

2. Seaton-Council Association

Very deep, gently sloping to steep, well drained, silty and loamy soils; on uplands

These soils are on bedrock-controlled uplands. Seaton soils are on summits and shoulders and on back slopes, head slopes, and foot slopes. Council soils are on back slopes, head slopes, and foot slopes.

This association makes up about 14 percent of the county. It is about 50 percent Seaton and similar soils, 25 percent Council soils, and 25 percent soils of minor extent (fig. 2).

Seaton soils formed in loess. They are gently

sloping to steep. Permeability is moderate. The available water capacity is very high. In the more sloping cultivated areas, much of the original surface layer has been lost through erosion. Typically, the remaining surface layer is dark brown silt loam about 9 inches thick. It is mixed with some brown subsoil material. The subsoil is friable silt loam about 37 inches thick. It is brown in the upper part and dark yellowish brown and mottled in the lower part. The substratum to a depth of about 60 inches is pale brown, mottled silt loam. The mottles in the lower part of the subsoil and the substratum are relict and are not associated with a seasonal high water table.

Council soils formed in loamy colluvium. They are sloping to steep. Permeability is moderate. The available water capacity is high. In most cultivated areas, much of the original surface layer has been lost through erosion. Typically, the remaining surface layer is dark brown loam about 7 inches thick. It is mixed with dark yellowish brown subsoil material. The subsoil is about 38 inches thick. It is dark yellowish brown, friable loam in the upper part and dark yellowish brown, friable sandy loam in the lower part. The substratum to a depth of about 60 inches is light yellowish brown and dark yellowish brown, mottled silt loam that has pockets or layers of loam. The mottles in the substratum are relict and are not associated with a seasonal high water table.

Some of the minor soils in this association are Coffton, Elevasil, Ettrick, Gale, and Orion soils and the loamy, very steep Udorthents. The somewhat poorly drained Coffton soils formed in silty alluvium on flood plains and alluvial fans. The poorly drained Ettrick soils formed in silty alluvium on flood plains. The somewhat poorly drained Orion soils formed in light colored, mostly silty alluvium overlying a buried soil with a dark colored A horizon. They are on flood plains. The well drained Elevasil soils formed mostly in siliceous loamy colluvium and siliceous sandy residuum derived from the underlying sandstone on hills. The well drained Gale soils are in positions similar to those of the Seaton and Council soils. They formed dominantly in loess overlying sandy residuum derived from the underlying sandstone. The well drained Udorthents are on back slopes and foot slopes of gullies on stream terraces. These soils formed in loess or in silty and loamy alluvium or colluvium.

Most of the less sloping areas of this association are used for cultivated crops. The steeper areas are mostly used for pasture or are wooded. The gently sloping to moderately steep areas are well suited to hay and pasture and are suited to cultivated crops. The major soils are well suited to trees.

The major soils in this association generally are well suited to septic tank absorption fields and dwellings in gently sloping areas. They are moderately suited to these uses in sloping areas, poorly suited in moderately steep areas, and generally unsuited in steep areas.

3. Urne-Council-La Farge Association

Moderately deep and very deep, gently sloping to very steep, well drained, loamy and silty soils; on uplands

These soils are on bedrock-controlled uplands. Urne soils are on shoulders and back slopes of knolls, ridges, and hills. Council soils are on back slopes, foot slopes, and head slopes. La Farge soils are on summits and shoulders and on back slopes and nose slopes and the upper foot slopes of knolls, ridges, and hills.

This association makes up about 10 percent of the county. It is about 30 percent Urne and similar soils, 25 percent Council and similar soils, 20 percent La Farge and similar soils, and 25 percent soils of minor extent (fig. 3).

Urne soils formed in loamy residuum derived from the underlying fine grained glauconitic sandstone or in loamy colluvium and residuum. These soils are sloping to very steep. Permeability is moderate or moderately rapid in the subsoil and slow to moderate in the underlying sandstone. The available water capacity is low. Typically, the surface layer is black fine sandy loam about 2 inches thick covered by about 1 inch of very dark grayish brown mucky peat. The subsoil is olive brown and light olive brown, friable fine sandy loam about 34 inches thick. The substratum to a depth of about 60 inches is weakly cemented, fine grained glauconitic sandstone.

Council soils formed in loamy colluvium. They are sloping to very steep. Permeability is moderate. The available water capacity is high. In most cultivated areas, much of the original surface layer has been lost through erosion. Typically, the remaining surface layer is dark brown loam about 7 inches thick. It is mixed with dark yellowish brown subsoil material. The subsoil is about 38 inches thick. It is dark yellowish brown, friable loam in the upper part and dark yellowish brown, friable sandy loam in the lower part. The substratum to a depth of about 60 inches is light yellowish brown and dark yellowish brown, mottled silt loam that has pockets or layers of loam. The mottles in the substratum are relict and are not associated with a seasonal high water table.

La Farge soils formed mostly in loess and loamy

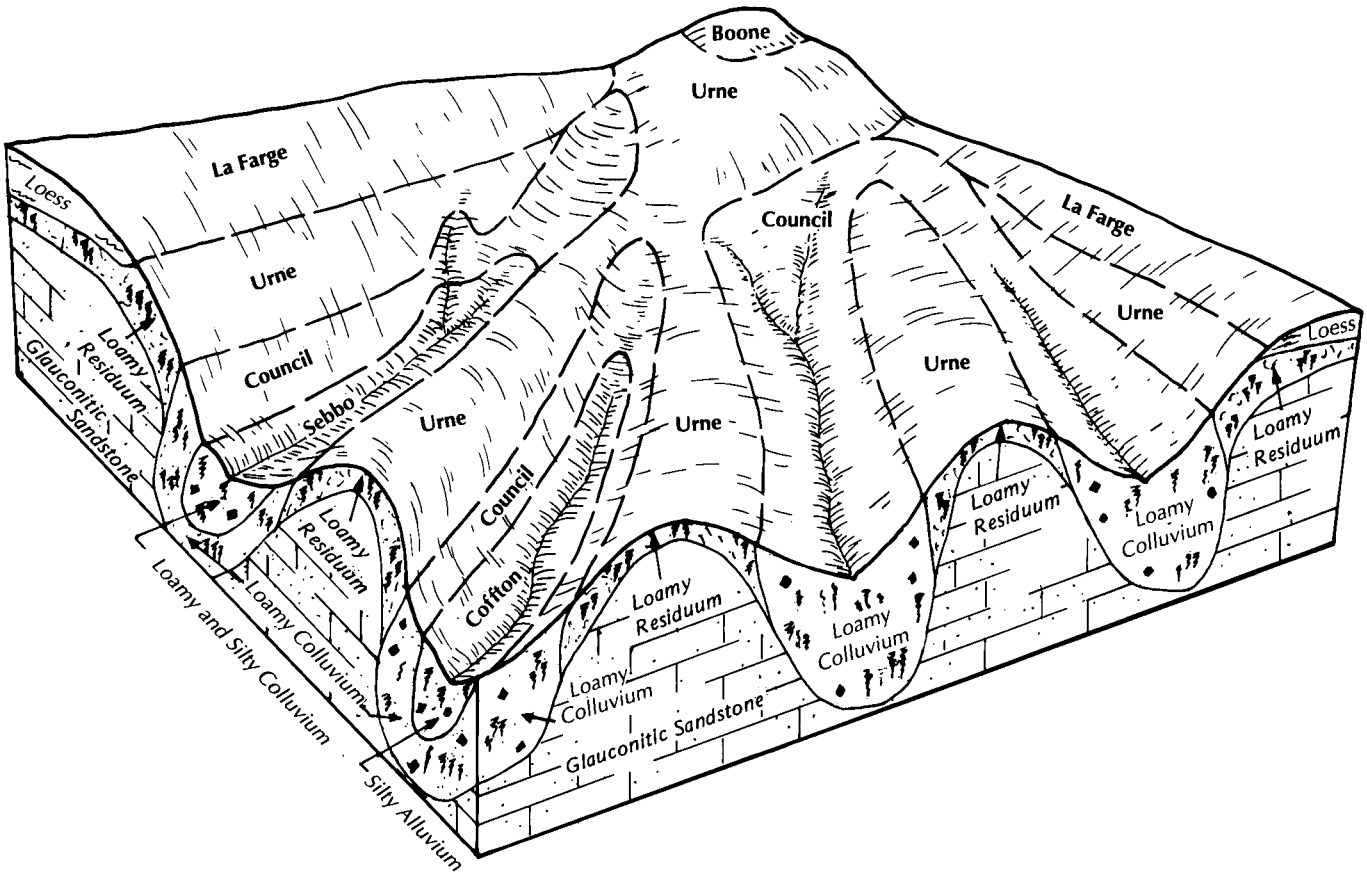

Figure 3.—Relationship of soils, topography, and parent material in the Urne-Council-La Farge association.

residuum derived from the underlying fine grained glauconitic sandstone. These soils are gently sloping to steep. Permeability is moderate in the subsoil and slow to moderate in the underlying sandstone. The available water capacity is moderate. In most cultivated areas, much of the original surface layer has been lost through erosion. Typically, the remaining surface layer is dark grayish brown silt loam about 6 inches thick. It is mixed with some yellowish brown subsoil material. The subsoil is about 31 inches thick. It is yellowish brown and dark yellowish brown, friable silt loam in the upper part and olive brown, friable loam in the lower part. The substratum to a depth of about 60 inches is weakly cemented, fine grained glauconitic sandstone.

Some of the minor soils in this association are Boone, Coffton, Ettrick, Houghton, Orion, Seaton, and Sebbo soils. The excessively drained Boone soils are on summits and shoulders and on nose slopes and back slopes. They formed in siliceous sandy residuum derived from the underlying sandstone. The somewhat poorly drained Coffton soils formed in silty alluvium on flood plains and alluvial fans. The poorly drained Ettrick soils formed in silty alluvium on flood plains. The somewhat poorly drained Orion soils formed in light colored, mostly silty alluvium overlying a buried soil with a dark colored A horizon. They are on flood plains. The very poorly drained Houghton soils formed in organic material more than 51 inches thick on flood plains. The well drained Seaton soils formed in loess on summits, shoulders, and back slopes. The moderately well drained Sebbo soils formed in loamy and silty colluvium on toe slopes.

Most of the less sloping areas of this association are used for cultivated crops or pasture. The steeper areas are mostly wooded or are planted to pine trees. These soils are well suited to trees. The gently sloping to moderately steep areas are well suited to hay and pasture and are suited to cultivated crops.

The gently sloping and sloping areas of this association are poorly suited to septic tank absorption fields and moderately suited to dwellings. The moderately steep areas are poorly suited to these uses, and the steep and very steep areas are generally unsuited.

4. Tarr-Boone-Rockdam Association

Moderately deep and very deep, nearly level to very steep, excessively drained and moderately well drained, sandy soils; on uplands, pediments, and stream terraces

Tarr and Rockdam soils are on stream terraces and pediments. Tarr soils are on head slopes, back slopes, foot slopes, and toe slopes. Rockdam soils are on toe slopes. Boone soils are on summits and shoulders and on back slopes and nose slopes of ridges, knolls, and hills on bedrock-controlled uplands.

This association makes up about 26 percent of the county. It is about 45 percent Tarr and similar soils, 25 percent Boone and similar soils, 15 percent Rockdam and similar soils, and 15 percent soils of minor extent (fig. 4).

Tarr soils formed in siliceous sandy alluvium or siliceous residuum derived from sandstone. They are excessively drained and are nearly level to very steep. Permeability is rapid. The available water capacity is low. Typically, the surface layer is very dark grayish brown sand about 8 inches thick. The subsoil is dark brown and strong brown, loose sand about 28 inches thick. The substratum to a depth of about 60 inches is yellow sand.

Boone soils formed in siliceous sandy residuum derived from the underlying sandstone. They are excessively drained and are gently sloping to very steep. Permeability is rapid in the sandy residuum and moderately slow or moderate in the underlying sandstone. The available water capacity is low or very low. Typically, the surface layer is very dark grayish brown sand about 2 inches thick covered by about 1 inch of very dark grayish brown mucky peat. The subsurface layer is brown sand about 5 inches thick. The subsoil is dark yellowish brown, very friable sand about 13 inches thick. The upper part of

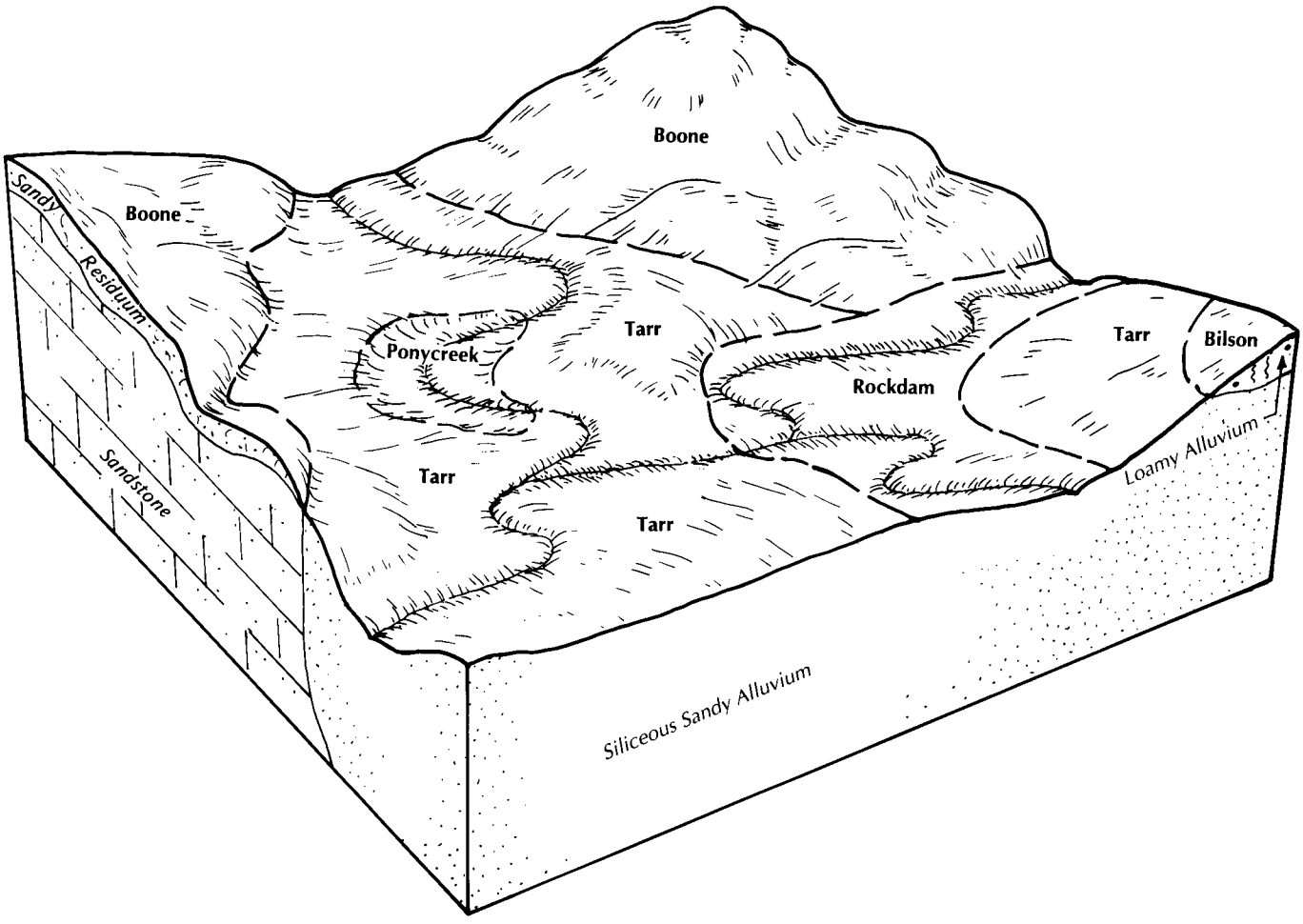

Figure 4.—Relationship of soils, topography, and parent material in the Tarr-Boone-Rockdam association.

the substratum is brownish yellow sand about 14 inches thick. The lower part of the substratum to a depth of about 61 inches is weakly cemented sandstone.

Rockdam soils formed in siliceous sandy alluvium or residuum derived from sandstone. They are moderately well drained and are nearly level and gently sloping. Permeability is rapid or very rapid. The available water capacity is low. Typically, the surface layer is very dark gray sand about 2 inches thick covered by about 2 inches of very dark grayish brown mucky peat. The subsurface layer is dark grayish brown sand about 3 inches thick. The subsoil is dark brown and yellowish brown, very friable sand about 21 inches thick. The upper part of the substratum is brownish yellow sand about 16 inches thick. The next part is yellow, mottled sand about 10 inches thick. The lower part of the substratum to a depth of about 61 inches is light gray, mottled sand.

Some of the minor soils in this association are Adder, Bilmod, Bilson, Council, Dawsil, Ironrun, Majik, Newlang, and Ponycreek soils. Adder and Newlang soils are on flood plains. Dawsil and Ponycreek soils are in depressions. The very poorly drained Adder and Dawsil soils formed in organic material overlying siliceous sandy alluvium. The poorly drained Newlang and Ponycreek soils formed in siliceous sandy alluvium. The well drained Bilson and moderately well drained Bilmod soils are in positions on the landscape similar to those of the Tarr soils. Bilson and Bilmod soils formed in siliceous loamy alluvium overlying siliceous sandy alluvium. The well drained Council soils are in concave positions on foot slopes and head slopes. They formed in loamy colluvium. The somewhat poorly drained Ironrun and Majik soils are lower on the landscape than the Tarr soils. They formed in siliceous sandy alluvium.

Most areas of this association are wooded. Some areas are used for pasture or are planted to pine trees. A few less sloping areas are used as cropland. These soils are suited to pine trees. Hardwood trees generally grow slowly and are poorly shaped. Because of the low or very low available water capacity, the nearly level to moderately steep areas are generally poorly suited to hay and pasture and to cultivated crops. The more sloping areas are generally unsuited to these uses.

The major soils in this association are poorly suited to septic tank absorption fields because they do not adequately filter the effluent. The nearly level and gently sloping areas are generally well suited to dwellings. The sloping and moderately steep areas are only moderately suited to dwellings, and the steep and very steep areas are generally unsuited.

5. Bilson-Elevasil-Merit Association

Moderately deep and very deep, nearly level to steep, well drained, loamy and silty soils; on stream terraces, pediments, and uplands

Bilson and Merit soils are on stream terraces and pediments. Bilson soils are on low knolls and head slopes, foot slopes, and toe slopes. Merit soils are on knolls and toe slopes. Elevasil soils are on summits and shoulders and on nose slopes, back slopes, and the upper foot slopes of hills and ridges on pediments and on bedrock-controlled uplands.

This association makes up about 10 percent of the county. It is about 55 percent Bilson and similar soils, 15 percent Elevasil and similar soils, 15 percent Merit and similar soils, and 15 percent soils of minor extent (fig. 5).

Bilson soils formed in siliceous loamy alluvium overlying siliceous sandy alluvium. They are nearly level to moderately steep. Permeability is moderate or moderately rapid in the subsoil and rapid in the substratum. The available water capacity is moderate. Typically, the surface layer is very dark brown sandy loam about 8 inches thick. The subsoil is dark yellowish brown, dark brown, and strong brown, friable sandy loam about 24 inches thick. The substratum to a depth of about 60 inches is brownish yellow sand that has a few thin strata of dark brown loamy sand.

Elevasil soils formed mostly in siliceous loamy colluvium and siliceous sandy residuum derived from the underlying sandstone. They are gently sloping to steep. Permeability is moderate or moderately rapid in the loamy part of the subsoil, rapid in the sandy part of the subsoil and in the substratum, and moderately slow or moderate in the underlying sandstone. The available water capacity is low. In most cultivated areas, much of the original surface layer has been lost through erosion. In wooded areas the surface layer is typically very dark brown sandy loam about 2 inches thick covered by about 1 inch of very dark grayish brown mucky peat. The subsoil is about 28 inches thick. It is dark yellowish brown and strong brown, friable sandy loam in the upper part and strong brown, very friable loamy sand in the lower part. The upper part of the substratum is reddish yellow sand about 8 inches thick. The lower part to a depth of about 60 inches is weakly cemented sandstone.

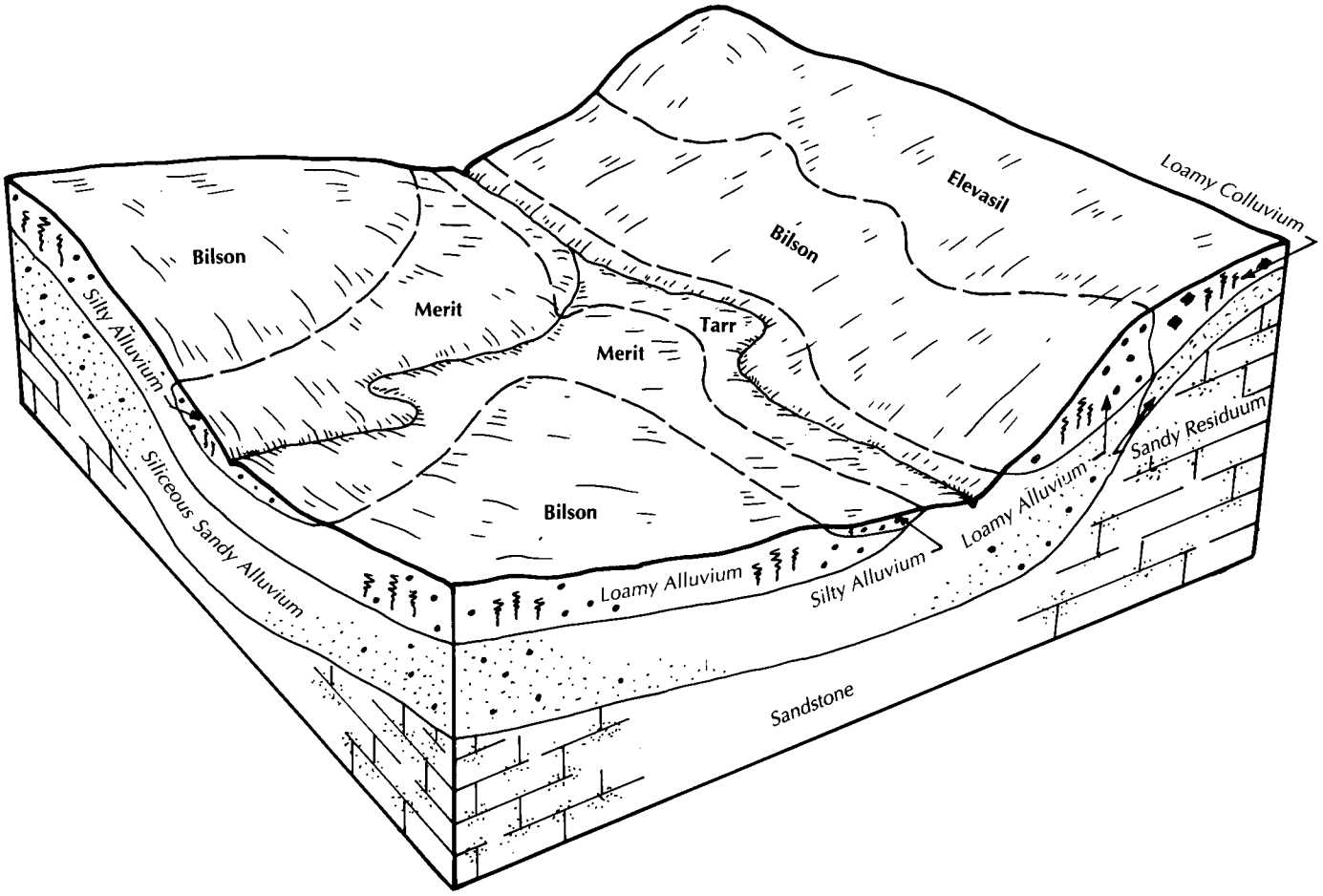

Figure 5.—Relationship of soils, topography, and parent material in the Bilson-Elevasil-Merit association.

Merit soils formed in silty alluvium and in the underlying loamy alluvium underlain by siliceous sandy alluvium. They are nearly level or gently sloping. Permeability is moderate in the subsoil and rapid in the substratum. The available water capacity is moderate. Typically, the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsoil is about 21 inches thick. It is friable. The upper part is dark yellowish brown silt loam, and the lower part is dark brown loam. The substratum to a depth of about 60 inches is strong brown sand.

Some of the minor soils in this association are Adder, Boone, Bilmod, Council, Gale, Merimod, Seaton, and Tarr soils. The very poorly drained Adder soils formed in organic material overlying siliceous sandy alluvium on flood plains. The excessively drained Boone soils are in convex positions higher than those of the Elevasil soils. They formed in siliceous sandy residuum derived from the underlying sandstone. The moderately well drained Bilmod soils are in positions slightly lower than those of the Bilson soils. They formed in materials similar to those in which the Bilson soils formed. The well drained Gale and Seaton soils are in positions similar to those of the Elevasil soils. Gale soils formed dominantly in loess overlying sandy residuum derived from the underlying sandstone. Seaton soils formed in loess. The moderately well drained Merimod soils are in positions slightly lower than those of the Merit soils. They formed in materials similar to those in which the Merit soils formed. The excessively drained Tarr soils are in positions similar to those of the Bilson soils. They formed in siliceous sandy alluvium or siliceous residuum derived from sandstone. The well drained Council soils are in concave positions on foot slopes and head slopes. They formed in loamy colluvium.

Most of the nearly level to sloping areas of this association are used for cultivated crops. The more sloping areas are generally used for pasture or are wooded. Most areas of these soils are suited to hay and pasture and to trees. Hardwood trees grow slowly and are poorly shaped in areas of the Elevasil soils. These soils are better suited to pine trees. The

less sloping areas of the major soils are suited to cultivated crops.

The major soils are poorly suited to septic tank absorption fields because of a thin layer over bedrock, poor filtering material, or seasonal wetness. Steep and very steep areas are generally unsuited because of the slope. The nearly level and gently sloping areas are well suited or moderately suited to dwellings. Sloping areas are only moderately suited to dwellings, moderately steep areas are poorly suited, and steep and very steep areas are generally unsuited.

6. Elm Lake-Fairchild Association

Moderately deep, nearly level and gently sloping, somewhat poorly drained and poorly drained, sandy and mucky soils; on pediments

Elm Lake soils are in drainageways and depressions, and Fairchild soils are on toe slopes on pediments.

This association makes up about 4 percent of the county. It is about 50 percent Elm Lake and similar soils, 40 percent Fairchild and similar soils, and 10 percent soils of minor extent.

Elm Lake soils formed in siliceous sandy alluvium overlying loamy residuum derived from the underlying interbedded sandstone and shale. They are poorly drained. Permeability is rapid in the sandy alluvium, moderately slow or moderate in the loamy residuum, and extremely slow to moderately slow in the underlying interbedded sandstone and shale. The available water capacity is low. Typically, the surface layer is black muck about 4 inches thick. The subsurface layer is very dark gray sand about 4 inches thick. The upper part of the substratum is gray, loose sand. The next part is grayish brown, mottled, loose loamy sand over light brownish gray, mottled, firm clay loam. The lower part of the substratum from a depth of about 38 to 60 inches is weakly cemented interbedded sandstone and shale.

Fairchild soils formed in siliceous sandy alluvium and loamy residuum derived from the underlying interbedded sandstone and shale. They are somewhat poorly drained. Permeability is rapid in the sandy alluvium, moderately slow or moderate in the loamy residuum, and extremely slow to moderately slow in the underlying interbedded sandstone and shale. The available water capacity is low. Typically, the surface layer is black sand about 2 inches thick covered by about 2 inches of very dark grayish brown mucky peat. The subsurface layer is grayish brown sand about 9 inches thick. The subsoil is about 26 inches thick. The upper part is dark reddish brown, very friable sand. The next part is dark brown and brownish yellow, mottled, very friable sand. The lower part is pale olive, mottled, firm clay loam. The substratum to a depth of about 60 inches is weakly cemented interbedded sandstone and shale.

Some of the minor soils in this association are Citypoint, Dawsil, Ironrun, Ludington, Rockdam, and Tarr soils. Citypoint and Dawsil soils are very poorly drained. Citypoint soils formed in organic material overlying interbedded sandstone and shale in drainageways and depressions. Dawsil soils formed in organic material overlying siliceous sandy alluvium in depressions. The somewhat poorly drained Ironrun soils are in positions similar to those of the Fairchild soils. They formed in siliceous sandy alluvium. The moderately well drained Ludington and Rockdam soils and the excessively drained Tarr soils are in higher positions than those of the major soils. Ludington soils formed in siliceous sandy alluvium and in loamy residuum derived from the underlying interbedded sandstone and shale. Rockdam and Tarr soils formed in siliceous sandy alluvium or residuum derived from sandstone.

Most areas of this association are wooded. Some areas are used for unimproved pasture or support native wetland vegetation. A few areas of the Fairchild soils are used for cultivated crops. The Fairchild soils are suited to trees. The Elm Lake soils are suited to conifers but are poorly suited to most other trees. The Fairchild soils are suited to pasture. If drained, the Elm Lake soils are also suited to pasture. Mainly because of wetness, the Elm Lake soils are generally unsuited to cultivated crops and the Fairchild soils are poorly suited.

The Elm Lake soils are generally unsuited to septic tank absorption fields and dwellings, primarily because of ponding. The Fairchild soils are poorly suited to these uses, mainly because of the wetness and the thin layer over bedrock.

7. Ironrun-Ponycreek-Dawsil Association

Very deep, nearly level and gently sloping, somewhat poorly drained to very poorly drained, sandy, mucky, and peaty soils; on stream terraces and pediments

Ironrun soils are on the lower toe slopes and in slight depressions. Ponycreek and Dawsil soils are in depressions.

This association makes up about 18 percent of the county. It is about 40 percent Ironrun and similar soils, 35 percent Ponycreek and similar soils, 10 percent Dawsil and similar soils, and 15 percent soils of minor extent (fig. 6).

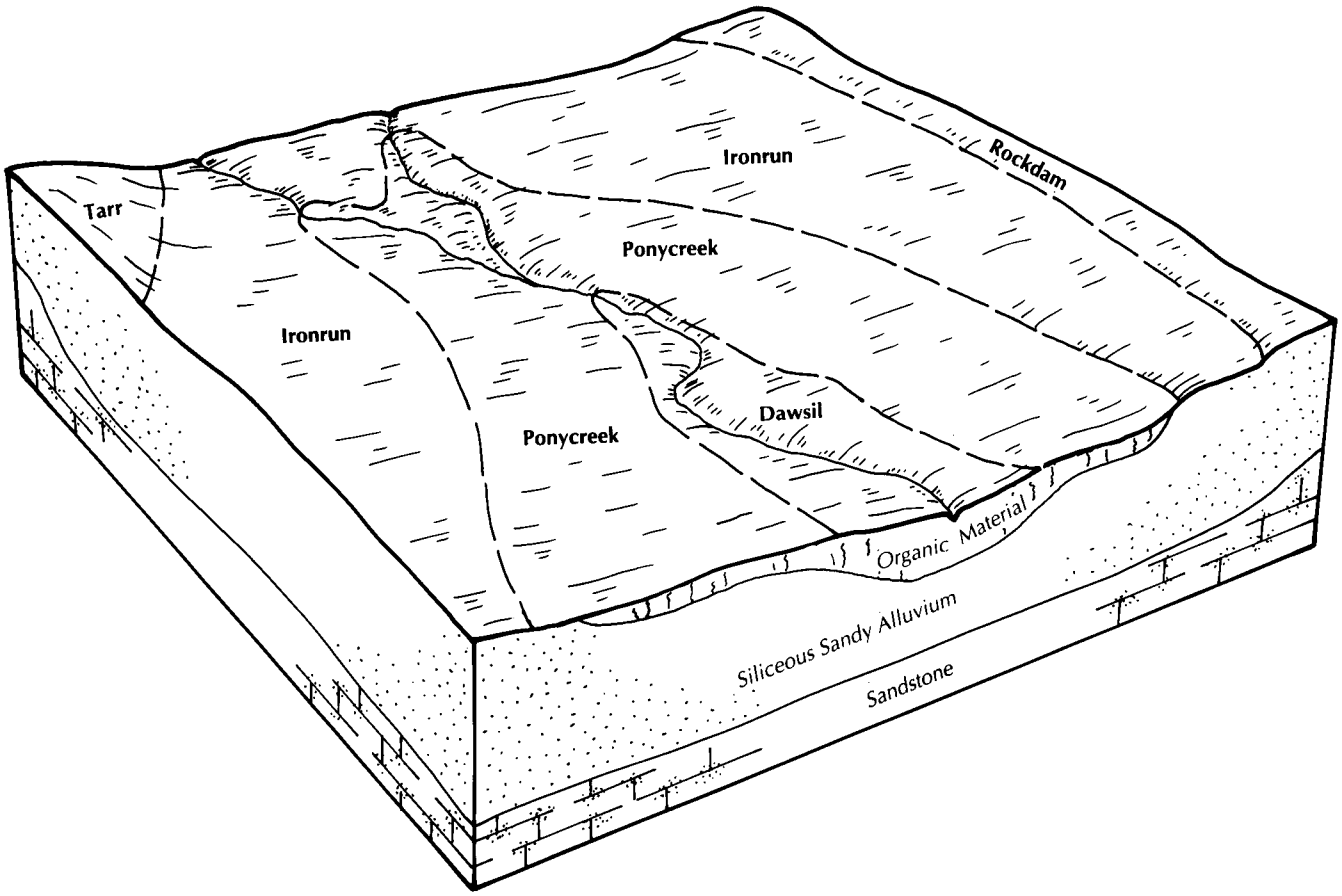

Figure 6.—Relationship of soils, topography, and parent material in the Ironrun-Ponycreek-Dawsil association.

Ironrun soils formed in siliceous sandy alluvium. They are somewhat poorly drained and are nearly level and gently sloping. Permeability is rapid or very rapid. The available water capacity is low. Typically, the surface layer is black sand about 2 inches thick covered by about 2 inches of very dark grayish brown mucky peat. The subsurface layer is gray sand about 8 inches thick. The subsoil is very friable sand about 18 inches thick. It is dark reddish brown in the upper part and mottled reddish brown and dark brown in the lower part. The substratum to a depth of about 60 inches is yellow, mottled sand.

Ponycreek soils formed in siliceous sandy alluvium. They are subject to ponding. They are poorly drained and nearly level. Permeability is rapid or very rapid. The available water capacity is low. Typically, the surface layer is black muck about 4 inches thick. The subsurface layer is black mucky sand about 2 inches thick. The subsoil is dark grayish brown and grayish brown, mottled, very friable sand about 23 inches thick. The substratum to a depth of about 60 inches is light yellowish brown sand.

Dawsil soils formed in organic material overlying siliceous sandy alluvium. They are subject to ponding. They are very poorly drained and nearly level. Permeability is moderately slow to moderately rapid in the organic layers and rapid in the sandy alluvium. The available water capacity is very high. Typically, the upper 20 inches is dark reddish brown and dark brown mucky peat. The next 20 inches is black muck. The substratum to a depth of about 60 inches is light brownish gray sand.

Some of the minor soils in this association are Boone, Loxley, Rockdam, and Tarr soils. The excessively drained Boone soils are in the highest positions. They formed in siliceous sandy residuum derived from the underlying sandstone. The very poorly drained Loxley soils are in positions on the landscape similar to those of the Dawsil soils. They formed in organic material more than 51 inches thick. The moderately well drained Rockdam and

excessively drained Tarr soils are slightly higher on the landscape than the Ironrun soils. They formed in siliceous sandy alluvium or residuum derived from sandstone.

Most areas of the Ironrun soils are wooded. A few areas are used as pasture or cropland. Most areas of the Ponycreek and Dawsil soils support native wetland vegetation or are forested. Ironrun soils are suited to trees. Ponycreek soils are suited to conifers but are poorly suited to most other trees. Dawsil soils are generally unsuited to trees, but they support stands of conifers in a few areas. Ironrun soils are suited to pasture but are poorly suited to cultivated crops, mainly because of wetness. Drained areas of the Ponycreek soils are poorly suited to cultivated crops, and undrained areas are generally unsuited. Dawsil soils are generally unsuited to pasture and cultivated crops because of the wetness and extremely acid reaction. If managed intensively, some areas of the Ponycreek and Dawsil soils are suited to cranberries and other specialty crops.

The Ironrun soils are poorly suited to septic tank absorption fields and dwellings, mainly because of the wetness. The Ponycreek and Dawsil soils are generally unsuited to these uses, mainly because of the wetness and the ponding.

8. Merrillan-Veedum-Humbird Association

Moderately deep, nearly level and gently sloping, moderately well drained to poorly drained, loamy and mucky soils; on pediments

Merrillan soils are on toe slopes. Veedum soils are in drainageways and depressions. Humbird soils are on summits and shoulders of knolls.

This association makes up about 6 percent of the county. It is about 40 percent Merrillan and similar soils, 30 percent Veedum and similar soils, 15 percent Humbird and similar soils, and 15 percent soils of minor extent (fig. 7).

Merrillan soils formed in loamy alluvium and in clayey residuum derived from the underlying interbedded sandstone and shale. These soils are somewhat poorly drained and are nearly level and gently sloping. Permeability is moderate or moderately rapid in the loamy alluvium, slow in the clayey residuum, and extremely slow to moderately slow in the underlying interbedded sandstone and shale. The available water capacity is low. Typically, the surface layer is very dark brown fine sandy loam about 3 inches thick covered by about 1 inch of very dark grayish brown mucky peat. The subsurface layer is grayish brown fine sandy loam about 2 inches thick. The subsoil is about 25 inches thick. The upper part is dark brown, friable fine sandy loam. The next part is dark brown, mottled, friable fine sandy loam. The lower part is pale brown, mottled, firm silty clay loam and light brownish gray, mottled, firm clay loam. The substratum to a depth of about 60 inches is weakly cemented interbedded sandstone and shale.

Veedum soils formed in silty alluvium and loamy residuum derived from the underlying interbedded sandstone and shale. They are poorly drained and nearly level. Permeability is moderate in the silty alluvium, moderately slow or moderate in the residuum, and extremely slow to moderately slow in the underlying interbedded sandstone and shale. The available water capacity is moderate. Typically, the surface layer is black muck about 3 inches thick. The subsurface layer is black silt loam about 6 inches thick. The subsoil is about 24 inches thick. It is dark grayish brown, mottled, friable silt loam in the upper part and grayish brown, mottled, firm clay loam in the lower part. The substratum to a depth of about 60 inches is weakly cemented interbedded sandstone and shale.

Humbird soils formed in loamy alluvium and in clayey residuum derived from the underlying interbedded sandstone and shale. These soils are moderately well drained and are nearly level and gently sloping. Permeability is moderate or moderately rapid in the loamy alluvium, slow in the clayey residuum, and extremely slow to moderately slow in the underlying interbedded sandstone and shale. The available water capacity is low. Typically, the surface layer is black fine sandy loam about 2 inches thick covered by about 1 inch of very dark grayish brown mucky peat. The subsurface layer is grayish brown fine sandy loam about 3 inches thick. The subsoil is about 24 inches thick. It is dark brown, very friable fine sandy loam in the upper part; reddish brown, firm silty clay in the next part; and light olive gray, mottled, firm silty clay in the lower part. The substratum to a depth of about 60 inches is weakly cemented interbedded sandstone and shale.

Some of the minor soils in this association are Citypoint, Dawsil, Elm Lake, Fairchild, Ludington, and Rockdam soils. The very poorly drained Citypoint and Dawsil soils are in the lowest positions on the landscape. Citypoint soils formed in organic material overlying interbedded sandstone and shale. Dawsil soils formed in organic material overlying siliceous sandy alluvium. The poorly drained Elm Lake soils are in positions similar to those of the Veedum soils. They formed in siliceous sandy alluvium overlying loamy residuum derived from the underlying

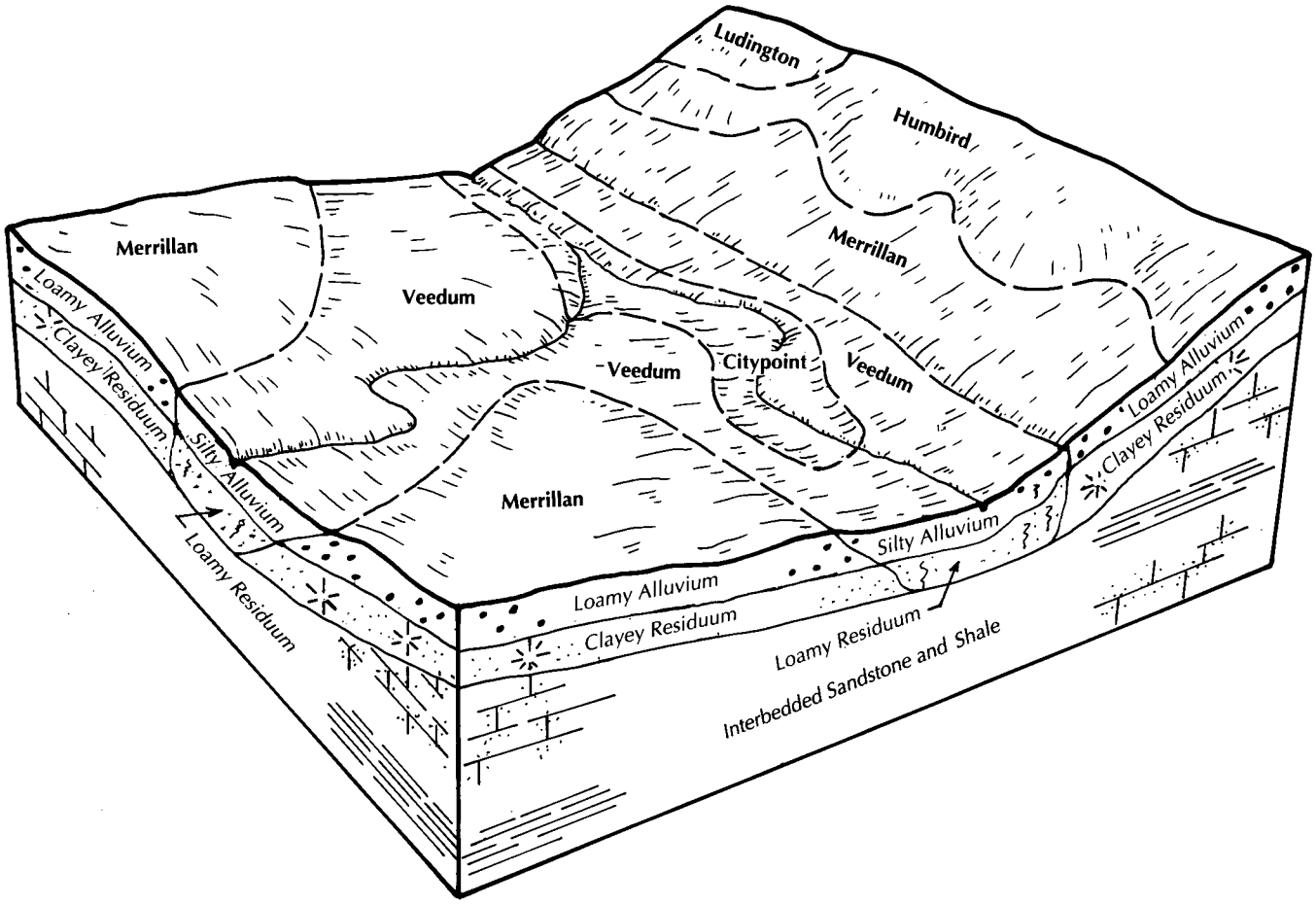

Figure 7.—Relationship of soils, topography, and parent material in the Merrillan-Veedum-Humbird association.

interbedded sandstone and shale. The somewhat poorly drained Fairchild soils are in positions similar to those of the Merrillan soils. They formed in siliceous sandy alluvium and loamy residuum derived from the underlying interbedded sandstone and shale. The moderately well drained Ludington and Rockdam soils are in positions similar to those of the Humbird soils. Ludington soils formed in siliceous sandy alluvium and in loamy residuum derived from the underlying interbedded sandstone and shale. Rockdam soils formed in siliceous sandy alluvium or residuum derived from sandstone.

Most areas of the Merrillan soils are wooded. A few areas are used as cropland or pasture. Most areas of the Veedum soils support native wetland vegetation. Most areas of the Humbird soils are used as cropland or pasture. A few areas are wooded. Merrillan and Humbird soils are suited to trees. Veedum soils are suited to some conifers but are poorly suited to most other trees. The Merrillan and Humbird soils are suited to pasture. The Humbird soils and drained areas of the Merrillan soils are suited to cultivated crops. The Veedum soils are generally unsuited to pasture and cultivated crops because of wetness and ponding.

The Merrillan and Humbird soils are generally poorly suited to septic tank absorption fields and dwellings, and the Veedum soils are generally unsuited to these uses, primarily because of the wetness and the thin layer over bedrock.

9. Loxley-Dawsil Association

Very deep, nearly level, very poorly drained, peaty soils; on lake plains, stream terraces, and pediments

These soils are in depressions. They are subject to frequent ponding.

This association makes up about 8 percent of the county. It is about 50 percent Loxley and similar soils,

40 percent Dawsil and similar soils, and 10 percent soils of minor extent.

Loxley soils formed in organic material more than 51 inches thick. Permeability is moderately slow to moderately rapid. The available water capacity is very high. Typically, the organic layers extend to a depth of more than 51 inches. The upper part is reddish brown peat about 4 inches thick, and the lower part is mostly black muck.

Dawsil soils formed in organic material overlying siliceous sandy alluvium. Permeability is moderately slow to moderately rapid in the organic layers and rapid in the sandy alluvium. The available water capacity is very high. Typically, the upper 20 inches is dark reddish brown and dark brown mucky peat. The next 20 inches is black muck. The substratum to a depth of about 60 inches is light brownish gray sand.

Some of the minor soils in this association are Boone, Ironrun, Ponycreek, Rockdam, and Tarr soils. The excessively drained Boone and Tarr soils are in the highest positions on the landscape. Boone soils are moderately deep. They formed in siliceous sandy residuum derived from the underlying sandstone. Tarr soils are very deep. They formed in siliceous sandy alluvium or residuum derived from sandstone. The somewhat poorly drained Ironrun and poorly drained Ponycreek soils are along the edges of depressions. They formed in siliceous sandy alluvium. The moderately well drained Rockdam soils are slightly higher on the landscape than the Ironrun soils. They formed in siliceous sandy alluvium or residuum derived from sandstone.

Most areas of the Loxley and Dawsil soils support wetland vegetation. The Loxley soils are suited to some conifers but are poorly suited to most other trees. The Dawsil soils are generally not suited to trees, but they support stands of conifers in a few areas. If managed intensively, some areas of the Loxley and Dawsil soils are suited to cranberries and other specialty crops.

These soils are generally unsuited to pasture, cultivated crops, septic tank absorption fields, and dwellings, mainly because of wetness and the frequent ponding.

10. Kert-Veedum Association

Moderately deep, nearly level and gently sloping, somewhat poorly drained and poorly drained, silty and mucky soils; on pediments

Kert soils are on toe slopes. Veedum soils are in drainageways and depressions.

This association makes up about 2 percent of the county. It is about 40 percent Kert and similar soils, 35 percent Veedum and similar soils, and 25 percent soils of minor extent.

Kert soils formed in loess and in residuum derived from the underlying interbedded sandstone and shale. They are somewhat poorly drained and are nearly level and gently sloping. Permeability is moderate in the loess, moderately slow or moderate in the residuum, and extremely slow to moderately slow in the underlying interbedded sandstone and shale. The available water capacity is moderate. Typically, the surface layer is black silt loam about 2 inches thick covered by about 1 inch of very dark grayish brown mucky peat. The subsurface layer is brown silt loam about 5 inches thick. The subsoil is about 23 inches thick. It is mottled. The upper part is a mixture of dark yellowish brown and brown, friable silt loam, and the lower part is olive gray, firm silty clay loam. The substratum to a depth of about 60 inches is weakly cemented interbedded sandstone and shale.

Veedum soils formed in silty alluvium and loamy residuum derived from the underlying interbedded sandstone and shale. They are poorly drained and nearly level. Permeability is moderate in the silty alluvium, moderately slow or moderate in the residuum, and extremely slow to moderately slow in the underlying interbedded sandstone and shale. The available water capacity is moderate. Typically, the surface layer is black muck about 3 inches thick. The subsurface layer is black silt loam about 6 inches thick. The subsoil is about 24 inches thick. It is dark grayish brown, mottled, friable silt loam in the upper part and grayish brown, mottled, firm clay loam in the lower part. The substratum to a depth of about 60 inches is weakly cemented interbedded sandstone and shale.

Some of the minor soils in this association are Humbird, Merrillan, and Citypoint soils. The moderately well drained Humbird soils are slightly higher on the landscape than the Kert soils. The somewhat poorly drained Merrillan soils are in positions similar to those of the Kert soils. Humbird and Merrillan soils formed in loamy alluvium and in clayey residuum derived from the underlying interbedded sandstone and shale. The very poorly drained Citypoint soils are in positions similar to those of the Veedum soils. They formed in organic material overlying interbedded sandstone and shale.

Most areas of the Kert soils are wooded or are used as cropland. Some areas are used for pasture. Most areas of the Veedum soils support native wetland vegetation. The Kert soils are suited to trees. The Veedum soils are suited to some conifers but are

poorly suited to most other trees. The Kert soils are suited to pasture and cultivated crops. The Veedum soils are generally unsuited to these uses, mainly because of wetness and ponding.

Mainly because of the wetness and the ponding, the Kert soils are poorly suited to septic tank absorption fields and dwellings and the Veedum soils are generally unsuited to these uses.

Detailed Soil Map Units

The map units delineated on the detailed maps in this survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses. More information about each map unit is given under the heading "Use and Management of the Soils."

A map unit delineation on a map represents an area dominated by one or more major kinds of soil or miscellaneous areas (USDA, National Soil Survey Handbook; USDA, 1993). A map unit is identified and named according to the taxonomic classification of the dominant soils or miscellaneous areas. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils and miscellaneous areas are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some "included" areas that belong to other taxonomic classes.

Most included soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, inclusions. They may or may not be mentioned in the map unit description. Other included soils and miscellaneous areas, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, inclusions. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The included areas of contrasting soils or miscellaneous areas are mentioned in the map unit descriptions. A few included areas may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of included areas in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans, but if intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives the principal hazards and limitations to be considered in planning for specific uses.

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

Soils of one series can differ in texture of the surface layer, slope, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases.* Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Boone sand, 6 to 15 percent slopes, is a phase of the Boone series.

Some map units are made up of two or more major soils. These map units are called complexes or undifferentiated groups.

A *complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils are somewhat similar in all areas. Humbird-Merrillan fine sandy loams, 0 to 6 percent slopes, is an example.

An *undifferentiated group* is made up of two or

more soils that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils in a mapped area are not uniform. An area can be made up of only one of the major soils, or it can be made up of all of them. Council and Seaton soils, 20 to 30 percent slopes, is an undifferentiated group in this survey area.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. The map unit "Pits" is an example.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

AbA—Absco loamy sand, 0 to 3 percent slopes

This very deep, nearly level and gently sloping, moderately well drained soil is on flood plains along rivers and large streams. It is subject to occasional flooding for brief periods. Individual areas are long and narrow and generally range from 5 to 80 acres in size.

Typically, the surface layer is dark brown loamy sand about 4 inches thick. The subsoil is brown, very friable sand about 10 inches thick. The upper part of the substratum is pale brown sand about 21 inches thick. The next part is about 7 inches thick. It is pale brown, mottled loamy sand that has thin strata of silt loam and fine sandy loam. The lower part of the substratum to a depth of about 60 inches is mottled, very pale brown sand. In places the surface layer is sand, loamy fine sand, or sandy loam.

Included with this soil in mapping are small areas of the poorly drained Kalmarville, somewhat poorly drained Northbend, and excessively drained Tarr soils. Also included are many areas of abandoned river and stream channels. Some are partially filled with water. Kalmarville and Northbend soils are in the lower positions on the landscape. They have more silt and clay in the surface layer and the upper part of the substratum than the Absco soil. Tarr soils are in the higher positions. Included areas make up 10 to 15 percent of the unit.

Permeability is rapid in the Absco soil. The available water capacity is low. The content of organic matter is low or moderately low in the surface layer. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content. An apparent seasonal high water table is at a depth of 3.5 to 6.0 feet.

Most areas are wooded. A few areas are used for pasture. This soil is generally not suited to crops because of the occasional flooding and the low available water capacity.

A cover of pasture plants is effective in controlling soil blowing. Also, it helps to control water erosion and scouring caused by flooding. Forage yields are generally low unless fertilizer is applied and adequate moisture is available. Planting early in the spring, before the soil has a chance to dry, helps to overcome the droughtiness. Later plantings are likely to have a poor survival rate. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Measures that improve fertility, proper stocking rates, and pasture rotation help to keep the pasture in good condition.

This soil is suited to trees, especially pines. The equipment limitation and seedling mortality are management concerns. Equipment use is restricted by the loose sand and the flooding. These restrictions can be reduced by using equipment during the winter when the surface is frozen and the flooding hazard is less severe. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Log landings and haul roads are subject to repeated use by heavy equipment. These areas can be established in better suited included or adjacent areas that are not subject to flooding. If they are established in areas of this soil, the loose sand can be stabilized with gravel or crushed rock. Culverts and ditches can be used along haul roads to maintain natural drainage systems. Seedling mortality caused by droughtiness can be reduced by careful planting of vigorous nursery stock or containerized seedlings. It can also be reduced by planting when the soil is moist. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or mechanical removal.

This soil generally is not suitable as a site for septic tank absorption fields, dwellings, or local roads, mainly because of the flooding. Overcoming this limitation is difficult. A better suited site should be considered.

The land capability classification is IVs. The woodland ordination symbol is 3S (Black oak). The primary forest habitat type commonly is PVRh, and the secondary forest habitat type is PVGy.

AcA—Absco-Northbend complex, 0 to 3 percent slopes

These soils are very deep and are nearly level and gently sloping. They are on flood plains along rivers and large streams (fig. 8). The moderately well drained Absco soil is subject to occasional flooding for brief periods. The somewhat poorly drained Northbend soil is frequently flooded for brief periods. The Absco and Northbend soils occur as areas so intricately mixed or so small that it was not practical to map them separately. Individual areas are long and narrow and range from 20 to 500 acres in size. They are about 40 to 60 percent Absco soil and 30 to 50 percent Northbend soil.

Typically, the surface layer of the Absco soil is dark brown loamy sand about 4 inches thick. The substratum extends to a depth of about 60 inches. It is yellowish brown and light yellowish brown sand in the upper part and light yellowish brown, mottled sand in the lower part. In places the surface layer is loamy fine sand, sand, or loamy sand.

Typically, the surface layer of the Northbend soil is dark brown silt loam about 7 inches thick. The subsoil is about 29 inches thick. It is mottled and is friable or very friable. The upper part is dark brown silt loam, the next part is dark brown loam, and the lower part is dark brown loamy fine sand. The substratum to a depth of about 60 inches is brown and very pale brown, mottled sand that has a few thin strata of dark

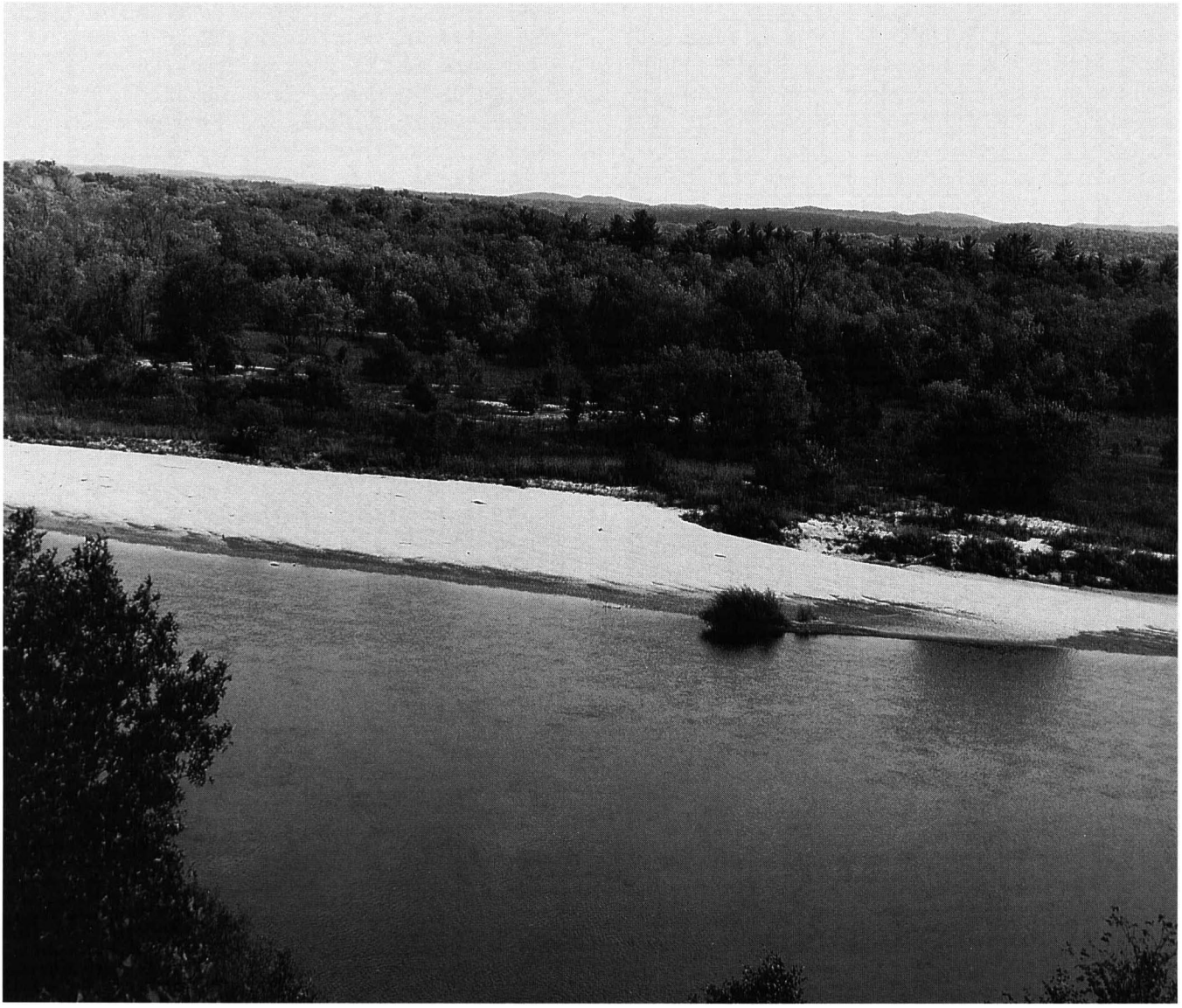

Figure 8.—An area of Absco-Northbend complex, 0 to 3 percent slopes, along the Black River.

brown loamy sand. In places the surface layer and the subsoil are mostly fine sandy loam.

Included with these soils in mapping are small areas of the poorly drained Kalmarville and excessively drained Tarr soils. Also included are many areas of abandoned river and stream channels. Some are partially filled with water. Kalmarville soils are in the lower positions on the landscape. They have a content of silt and clay similar to that of the Northbend soil. Tarr soils are in the higher positions. They have a sand content similar to that of the Absco soil. Included areas make up 5 to 25 percent of the unit.

Permeability is rapid in the Absco soil. It is moderate or moderately rapid in the silty and loamy alluvium in the Northbend soil and rapid in the sandy alluvium. The content of organic matter is low or moderately low in the surface layer of the Absco soil and moderate in the surface layer of the Northbend soil. The available water capacity is low in the Absco soil and moderate in the Northbend soil. An apparent seasonal high water table is at a depth of 3.5 to 6.0 feet in the Absco soil and at a depth of 1.0 to 2.0 feet in the Northbend soil. The rooting depth of most crops is limited by the seasonal high water table in the Northbend soil during wet periods of the growing season.

Most areas of these soils are wooded. Some areas are used as pasture or cropland. The Absco soil generally is not suited to crops because of the flooding and the low available water capacity. The Northbend soil is poorly suited to row crops unless it is protected from flooding. Dikes and diversions help to prevent flooding in areas of both soils. Land smoothing, a surface drainage system, and interception drains help to remove excess water in areas of the Northbend soil. Returning crop residue or other organic material to the soil reduces the amount of water lost through evaporation, increases the rate of water infiltration, maintains fertility and good tilth, and helps to control soil blowing, erosion, and scouring by floodwater.

A cover of pasture plants is effective in controlling soil blowing on the Absco soil. It also helps to control erosion and scouring on the Absco and Northbend soils during periods of flooding. Forage yields in areas of the Absco soil are generally low unless fertilizer is applied and adequate moisture is available. Planting early in spring, before the soil has a chance to dry, helps to overcome the droughtiness. Later plantings are likely to have a poor survival rate. The Northbend soil is poorly suited to pasture unless it is protected from flooding and wetness. Overgrazing when the soils are wet can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species and increases the hazard of erosion and scouring by floodwater. Measures that improve fertility, proper stocking rates, pasture rotation, and restricted use during wet periods help to keep the pasture in good condition.

These soils are suited to trees. The equipment limitation is a management concern. Also, seedling mortality is a concern on the Absco soil. Equipment use is restricted by the flooding and the loose sand in areas of the Absco soil and by the flooding and the wetness in areas of the Northbend soil. These restrictions can be reduced by using equipment during the winter when the surface is frozen and the flooding hazard is less severe. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Log landings and haul roads are subject to repeated use by heavy equipment. These areas can be established in better suited included or adjacent areas not subject to flooding. If they are established in areas of these soils, they can be stabilized and strengthened with gravel or crushed rock. Also, culverts and ditches can be used along haul roads to maintain natural drainage systems. Competing vegetation on the Northbend soil, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or mechanical removal.

This map unit generally is not suitable as a site for septic tank absorption fields, dwellings, or local roads, mainly because of the flooding. Overcoming this limitation is difficult. A better suited site should be considered.

The land capability classification is IVw. The woodland ordination symbol is 3S (Black oak) for the Absco soil and 2W (Silver maple) for the Northbend soil. The forest habitat type commonly is PVRh for the Absco soil and ArCi for the Northbend soil.

Ad—Adder muck, 0 to 1 percent slopes

This very deep, nearly level, very poorly drained soil is in backswamps on flood plains. It is subject to ponding and to frequent flooding for long periods. Individual areas are long and narrow or irregularly shaped and generally range from 5 to 100 acres in size.

Typically, the upper part is about 22 inches of black muck. The substratum to a depth of about 60 inches is light brownish gray sand.

Included with this soil in mapping are small areas of the poorly drained Kalmarville and Newlang soils

and the very poorly drained Houghton soils. Kalmarville and Houghton soils are in positions on the landscape similar to those of the Adder soil. Kalmarville soils formed in recent loamy alluvium over sandy alluvium. Houghton soils formed in organic material more than 51 inches thick. Newlang soils are in the slightly higher positions on the landscape. They formed dominantly in siliceous sandy alluvium. Included soils make up 5 to 15 percent of the unit.

Permeability is moderately slow to moderately rapid in the organic layers of the Adder soil and rapid or very rapid in the substratum. The available water capacity and the content of organic matter are very high. The rooting depth of most crops is limited by an apparent seasonal high water table, which is near or above the surface in undrained areas.

Most areas support wetland vegetation. Because of the wetness, the frequent flooding, and the hazard of frost late in spring and early in fall, this soil is generally not suited to cultivated crops or to pasture. If drained and protected from flooding, cultivated areas are subject to burning and subsidence. Also, they are subject to soil blowing. If intensive management is applied, a few areas of this soil are suited to specialty crops.

Generally, this soil is not suited to trees. In most areas the trees grow so poorly that they are barely merchantable. In a few areas, however, there are merchantable stands of conifers. The equipment limitation, seedling mortality, and the windthrow hazard are management concerns. Overcoming these limitations is difficult. A more suitable site should be selected.

This soil generally is not suitable as a site for septic tank absorption fields, dwellings, or local roads and streets because of the subsidence, the flooding, and the ponding. Overcoming these hazards is difficult. A better suited site should be considered.

The land capability classification is Vw in undrained areas. No woodland ordination symbol or forest habitat type is assigned.

ArA—Arenzville silt loam, 0 to 3 percent slopes

This very deep, nearly level and gently sloping, moderately well drained soil is in intermittent upland drainageways and on flood plains along small perennial streams. It is occasionally flooded for brief periods. Individual areas are long and narrow and generally range from 5 to 40 acres in size.

Typically, the surface layer is dark brown silt loam about 9 inches thick. The upper part of the substratum is stratified, dark brown and brown silt loam about 23 inches thick. Below this is a buried surface layer of very dark brown silt loam about 10 inches thick. The lower part of the substratum to a depth of about 60 inches is light brownish gray, mottled silt loam that has a few thin lenses of fine sand. In some places the surface layer is very fine sandy loam. In other places the lower part of the substratum contains thin strata of sand and does not have a buried layer. In some areas the slope is more than 3 percent.

Included with this soil in mapping are small areas of the poorly drained Ettrick and somewhat poorly drained Orion soils. These soils are in the slightly lower positions on the landscape. They make up 5 to 15 percent of the unit.

Permeability is moderate in the Arenzville soil. The available water capacity is very high. The content of organic matter is moderately low or moderate in the surface layer. The surface layer is friable and can be easily tilled, but it tends to crust and puddle after hard rains or forms hard clods if it is tilled when too wet. A perched seasonal high water table is at a depth of 3.5 to 6.0 feet.

Most areas are used as cropland. A few areas are used as pasture, and very few areas are wooded. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, the hazard of water erosion is generally slight but some scour erosion occurs near streams. Dikes and diversions help to prevent flooding. Applying streambank stabilization measures and fencing cattle away from the streams help to prevent streambank and scour erosion. Applying a system of conservation tillage and returning crop residue to the soil or adding other organic material can help to maintain fertility and good tilth, increase the rate of water infiltration, and reduce the hazard of scouring by floodwater.

A cover of pasture plants is effective in controlling scouring by floodwater. The surface layer is subject to crusting, which restricts the emergence of plants. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

This soil is suited to trees. Equipment use at log landings and on haul roads is restricted by the flooding and by low soil strength. These restrictions can be reduced by using equipment during dry

periods or during periods when the soil is frozen or has adequate snow cover. Log landings and haul roads can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Competing vegetation, which interferes with tree planting and natural regeneration after trees are harvested, can be controlled by herbicides or by mechanical removal.

This soil generally is not suitable as a site for septic tank absorption fields, dwellings, or local roads and streets, mainly because of the flooding. Overcoming this limitation is difficult. A better suited site should be considered.

The land capability classification is IIw. The woodland ordination symbol is 4A (Northern red oak). The forest habitat type commonly is ArCi.

BeB—Bertrand silt loam, 1 to 6 percent slopes

This very deep, nearly level and gently sloping, well drained soil is on broad toe slopes and low knolls. Individual areas are irregular in shape and generally range from 4 to 30 acres in size.

Typically, the surface layer is dark brown silt loam about 9 inches thick. The subsoil is about 39 inches thick. It is dark yellowish brown, friable silt loam in the upper part; dark brown and brown, friable silt loam in the next part; and dark brown, friable fine sandy loam in the lower part. The substratum to a depth of about 60 inches is mostly yellow sand. In places the slope is more than 6 percent.

Included with this soil in mapping are small areas of the moderately well drained Jackson and well drained Merit soils. Jackson soils are in the slightly lower positions on the landscape. Merit soils are in positions similar to those of the Bertrand soil. They have more sand in the surface layer and subsoil than the Bertrand soil, and the depth to the sandy substratum is less than 40 inches. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate in the silty subsoil of the Bertrand soil and rapid in the sandy substratum. The available water capacity is high. The content of organic matter is moderately low or moderate in the surface layer. The surface layer is friable and can be easily tilled, but it tends to crust and puddle after hard rains or forms hard clods if tilled when too wet.

Most areas are used as cropland. Very few areas are wooded. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, water erosion is a slight or moderate hazard. It can be controlled by terraces, grassed waterways, contour farming, contour stripcropping, and conservation tillage. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and reduces the hazard of erosion.

A cover of pasture plants is effective in controlling erosion. The surface layer is subject to crusting, which restricts the emergence of plants. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

This soil is suited to trees. Equipment use at log landings and on haul roads is restricted by low soil strength. This restriction can be reduced by using equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or mechanical removal.

Because of the restricted permeability in the subsoil, this soil is only moderately suited to septic tank absorption fields. This limitation can be overcome by constructing a filtering mound of suitable material or by increasing the size of the absorption field.

Because of the potential for shrinking and swelling, this soil is only moderately suited to dwellings. This limitation can be overcome by excavating the soil and replacing it with coarse textured material, such as sand or gravel; by strengthening the basement walls; and by installing a subsurface drainage system around the dwellings at or below the basement elevation.

Because of the low strength and the potential for frost action, this soil is poorly suited to local roads and streets. These limitations can be overcome by replacing the upper part of the soil with coarse textured base material, such as sand or gravel. The low strength can also be overcome by increasing the thickness of the pavement or base material.

The land capability classification is IIe. The woodland ordination symbol is 5A (Northern red oak). The forest habitat type commonly is ArCi.

BkA—Bilmod sandy loam, 0 to 3 percent slopes

This very deep, nearly level and gently sloping, moderately well drained soil is on toe slopes and in slight depressions and drainageways. Individual areas are irregular in shape and generally range from 5 to 70 acres in size.

Typically, the surface layer is dark brown sandy loam about 9 inches thick. The subsoil is about 23 inches thick. It is dark brown, friable sandy loam in the upper part; dark brown, friable loam in the next part; and strong brown, very friable loamy sand in the lower part. The substratum to a depth of about 60 inches is reddish yellow, mottled sand. In places the surface layer is loamy sand or fine sandy loam. In some areas the substratum has thin strata of loamy material.

Included with this soil in mapping are small areas of the well drained Bilson and moderately well drained Merimod soils. Bilson soils are in the slightly higher positions on the landscape. Merimod soils are in positions similar to those of the Bilmod soil. They have more silt and clay in the surface layer and subsoil than the Bilmod soil. Included soils make up 5 to 10 percent of the unit.

Permeability is moderate or moderately rapid in the loamy mantle in the Bilmod soil and rapid in the substratum. The available water capacity is moderate. The content of organic matter is moderately low in the surface layer. The surface layer is friable and can be easily tilled throughout a wide range in moisture content. The rooting depth of most crops is limited by the sandy substratum. An apparent seasonal high water table is at a depth of 3.5 to 6.0 feet.

Most areas are used as cropland. A few areas are used as pasture, and very few areas are wooded. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, water erosion is a slight or moderate hazard. Also, the soil is subject to soil blowing. Conservation tillage, winter cover crops, and field windbreaks help to prevent excessive soil loss. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and helps to control erosion and soil blowing.

A cover of pasture plants is effective in controlling erosion and soil blowing. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, measures that improve fertility, and pasture rotation help to keep the pasture in good condition.

This soil is suited to trees. The only soil-related management concern is competing vegetation, which interferes with tree planting and natural regeneration after trees are harvested. Plant competition can be controlled by herbicides or by mechanical removal.

This soil readily absorbs the effluent in septic tank absorption fields. It does not adequately filter the effluent, however, because of the rapid permeability in the substratum. The poor filtering capacity can result in the pollution of ground water. Wetness also is a limitation. Mounding the site with suitable filtering material helps to overcome the wetness and the poor filtering capacity. Also, the effluent can be pumped to an absorption field in a nearby area of a better suited soil.

This soil is suited to dwellings without basements. Because of the wetness, however, it is only moderately suited to dwellings with basements. The wetness can be overcome by installing tile drains around the foundations and providing gravity outlets or other dependable outlets and by constructing the foundations on coarse textured fill material above the level of wetness.

Because of the potential for frost action, this soil is only moderately suited to local roads and streets. Replacing the upper part of the soil with coarse textured base material, such as sand or gravel, helps to prevent the damage caused by frost action.

The land capability classification is IIIs. The woodland ordination symbol is 4A (Northern red oak). The primary forest habitat type commonly is ArDe-V, and the secondary forest habitat type is PVCr.

BlB—Bilson sandy loam, 0 to 6 percent slopes

This very deep, nearly level and gently sloping, well drained soil is on toe slopes and low knolls. Individual areas are irregular in shape and generally range from 5 to 100 acres in size.

Typically, the surface layer is very dark brown sandy loam about 8 inches thick. The subsoil is dark yellowish brown, dark brown, and strong brown, friable sandy loam about 24 inches thick. The substratum to a depth of about 60 inches is brownish yellow sand that has a few thin strata of dark brown loamy sand. In places the surface layer is fine sandy loam or loamy sand. In some areas the slope is more than 6 percent.

Included with this soil in mapping are small areas

of the moderately well drained Bilmod, somewhat excessively drained Gosil, and well drained Merit soils. Bilmod soils are in the lower positions on the landscape. Gosil and Merit soils are in positions similar to those of the Bilson soil. Gosil soils have more sand in the surface layer and subsoil than the Bilson soil, and Merit soils have more silt and clay in the surface layer and subsoil. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate or moderately rapid in the loamy mantle in the Bilson soil and rapid in the substratum. The available water capacity is moderate. The content of organic matter is moderately low in the surface layer. The surface layer is friable and can be easily tilled throughout a wide range in moisture content. The rooting depth of most crops is limited by the sandy substratum.

Most areas are used as cropland. A few areas are used as pasture, and very few areas are wooded. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. In most years crop yields are somewhat limited by the moderate available water capacity. If irrigated, the soil is also suited to vegetables, such as snap beans, potatoes, sweet corn, and peas. If cultivated crops are grown, water erosion is a slight or moderate hazard. Also, the soil is subject to soil blowing. Conservation tillage, winter cover crops, and field windbreaks help to prevent excessive soil loss. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and helps to control erosion and soil blowing.

A cover of pasture plants is effective in controlling water erosion and soil blowing. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, measures that improve fertility, and pasture rotation help to keep the pasture in good condition.

This soil is suited to trees. The only soil-related management concern is competing vegetation, which interferes with tree planting and natural regeneration after trees are harvested. Plant competition can be controlled by herbicides or by mechanical removal.

This soil readily absorbs the effluent in septic tank absorption fields. It does not adequately filter the effluent, however, because of the rapid permeability in the substratum. The poor filtering capacity can result in the pollution of ground water.

This soil is suited to dwellings. It is only moderately suited to local roads and streets because of the potential for frost action. Replacing the upper part of the soil with coarse textured base material, such as sand or gravel, helps to prevent the damage caused by frost action.

The land capability classification is IIIs. The woodland ordination symbol is 4A (Northern red oak). The primary forest habitat type commonly is ArDe-V, and the secondary forest habitat type is PVCr.

BnB—Bilson-Silverhill sandy loams, 1 to 6 percent slopes

These soils are well drained and are nearly level and gently sloping. The Bilson soil is very deep. It is on low knolls and toe slopes. The Silverhill soil is deep. It is on the tops and shoulders of hills. The Bilson and Silverhill soils occur as areas so intricately mixed or so small that it was not practical to map them separately. Individual areas are irregular in shape and generally range from 10 to 200 acres in size. They are about 50 to 55 percent Bilson soil and 30 to 40 percent Silverhill soil.

Typically, the surface layer of the Bilson soil is very dark grayish brown sandy loam about 9 inches thick. The subsoil is mostly brown, friable sandy loam about 19 inches thick. The substratum to a depth of about 60 inches is yellowish brown sand that has a few thin strata of brown and strong brown sandy loam and loamy sand. In places the surface layer is fine sandy loam or loamy sand. In some areas the loamy mantle is more than 40 inches thick. In other areas the substratum is stratified sand, sandy loam, loam, and silt loam.

Typically, the surface layer of the Silverhill soil is very dark grayish brown sandy loam about 8 inches thick. The subsoil is about 24 inches thick. It is dark yellowish brown and dark brown, friable sandy loam in the upper part and strong brown, loose sand in the lower part. The upper part of the substratum is brownish yellow sand about 18 inches thick. It has a few thin strata of dark brown sandy loam. The lower part of the substratum to a depth of about 60 inches is weakly cemented sandstone. In places, the surface layer is loam and the substratum does not have loamy strata.

Included with these soils in mapping are small areas of the well drained Elevasil and Merit soils and the somewhat excessively drained Gosil soils. Also included are a few areas where the slope is more than 6 percent. Elevasil soils are in positions similar to those of the Silverhill soil. They are underlain by sandstone at a depth of less than 40 inches. Gosil and Merit soils are in positions similar to those of the

Bilson soil. They are sandy throughout. Merit soils have more clay and less sand than the major soils. Included areas make up 5 to 15 percent of the unit.

Permeability is moderate or moderately rapid in the loamy mantle in the Bilson soil and rapid in the substratum. It is moderate or moderately rapid in the loamy colluvium in the Silverhill soil, rapid in the sandy residuum, and moderately slow or moderate in the underlying sandstone. The available water capacity is moderate in both soils. The content of organic matter is moderately low in the surface layer. The surface layer of both soils is friable and can be easily tilled throughout a wide range in moisture content. The rooting depth of most crops is limited by the sandy substratum in both soils.

Most areas are used as cropland. A few areas are used as pasture, and very few areas are wooded. These soils are suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. In most years crop yields are somewhat limited by the moderate available water capacity. If irrigated, the soils are also suited to vegetables, such as snap beans, potatoes, sweet corn, and peas. If cultivated crops are grown, water erosion is a slight or moderate hazard. Also, the soils are subject to soil blowing. Conservation tillage, winter cover crops, and field windbreaks help to prevent excessive soil loss. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and helps to control erosion and soil blowing.

A cover of pasture plants is effective in controlling water erosion and soil blowing. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, measures that improve fertility, and pasture rotation help to keep the pasture in good condition.

These soils are suited to trees. The only soil-related management concern is competing vegetation, which interferes with tree planting and natural regeneration after trees are harvested. Plant competition can be controlled by herbicides or by mechanical removal.

These soils are suited to dwellings. They readily absorb the effluent in septic absorption fields. They do not adequately filter the effluent, however, because of the rapid permeability in the substratum. The poor filtering capacity can result in the pollution of ground water. The absorption field functions better if the site is mounded with suitable filtering material.

These soils are only moderately suited to local roads and streets because of the potential for frost action. Replacing the upper part of the soil with coarse textured base material, such as sand or gravel, helps to prevent the damage caused by frost action.

The land capability classification is IIIs. The woodland ordination symbol is 4A (Northern red oak). The forest habitat type commonly is ArDe-V.

BnC2—Bilson-Elevasil sandy loams, 6 to 12 percent slopes, eroded

These soils are sloping and are well drained. The Bilson soil is very deep. It is on foot slopes and head slopes. The Elevasil soil is moderately deep. It is on nose slopes and shoulder slopes of hills. The Bilson and Elevasil soils occur as areas so intricately mixed or so small that it was not practical to map them separately. Individual areas are irregular in shape and generally range from 10 to 80 acres in size. They are about 45 to 55 percent Bilson soil and 35 to 45 percent Elevasil soil. In most cultivated areas, erosion has removed much of the original surface layer of both soils.

Typically, the surface layer of the Bilson soil is dark brown sandy loam about 9 inches thick. It is mixed with some brown subsoil material. The subsoil is mostly brown and strong brown, very friable sandy loam about 15 inches thick. The substratum to a depth of about 60 inches is yellow and brownish yellow sand that has few strata of brown and yellowish red sandy loam and loam. In places the surface layer is fine sandy loam or loamy sand. In some areas the substratum is stratified sand, sandy loam, loam, or silt loam.

Typically, the surface layer of the Elevasil soil is dark brown sandy loam about 9 inches thick. It is mixed with some brown subsoil material. The subsoil is about 18 inches thick. The upper part is brown, friable sandy loam, and the lower part is strong brown, very friable loamy sand. The upper part of the substratum is strong brown sand about 5 inches thick. The lower part to a depth of about 60 inches is weakly cemented sandstone. In places the surface layer is fine sandy loam.

Included with these soils in mapping are small areas of the well drained Council soils, the somewhat excessively drained Gosil soils, the well drained Merit soils, the moderately well drained Sebbo soils, and the well drained Silverhill soils. Also included are some areas where the slope is less than 6 percent or more than 12 percent. Council, Merit, and Gosil soils are in positions similar to those of the Bilson soil. Council soils are loamy throughout. Merit soils have

more clay and silt in the solum than the Bilson soil. Gosil soils are sandy throughout. Sebbo soils are in the lower positions on toe slopes. They are loamy throughout. Silverhill soils are in positions similar to those of the Elevasil soil. They are deep to weakly cemented sandstone. Included areas make up 5 to 15 percent of the unit.

Permeability is moderate or moderately rapid in the loamy mantle in the Bilson soil and rapid in the substratum. It is moderate or moderately rapid in the loamy colluvium in the Elevasil soil, rapid in the sandy residuum, and moderately slow or moderate in the underlying sandstone. The available water capacity is moderate in the Bilson soil and low in the Elevasil soil. The content of organic matter is moderately low in the surface layer of both soils. The surface layer is friable and can be easily tilled throughout a wide range in moisture content. The rooting depth of most crops is limited by the sandy substratum in the Bilson soil and by the underlying sandstone in the Elevasil soil.

Most areas are used as cropland. A few areas are used as pasture or woodland. These soils are suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. In most years crop yields are somewhat limited by the moderate or low available water capacity. The soils are poorly suited to irrigation because of the slope. If cultivated crops are grown, water erosion is a moderate hazard. Also, the soils are subject to soil blowing. Conservation tillage, field windbreaks, contour farming, and contour stripcropping help to prevent excessive soil loss. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and helps to control erosion and soil blowing.

A cover of pasture plants is effective in controlling water erosion and soil blowing. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, measures that improve fertility, and pasture rotation help to keep the pasture in good condition.

These soils are suited to trees. Equipment use at log landings is restricted by the slope. Log landings can be established in nearly level or gently sloping included or adjacent areas. Competing vegetation, which interferes with tree planting and natural regeneration after trees are harvested, can be controlled by herbicides or by mechanical removal.

The Bilson soil readily absorbs the effluent in septic tank absorption fields. It does not adequately filter the effluent, however, because of the rapid permeability in the substratum. The poor filtering capacity can result in the pollution of ground water. The Elevasil soil is poorly suited to septic tank absorption fields because of the thin layer over bedrock and the poor filtering capacity. The absorption field can function adequately if the site is mounded with suitable filtering material.

Because of the slope, these soils are only moderately suited to dwellings. This limitation can be overcome by cutting and filling, by installing retaining walls, or by designing the dwellings so that one side of the basement fronts on the lower part of the slope. Also, the dwellings can be constructed in the included areas where the slope is less than 6 percent.

Because of the slope and the potential for frost action, these soils are only moderately suited to local roads and streets. The slope can be overcome by shaping the roadway through cutting and filling. Also, the roads can be built in the less sloping areas. Replacing the upper part of the soil with coarse textured base material, such as sand or gravel, helps to prevent the damage caused by frost action.

The land capability classification is IIIe. The woodland ordination symbol is 4A (Northern red oak) for the Bilson soil and 2A (Black oak) for the Elevasil soil. The forest habitat type commonly is ArDe-V for the Bilson soil and PVCr for the Elevasil soil.

BnD2—Bilson-Elevasil sandy loams, 12 to 20 percent slopes, eroded

These soils are moderately steep and are well drained. The Bilson soil is very deep. It is on foot slopes and head slopes. The Elevasil soil is moderately deep. It is on nose slopes, shoulder slopes, and back slopes of hills. The Bilson and Elevasil soils occur as areas so intricately mixed or so small that it was not practical to map them separately. Individual areas are irregular in shape and generally range from 10 to 80 acres in size. They are about 45 to 55 percent Bilson soil and 30 to 40 percent Elevasil soil. In most cultivated areas, erosion has removed much of the original surface layer of both soils.

Typically, the surface layer of the Bilson soil is dark brown sandy loam about 9 inches thick. It is mixed with some brown subsoil material. The subsoil is about 30 inches thick. It is brown and friable. The upper part is sandy loam, and the lower part is loamy sand. The substratum to a depth of about 60 inches is yellowish brown sand that has few strata of strong brown and reddish brown sandy loam and loam. In

places the surface layer is fine sandy loam or loamy sand. In some areas the substratum does not have loamy strata.

Typically, the surface layer of the Elevasil soil is dark brown sandy loam about 9 inches thick. It is mixed with some brown subsoil material. The subsoil is about 17 inches thick. The upper part is brown, friable sandy loam, and the lower part is strong brown, very friable loamy sand. The upper part of the substratum is strong brown sand about 4 inches thick. The lower part to a depth of about 60 inches is weakly cemented sandstone. In places the surface layer is fine sandy loam.

Included with these soils in mapping are small areas of the well drained Council, Merit, Silverhill, and Seaton soils. Also included are some areas where the slope is less than 6 percent or more than 12 percent. Council and Merit soils are in positions similar to those of the Bilson soil. Council soils are loamy throughout and are very deep to sandstone. Merit soils have more clay and silt in the solum than the Bilson soil. Silverhill and Seaton soils are in positions similar to those of the Elevasil soil. Silverhill soils are deep to weakly cemented sandstone. Seaton soils have more silt and clay in the solum than the Elevasil soil. Also, they are very deep. Included areas make up 5 to 15 percent of the unit.

Permeability is moderate or moderately rapid in the loamy mantle in the Bilson soil and rapid in the substratum. It is moderate or moderately rapid in the loamy mantle in the Elevasil soil, rapid in the sandy part of the subsoil and in the substratum, and moderately slow or moderate in the underlying sandstone. The available water capacity is moderate in the Bilson soil and low in the Elevasil soil. The content of organic matter is moderately low in the surface layer of both soils. The surface layer of both soils is friable and can be easily tilled throughout a wide range in moisture content. The rooting depth of most crops is limited by the sandy substratum in the Bilson soil and by the underlying sandstone in the Elevasil soil.

Most areas are used as cropland. A few areas are used as pasture or woodland. These soils are suited to corn and small grain and to grasses and legumes for hay and pasture. In most years crop yields are somewhat limited by the moderate or low available water capacity. The soils are not suited to irrigation because of the slope. If cultivated crops are grown, water erosion is a severe hazard. Also, the soils are subject to soil blowing. Contour farming, contour stripcropping, crop rotations that include grasses and legumes, and conservation tillage help to prevent excessive soil loss. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and helps to control erosion and soil blowing.

A cover of pasture plants is effective in controlling erosion and soil blowing. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, and measures that improve fertility help to keep the pasture in good condition.

These soils are suited to most trees. The erosion hazard and the equipment limitation are management concerns. Erosion is accelerated where runoff is concentrated on skid trails, log landings, and haul roads. Removing water with water bars, establishing out-sloping road surfaces, crowning the road surfaces, providing ditches and culverts, and establishing skid trails and haul roads on the contour minimize erosion. Erosion can also be controlled by seeding areas where logging activities have exposed the surface.

Equipment use is restricted by the slope. Skid trails and haul roads can be designed so that they conform to the topography and so that grades are kept as low as possible. Log landings can be established in nearly level or gently sloping included or adjacent areas. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or mechanical removal.

Because of the poor filtering material and the slope, the Bilson soil is poorly suited to septic tank absorption fields. This soil readily absorbs but does not adequately filter the effluent. The poor filtering capacity can result in the pollution of ground water. The slope can be overcome by installing a trench absorption system on the contour or in included or adjacent areas that have slopes of less than 6 percent. Because of the thin layer over bedrock, a poor filtering capacity, and the slope, the Elevasil soil generally is not suitable as a site for septic tank absorption fields.

Because of the slope, these soils are poorly suited to dwellings. This limitation can be overcome by cutting and filling, by installing retaining walls, or by designing the dwellings so that one side of the basement fronts on the lower part of the slope. Also, the dwellings can be constructed in the included areas where the slope is less than 6 percent.

Because of the slope, these soils are poorly suited to local roads and streets. This limitation can be overcome by shaping the roadway through cutting

and filling. Also, the roads can be built in the less sloping included areas.

The land capability classification is IVe. The woodland ordination symbol is 4R (Northern red oak) for the Bilson soil and 2R (Black oak) for the Elevasil soil. The forest habitat type commonly is ArDe-V for the Bilson soil and PVCr for the Elevasil soil.

BoB—Boone sand, 2 to 6 percent slopes

This moderately deep, gently sloping, excessively drained soil is on low knolls and summits of narrow ridges and hills. Individual areas are long and narrow and generally range from 4 to 60 acres in size.

Typically, the surface layer is dark brown sand about 8 inches thick. The subsoil is strong brown and dark yellowish brown sand about 14 inches thick. The upper part of the substratum is yellowish brown sand about 16 inches thick. The lower part to a depth of about 60 inches is weakly cemented sandstone. In places the surface layer is loamy sand or fine sand. In some areas the substratum has thin strata of loamy material. In other areas the slope is more than 6 percent.

Included with this soil in mapping are small areas of the somewhat excessively drained Elevasil and excessively drained Tarr soils. Elevasil soils are in positions on the landscape similar to those of the Boone soil. They have more silt and clay in the surface layer and subsoil than the Boone soil. Tarr soils are in the lower positions on the landscape. They are underlain by sand to a depth of 60 inches or more. Included soils make up 10 to 15 percent of the unit.

Permeability is rapid in the sandy subsoil and substratum of the Boone soil and moderately slow or moderate in the underlying sandstone. The available water capacity is low. The content of organic matter is very low or low in the surface layer. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content. The rooting depth of most crops is limited by the underlying sandstone.

Most areas are used as cropland. Some areas are planted to pine trees, and a few areas are used as pasture. This soil is poorly suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. In most years crop yields are limited by the low available water capacity. If irrigated, the soil is suited to the commonly grown farm crops and to vegetables, such as snap beans and sweet corn. If cultivated crops are grown, water erosion is a slight hazard. Also, the soil is subject to soil blowing. Winter cover crops, conservation tillage, wind stripcropping, and field windbreaks help to prevent excessive soil loss. Returning crop residue to the soil or adding other organic material reduces the amount of water lost through evaporation, helps to maintain fertility and good tilth, and reduces the hazard of soil blowing.

A cover of pasture plants is effective in controlling soil blowing and water erosion. Forage yields are generally low unless fertilizer is applied and the supply of moisture is adequate. Planting early in spring, before the soil has a chance to dry, helps to overcome the droughtiness. Later plantings are likely to have a poor survival rate. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Measures that improve fertility, proper stocking rates, and pasture rotation help to keep the pasture in good condition.

This soil is poorly suited to hardwood trees, which grow slowly and are poorly shaped. It is better suited to pine trees. The equipment limitation and seedling mortality are management concerns. Equipment use is restricted by the loose sand. This restriction can be reduced by using equipment when the surface is frozen. Equipment with flotation tires or with tracks has better traction in loose sand than standard wheeled equipment. Sandy areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be stabilized with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Seedling mortality caused by droughtiness can be reduced by careful planting of containerized seedlings or vigorous nursery stock. It can also be reduced by planting when the soil is moist. Although production of merchantable hardwood trees on this soil may not be profitable, the use of trees to control soil blowing and water erosion can be very effective.

This soil is suited to dwellings and local roads and streets. Because of a thin layer over bedrock and a poor filtering capacity, the soil is poorly suited to septic tank absorption fields. These limitations can result in the pollution of ground water. Mounding the site with suitable filtering material helps to overcome the limitations. Also, the effluent can be pumped to an absorption field on a better suited soil in a nearby area.

The land capability classification is IVs. The woodland ordination symbol is 2A (Black oak). The primary forest habitat type commonly is PVGy, and the secondary forest habitat type is PVCr.

BoC—Boone sand, 6 to 15 percent slopes

This moderately deep, sloping and moderately steep, excessively drained soil is on the summits, shoulders, and back slopes of ridges, knolls, and hills. Individual areas are long or irregularly shaped and generally range from 5 to 200 acres in size.

Typically, the surface layer is very dark gray sand about 2 inches thick. It is covered by about 2 inches of partially decomposed leaf and grass litter. The subsoil is dark brown and yellowish brown sand about 19 inches thick. The upper part of the substratum is brownish yellow sand about 15 inches thick. The lower part to a depth of about 60 inches is weakly cemented sandstone. In places the surface layer is loamy sand or fine sand. In some areas the slope is less than 6 percent or more than 12 percent.

Included with this soil in mapping are small areas of the well drained Elevasil and excessively drained Tarr soils. Elevasil soils are in positions on the landscape similar to those of the Boone soil. They have more silt and clay in the surface layer and subsoil than the Boone soil. Tarr soils are in the lower positions on foot slopes. They are very deep. Included soils make up 10 to 15 percent of the unit.

Permeability is rapid in the sandy subsoil and substratum of the Boone soil and moderately slow or moderate in the underlying sandstone. The available water capacity is very low. The content of organic matter is very low or low in the surface layer. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content. The rooting depth of most crops is limited by the underlying sandstone.

Most areas are wooded. A few areas have been planted to pine. This soil is generally unsuited to corn, soybeans, and small grain and is poorly suited to grasses and legumes for hay, mainly because of droughtiness, water erosion, and soil blowing.

A cover of pasture plants is effective in controlling soil blowing and water erosion. Forage yields are generally low unless fertilizer is applied and the supply of moisture is adequate. Planting early in spring, before the soil has a chance to dry, helps to overcome the droughtiness. Later plantings are likely to have a poor survival rate. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Measures that improve fertility, proper stocking rates, and pasture rotation help to keep the pasture in good condition.

This soil is poorly suited to hardwood trees, which grow slowly and are poorly shaped. It is better suited to pine trees. The equipment limitation and seedling mortality are management concerns. Equipment use is restricted by the loose sand and by the slope at log landings. The loose sand can be overcome by using equipment only when the surface is frozen. Equipment with flotation tires or with tracks has better traction in loose sand than standard wheeled equipment. Sandy areas that are subject to repeated use by heavy equipment, such as log landings and haul roads, can be stabilized with gravel or crushed rock. The log landings and haul roads can also be established in areas of better suited soils, such as included or adjacent nearly level or gently sloping areas. Seedling mortality caused by droughtiness can be reduced by careful planting of containerized seedlings or vigorous nursery stock. It can also be reduced by planting when the soil is moist. Although production of merchantable hardwood trees on this soil may not be profitable, the use of trees to control soil blowing and water erosion can be very effective.

Because of a thin layer over bedrock and a poor filtering capacity, this soil is poorly suited to use as a site for septic tank absorption fields. These limitations can result in the pollution of ground water. Mounding the site with suitable filtering material helps to overcome the limitations. Also, the effluent can be pumped to an absorption field on a better suited soil in a nearby area.

Because of the slope, this soil is only moderately suited to dwellings. This limitation can be overcome by cutting and filling, installing retaining walls, or by designing the dwellings so that one side of the basement fronts on the lower part of the slope. Also, the dwellings can be constructed in the included areas where the slope is less than 6 percent.

Because of the slope, this soil is only moderately suited to local roads and streets. This limitation can be overcome by shaping the roadway through cutting and filling.

The land capability classification is VIs. The woodland ordination symbol is 2A (Black oak). The primary forest habitat type commonly is PVGy, and the secondary forest habitat type is PVCr.

BoF—Boone sand, 15 to 50 percent slopes

This moderately deep, moderately steep to very steep, excessively drained soil is on shoulders, nose slopes, and back slopes of hills. Individual areas are long and narrow or irregularly shaped and range from 10 to 300 acres in size.

Typically, the surface layer is dark brown sand about 3 inches thick. The subsoil is yellowish brown,

loose sand about 15 inches thick. The upper part of the substratum is yellow sand about 12 inches thick. The lower part to a depth of about 60 inches is weakly cemented sandstone. In some places the surface layer is loamy sand or fine sand.

Included with this soil in mapping are small areas of the excessively drained Tarr soils. These soils are in the lower positions on foot slopes. They are very deep.

Permeability is rapid in the sandy subsoil and substratum of the Boone soil and moderately slow or moderate in the underlying sandstone. The available water capacity is very low. The content of organic matter is very low or low in the surface layer. The rooting depth of most plants is limited by the underlying sandstone.

Most areas are wooded. Because of the severe hazard of erosion, the hazard of soil blowing, and droughtiness, this soil is not suited to cultivated crops and is poorly suited to pasture. Using machinery on the steep and very steep slopes is difficult. In some of the less sloping areas, pasture can be renovated and improved. The native vegetation generally is of poor quality for forage. The soil is poorly suited to hardwood trees, which grow slowly and are poorly shaped. It is better suited to pine trees. The erosion hazard, equipment limitations, and seedling mortality are management concerns.

Erosion is accelerated where runoff is concentrated on skid trails, log landings, and haul roads. Removing water with water bars, establishing out-sloping road surfaces, crowning the road surfaces, providing culverts and ditches, and establishing skid trails and haul roads on the contour help to control erosion. Erosion also can be controlled by seeding areas where logging has exposed the soil surface.

Equipment use is severely restricted by the slope. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Skid trails and haul roads can be designed so that they conform to the topography and so that grades are kept as low as possible. In very steep areas, it may be necessary to yard the logs by cable. Log landings can be established in included or adjacent areas that are nearly level or gently sloping. Seedling mortality caused by droughtiness can be reduced by careful planting of containerized seedlings or vigorous nursery stock. It can also be reduced by planting when the soil is moist. Although production of merchantable hardwood trees on this soil may not be profitable, the use of trees to control soil blowing and water erosion is very effective.

This soil is generally not suitable as a site for septic tank absorption fields because of the slope and the depth to bedrock. It is generally not suitable for dwellings or for local roads and streets because of the slope. Overcoming these limitations is difficult. It may be possible to use some of the small, less sloping included areas for dwellings or for roads and streets; generally, however, a better suited site should be considered.

The land capability classification is VIIs. The woodland ordination symbol is 2R (Black oak). The forest habitat type is commonly PVGy.

BpF—Boone-Elevasil complex, 15 to 50 percent slopes

These soils are moderately deep. The excessively drained Boone soil is in steep and very steep positions, such as shoulder slopes, nose slopes, and back slopes of hills. The well drained Elevasil soil is in moderately steep and steep positions, such as summits, shoulders, and the lower part of back slopes and the upper part of foot slopes on hills and ridges. The Boone and Elevasil soils occur as areas so intricately mixed or so small that it was not practical to map them separately. Individual areas are long and narrow or irregularly shaped and generally range from 10 to 1,000 acres in size. They are about 40 to 50 percent Boone soil and 30 to 45 percent Elevasil soil.

Typically, the surface layer of the Boone soil is very dark grayish brown sand about 2 inches thick. It is covered by about 1 inch of dark grayish brown mucky peat, which is a mat of partially decomposed forest litter. The subsurface layer is brown sand about 5 inches thick. The subsoil is dark yellowish brown, very friable sand about 13 inches thick. The upper part of the substratum is brownish yellow sand about 14 inches thick. The lower part to a depth of about 61 inches is weakly cemented sandstone. In places the surface layer is loamy sand or fine sand. In some areas the sandstone is glauconitic.

Typically, the surface layer of the Elevasil soil is very dark brown sandy loam about 2 inches thick. It is covered by about 1 inch of very dark grayish brown mucky peat, which is a mat of partially decomposed forest litter. The subsoil is about 28 inches thick. It is dark yellowish brown and strong brown, friable sandy loam in the upper part and strong brown, very friable loamy sand in the lower part. The upper part of the substratum is reddish yellow sand about 8 inches thick. The lower part to a depth of about 60 inches is weakly cemented sandstone. In places the sandstone is fine grained

and glauconitic. In some areas the surface layer is fine sandy loam.

Included with these soils in mapping are small areas of the well drained Council soils, the moderately well drained Sebbo soils, and the excessively drained Tarr soils. Council soils are in landscape positions similar to those of the Elevasil soil. They are loamy throughout and are very deep. Sebbo soils are on toe slopes, and Tarr soils are on foot slopes. Sebbo soils are loamy throughout and are very deep. Included soils make up 10 to 20 percent of the unit.

Permeability is rapid in the sandy subsoil and substratum of the Boone soil and moderately slow or moderate in the underlying sandstone. It is moderate or moderately rapid in the loamy mantle in the Elevasil soil, rapid in the sandy part of the subsoil and substratum, and moderately slow or moderate in the underlying sandstone. The available water capacity is very low in the Boone soil and low in the Elevasil soil. The content of organic matter in the surface layer of the Boone soil is very low or low. It is moderately low in the surface layer of the Elevasil soil. The rooting depth of most plants is limited by the underlying sandstone in both soils.

Most areas are wooded. Because of a severe hazard of erosion, droughtiness, and the hazard of soil blowing, these soils are not suited to cultivated crops and are poorly suited to pasture. Using machinery on the steep and very steep slopes is difficult. In some of the less sloping areas, the pasture can be renovated and improved. The native vegetation generally is of poor quality for forage.

These soils are poorly suited to hardwood trees, which grow slowly and are poorly shaped (fig. 9). They are better suited to pine trees. The erosion hazard and the equipment limitation are management concerns. Seedling mortality is an additional concern on the Boone soil.

Erosion is accelerated where runoff is concentrated on skid trails, log landings, and haul roads. Removing water with water bars, establishing out-sloping road surfaces, crowning the road surfaces, providing culverts and ditches, and establishing skid trails and haul roads on the contour help to control erosion. Erosion also can be controlled by seeding areas where logging has exposed the soil surface.

Equipment use is severely restricted by the slope. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Skid trails and haul roads can be designed so that they conform to the topography and so that grades are kept as low as possible. In very steep areas, it may be necessary to yard the logs by cable. Log landings can be established in included or adjacent areas that are nearly level or gently sloping. In areas of the Boone soil, seedling mortality caused by droughtiness can be reduced by careful planting of containerized seedlings or vigorous nursery stock. It can also be reduced by planting when the soil is moist. Although production of merchantable hardwood trees on the Boone soil may not be profitable, the use of trees to control soil blowing and water erosion can be very effective. In areas of the Elevasil soil, competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or mechanical removal.

These soils generally are not suitable as sites for septic tank absorption fields, dwellings, or local roads and streets, mainly because of the slope. Overcoming this limitation is difficult. It may be possible to use some of the small, less sloping included areas for these uses; generally, however, a better suited site should be considered.

The land capability classification is VIIe. The woodland ordination symbol is 2R (Black oak) for both soils. The forest habitat type commonly is PVGy for the Boone soil and PVCr for the Elevasil soil.

Cd—Citypoint mucky peat, 0 to 1 percent slopes

This moderately deep or deep, nearly level, very poorly drained soil is in drainageways and depressions. It is subject to ponding. Individual areas are oblong or irregularly shaped and generally range from 20 to 300 acres in size.

Typically, the organic layers are about 26 inches thick. The upper part is dark reddish brown mucky peat, and the lower part is dark reddish brown and black muck. The upper part of the substratum is light brownish gray fine sand about 8 inches thick. The lower part to a depth of about 60 inches is weakly cemented interbedded sandstone and shale. In places sand extends to a depth of 60 inches or more.

Included with this soil in mapping are small areas of the very poorly drained Loxley and poorly drained Ponycreek soils. Loxley soils are in positions on the landscape similar to those of the Citypoint soil. They have organic material throughout. Ponycreek soils are in the slightly higher positions. They are mostly sandy throughout. Included soils make up 5 to 15 percent of the unit.

Permeability is moderately slow to moderately rapid in the organic material in the Citypoint soil. It is

Figure 9.—A stand of pin oak in an area of Boone-Elevasil complex, 15 to 50 percent slopes. Because these soils are droughty, hardwood trees grow slowly and tend to be poorly shaped.

slow to rapid in the substratum and extremely slow to moderately slow in the underlying interbedded sandstone and shale. The available water capacity and the content of organic matter are very high. The rooting depth of most plants is limited by a perched seasonal high water table, which is near or above the surface in undrained areas.

Most areas support wetland vegetation. Because of the wetness, a scarcity of suitable drainage outlets, and an extremely acid reaction, this soil is generally not suited to cultivated crops or pasture. If drained, cultivated areas are subject to burning and subsidence. Also, they are subject to soil blowing. If intensive management is applied, some areas of this soil are suited to cranberries and other specialty crops.

Generally, this soil is not suited to trees. In most areas trees grow so poorly that they are barely merchantable at best. A few areas support merchantable stands of conifers. The equipment limitation, seedling mortality, and the windthrow hazard are management concerns. Because overcoming these limitations is difficult, a more suitable site should be selected.

This soil generally is not suitable as a site for septic tank absorption fields, dwellings, or local

roads and streets, mainly because of the subsidence and the ponding. Overcoming these limitations is difficult. A better suited site should be considered.

The land capability classification is VIIw in undrained areas. The woodland ordination symbol is 2W (Black spruce). No forest habitat type is assigned.

CfA—Coffton silt loam, 0 to 3 percent slopes

This very deep, nearly level and gently sloping, somewhat poorly drained soil is on flood plains along perennial and intermittent streams. It is subject to occasional flooding for brief periods. Individual areas are long and narrow and generally range from 5 to 20 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. The subsurface layer is very dark gray silt loam about 3 inches thick. The subsoil is grayish brown and dark grayish brown, mottled, friable silt loam about 27 inches thick. The substratum to a depth of about 60 inches is olive gray, mottled silt loam that has thin strata of fine sandy loam. In some places the surface layer is thinner or lighter in color. In other places sand, sandy loam, or loam is at a depth of more than 40 inches.

Included with this soil in mapping are small areas of the moderately well drained Arenzville and poorly drained Ettrick soils. Arenzville soils are in the higher positions on the landscape. Ettrick soils are in the lower positions. Included soils make up 10 to 20 percent of the unit.

Permeability is moderate in the Coffton soil. The available water capacity is very high. The content of organic matter is moderate in the surface layer. The surface layer is friable and can be easily tilled, but it tends to crust and puddle after hard rains or forms hard clods if tilled when too wet. The rooting depth of most crops is limited during wet periods of the growing season by the apparent seasonal high water table, which is at a depth of 1 to 2 feet in undrained areas.

Most areas are used as cropland. A few areas are used as pasture or are wooded. If drained and protected from flooding, this soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Dikes and diversions help to prevent flooding. Land smoothing, diversions, and interception subsurface drains help to remove excess water. Restrictive soil layers may limit the movement of water to tile drains. Applying a system of conservation tillage and returning crop residue to the soil or adding other organic material can help to maintain fertility and good tilth, increase the rate of water infiltration, and reduce the hazard of scouring by floodwater.

A cover of pasture plants is effective in controlling scouring by floodwater. The surface layer is subject to crusting, which restricts the emergence of plants. Alfalfa is generally short lived because of the seasonal high water table, flooding, and winterkill resulting from frost heave. Red clover is generally grown. Overgrazing or grazing when the soil is wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, measures that improve fertility, pasture rotation, and restricted use during wet periods help to keep the pasture in good condition.

This soil is suited to trees. The use of equipment is restricted by the wetness, the flooding, and low soil strength. These restrictions can be reduced by using equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or mechanical removal.

This soil generally is not suitable as a site for septic tank absorption fields or dwellings, mainly because of the flooding and the wetness. Overcoming these limitations is difficult. A better suited site should be considered.

This soil is poorly suited to local roads and streets because of the flooding and the potential for frost action. Replacing the upper part of the soil with coarse textured base material, such as sand or gravel, helps to prevent the damage caused by frost action.

The land capability classification is IIw. The woodland ordination symbol is 2W (Silver maple). The forest habitat type commonly is ArCi.

CoC2—Council loam, 6 to 12 percent slopes, eroded

This very deep, sloping, well drained soil is on back slopes, head slopes, and foot slopes of hills. Individual areas are irregular in shape and generally range from 5 to 100 acres in size. The mottles in the lower part of the subsoil and the substratum are relict and are not associated with a seasonal high water table.

In most cultivated areas much of the original surface layer has been lost through erosion. Typically, the remaining surface layer is dark brown loam about 8 inches thick. It is mixed with some brown subsoil material. The subsoil is about 28 inches thick. It is dark brown, friable loam in the upper part and yellowish brown, very friable fine sandy loam in the lower part. The substratum to a depth of about 60 inches is yellowish brown, mottled silt loam. In places the surface layer is silt loam or sandy loam. In some areas the slope is less than 6 percent or more than 12 percent.

Included with this soil in mapping are small areas of the well drained Gale and Seaton soils and the moderately well drained Sebbo soils. Sebbo soils are in the lower positions on the landscape. Gale and Seaton soils are in landscape positions similar to those of the Council soil. Gale soils are underlain by sandstone at a depth of 20 to 40 inches. Seaton soils are silty throughout. Sebbo soils are on toe slopes. They have a perched water table. They contain more clay and less silt than the Council soil. Included soils make up 5 to 10 percent of the unit.

Permeability is moderate in the Council soil. The available water capacity is high. The content of organic matter is moderately low in the surface layer. The surface layer is friable and can be easily tilled, but it tends to crust and puddle after hard rains or forms hard clods if tilled when too wet.

Most areas are used as cropland. A few areas are used for pasture, and very few areas are wooded. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, water erosion is a moderate hazard. It can be controlled by terraces, contour farming, contour stripcropping, grassed waterways, and conservation tillage. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and reduces the hazard of erosion.

A cover of pasture plants is effective in controlling water erosion. The surface layer is subject to crusting, which restricts the emergence of plants. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

This soil is suited to trees. Equipment use at log landings is restricted by the slope. Log landings can be established in nearly level or gently sloping included or adjacent areas. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or mechanical removal.

Because of the slope, this soil is only moderately suited to septic tank absorption fields. The slope can be overcome by installing a trench absorption system on the contour. Also, the less sloping included areas can be used.

Because of the slope, this soil is only moderately suited to dwellings. This limitation can be overcome by cutting and filling, by installing retaining walls, or by designing the dwellings so that one side of the basement fronts on the lower part of the slope. Also, the dwellings can be constructed in areas of included soils that have slopes of less than 6 percent.

Because of the slope and the potential for frost action, this soil is only moderately suited to local roads and streets. The slope can be overcome by shaping the roadway through cutting and filling. Also, the roads can be built in the less sloping areas. Replacing the upper part of the soil with a coarse textured base material, such as sand or gravel, helps to prevent the damage caused by frost action.

The land capability classification is IIIe. The woodland ordination symbol is 4A (Northern red oak). The primary forest habitat type commonly is ArCi, and the secondary forest habitat type is ArDe-V.

CpC2—Council-Bilson fine sandy loams, 6 to 12 percent slopes, eroded

These very deep soils are sloping and well drained. They are on foot slopes and head slopes. The Council and Bilson soils occur as areas so intricately mixed or so small that it was not practical to map them separately. Individual areas generally are oblong and range from 5 to 60 acres in size. They are about 40 to 50 percent Council soil and 35 to 45 percent Bilson soil. The mottles in the lower part of the subsoil and the substratum of the Council soil are relict and are not associated with a seasonal high water table. In most cultivated areas, erosion has removed much of the original surface layer of both soils.

Typically, the surface layer of the Council soil is dark brown fine sandy loam about 9 inches thick. It is mixed with some yellowish brown subsoil material. The subsoil is about 32 inches thick. It is friable. The upper part is dark yellowish brown fine sandy loam, the next part is dark yellowish brown loam, and the lower part is light yellowish brown, mottled sandy loam. The substratum to a depth of about 60 inches is

stratified, brownish yellow, mottled silt loam and loam. In places the surface layer is sandy loam or silt loam.

Typically, the surface layer of the Bilson soil is very dark grayish brown fine sandy loam about 8 inches thick. It is mixed with some yellowish brown subsoil material. The subsoil is about 22 inches thick. It is mostly dark yellowish brown and friable. The upper part is fine sandy loam, the next part is sandy loam, and the lower part is loamy sand. The substratum to a depth of about 60 inches is brownish yellow and very pale brown sand. In places the surface layer is sandy loam or loam. In some areas the substratum has strata of sandy loam or loam.

Included with these soils in mapping are small areas of the well drained Elevasil and Seaton soils and the moderately well drained Sebbo soils. Also included are some areas where the slope is less than 6 percent or more than 12 percent. Elevasil soils are in the slightly higher positions on the landscape. They are underlain by sandstone at a depth of 20 to 40 inches. Seaton soils are in positions similar to those of the Council soil. They are silty throughout. Sebbo soils are on toe slopes. They have a perched water table. They have more clay and less silt than the major soils. Included areas make up 5 to 15 percent of the unit.

Permeability is moderate in the Council soil. It is moderate or moderately rapid in the loamy mantle in the Bilson soil and rapid in the substratum. The available water capacity is high in the Council soil and moderate in the Bilson soil. The content of organic matter is moderately low in the surface layer of both soils. The surface layer is friable and can be easily tilled throughout a wide range in moisture content. The rooting depth of most crops is limited in areas of the Bilson soil by the sandy substratum.

Most areas are used as cropland or pasture. A few areas are wooded. These soils are suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, water erosion is a moderate hazard. The soils are also subject to soil blowing. Grassed waterways, contour farming, contour stripcropping, field windbreaks, and conservation tillage help to prevent excessive soil loss. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and helps to control erosion and soil blowing.

A cover of pasture plants is effective in controlling erosion and soil blowing. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, and measures that improve fertility help to keep the pasture in good condition.

These soils are suited to trees. Equipment use at log landings is restricted by the slope. Log landings can be established in nearly level and gently sloping included or adjacent areas. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

Because of the slope, the Council soil is only moderately suited to septic tank absorption fields. The slope can be overcome by installing a trench absorption system on the contour. Also, the less sloping included areas may be used. The Bilson soil readily absorbs the effluent in septic tank absorption fields. It does not adequately filter the effluent, however, because of the rapid permeability in the substratum. The poor filtering capacity can result in the pollution of ground water. The absorption field functions better if the site is mounded with suitable filtering material.

Because of the slope, these soils are only moderately suited to dwellings. This limitation can be overcome by cutting and filling, by installing retaining walls, or by designing the dwellings so that one side of the basement fronts on the lower part of the slope. Also, the dwellings can be constructed in the included areas where the slope is less than 6 percent.

Because of the slope and the potential for frost action, these soils are only moderately suited to local roads and streets. The slope can be overcome by shaping the roadway through cutting and filling or by building the road in the less sloping areas. Replacing the upper part of the soil with a coarse textured base material, such as sand or gravel, helps to prevent the damage caused by frost action.

The land capability classification is IIIe. The woodland ordination symbol is 4A (Northern red oak). The forest habitat type commonly is ArCi for the Council soil and ArDe-V for the Bilson soil.

CpD2—Council-Bilson fine sandy loams, 12 to 20 percent slopes, eroded

These soils are very deep, moderately steep, and well drained. They are on foot slopes and head slopes. The Council and Bilson soils occur as areas so intricately mixed or so small that it was not practical to map them separately. Individual areas generally are oblong and range from 5 to 60 acres in size. They are about 40 to 50 percent Council soil and 35 to 45 percent Bilson soil. The mottles in the

substratum of the Council soil are relict and are not associated with a seasonal high water table. In most cultivated areas, erosion has removed much of the original surface layer of both soils.

Typically, the surface layer of the Council soil is dark brown fine sandy loam about 8 inches thick. It is mixed with some brown subsoil material. The subsoil is about 30 inches thick. It is brown, very friable fine sandy loam in the upper part and pale brown, very friable sandy loam in the lower part. The substratum to a depth of about 60 inches is stratified, pale brown, mottled silt loam and loam. In places the surface layer is sandy loam or silt loam.

Typically, the surface layer of the Bilson soil is very dark grayish brown fine sandy loam about 8 inches thick. It is mixed with some yellowish brown subsoil material. The subsoil is about 23 inches thick. It is very friable. The upper part is dark yellowish brown fine sandy loam, the next part is dark yellowish brown sandy loam, and the lower part is yellowish brown loamy sand. The substratum to a depth of about 60 inches is brownish yellow sand. In some places the surface layer is sandy loam or loam. In other places the substratum has strata of sandy loam or loam.

Included with these soils in mapping are small areas of the well drained Elevasil and Seaton soils and the moderately well drained Sebbo soils. Also included are some areas where the slope is less than 12 percent or more than 20 percent. Elevasil soils are in the slightly higher positions on the landscape. They are underlain by sandstone at a depth of 20 to 40 inches. Seaton soils are in positions similar to those of the Bilson soil. They are silty throughout. Sebbo soils are on toe slopes. They have a perched water table. They have more clay and less silt than the major soils. Included areas make up 5 to 15 percent of the unit.

Permeability is moderate in the Council soil. It is moderate or moderately rapid in the loamy mantle in the Bilson soil and rapid in the substratum. The available water capacity is high in the Council soil and moderate in the Bilson soil. The content of organic matter is moderately low in the surface layer of both soils. The surface layer is friable and can be easily tilled throughout a wide range in moisture content. The rooting depth of most crops is limited in areas of the Bilson soil by the sandy substratum.

Most areas are used as cropland or pasture. Some extensive areas are wooded. These soils are suited to corn and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, water erosion is a severe hazard. The soils are also subject to soil blowing. Contour farming, contour stripcropping, field windbreaks, crop rotations that include grasses and legumes, and conservation tillage help to prevent excessive soil loss. Returning crop residue or adding other organic material to the soil helps to maintain fertility and good tilth, increases the rate of infiltration, and helps to control erosion and soil blowing.

A cover of pasture plants is effective in controlling erosion and soil blowing. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, and measures that improve fertility help to keep the pasture in good condition.

These soils are suited to trees. The erosion hazard and the equipment limitation are management concerns. Erosion is accelerated where runoff is concentrated on skid trails, log landings, and haul roads. Removing water with water bars, establishing out-sloping road surfaces, crowning the road surfaces, providing ditches and culverts, and establishing skid trails and haul roads on the contour minimize erosion. Erosion also can be controlled by seeding areas where logging has exposed the surface.

Equipment use is restricted by the slope. Skid trails and haul roads can be designed so that they conform to the topography and so that grades are kept as low as possible. Log landings can be established in nearly level or gently sloping included or adjacent areas. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or mechanical removal.

Because of the slope, the Council soil is poorly suited to septic tank absorption fields. This limitation can be overcome by installing a trench absorption system on the contour. Also, included areas where the slope is less than 6 percent may possibly be used. Because of the poor filtering material and the slope, the Bilson soil is poorly suited to septic tank absorption fields. It readily absorbs but does not adequately filter the effluent. The poor filtering capacity can result in the pollution of ground water. The slope can be overcome by installing a trench absorption system on the contour or in included or adjacent areas that have slopes of less than 6 percent.

Because of the slope, these soils are poorly suited to dwellings. This limitation can be overcome by cutting and filling, by installing retaining walls, or by designing the dwellings so that one side of the

basement fronts on the lower part of the slope. Also, the dwellings can be constructed in included areas where the slope is less than 6 percent.

Because of the slope, these soils are poorly suited to local roads and streets. This limitation can be overcome by shaping the roadway through cutting and filling or by building the road in the less sloping areas.

The land capability classification is IVe. The woodland ordination symbol is 4R (Northern red oak). The forest habitat type commonly is ArCi for the Council soil and ArDe-V for the Bilson soil.

CsD2—Council and Seaton soils, 12 to 20 percent slopes, eroded

These very deep, moderately steep, well drained soils are on back slopes, foot slopes, and head slopes. Individual areas are long and narrow or irregularly shaped and generally range from 5 to 250 acres in size. The Council and Seaton soils are so similar in morphology and behavior characteristics that mapping them separately was not practical. Each mapped area consists of one or both of the soils in varying proportions. The mottles in the substratum of these soils are relict and are not associated with a seasonal high water table. In most cultivated areas, erosion has removed much of the original surface layer of both soils.

Typically, the surface layer of the Council soil is dark brown loam about 7 inches thick. It is mixed with dark yellowish brown subsoil material. The subsoil is about 38 inches thick. It is dark yellowish brown, friable loam in the upper part and dark yellowish brown, friable sandy loam in the lower part. The substratum to a depth of about 60 inches is light yellowish brown and dark yellowish brown, mottled silt loam that has pockets or layers of loam. In places the surface layer is fine sandy loam or silt loam. In some areas the substratum is loam, fine sandy loam, or sand.

Typically, the surface layer of the Seaton soil is dark brown silt loam about 9 inches thick. It is mixed with some brown subsoil material. The subsoil is friable silt loam about 37 inches thick. It is dark brown in the upper part and dark yellowish brown and mottled in the lower part. The substratum to a depth of about 60 inches is yellowish brown and brown, mottled silt loam. In places the substratum is loamy or sandy.

Included with these soils in mapping are small areas of the well drained Elevasil, Gale, and Hixton soils and the moderately well drained Sebbo soils. Elevasil, Gale, and Hixton soils are in the slightly higher positions on the landscape. They are underlain by sand and sandstone. Sebbo soils are on toe slopes. They have a perched water table. They have more clay than the Council soil and more sand than the Seaton soil. Included soils make up 10 to 20 percent of the unit.

Permeability is moderate in the Council and Seaton soils. The available water capacity is high in the Council soil and very high in the Seaton soil. The content of organic matter is moderately low in the surface layer of the Council soil and moderately low or moderate in the surface layer of the Seaton soil. The surface layer of both soils is friable and can be easily tilled, but it tends to crust and puddle after hard rains or forms hard clods if tilled when too wet.

Most areas are used as cropland or pasture. Some extensive areas on the upper head slopes are wooded. These soils are suited to corn and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, water erosion is a severe hazard. It can be controlled by contour farming, contour stripcropping, crop rotations that include grasses and legumes, and conservation tillage (fig. 10). Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and reduces the hazard of water erosion.

A cover of pasture plants is effective in controlling erosion. The surface layer is subject to crusting, which restricts the emergence of plants. Overgrazing or grazing when the soils are too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

These soils are suited to trees. The erosion hazard and the equipment limitation are management concerns. Erosion is accelerated where runoff is concentrated on skid trails, log landings, and haul roads. Removing water with water bars, establishing out-sloping road surfaces, crowning the road surfaces, providing ditches and culverts, and establishing skid trails and haul roads on the contour minimize erosion. Erosion also can be controlled by seeding areas where logging has exposed the surface.

Equipment is restricted by the slope. Low strength is an additional limitation in areas of the Seaton soil. Skid trails and haul roads can be designed so that they conform to the topography and so that grades are kept as low as possible. Log landings can be established in the nearly level or gently sloping

Figure 10.—Contour stripcropping in an area of Council and Seaton soils, 12 to 20 percent slopes, eroded.

included or adjacent areas. The low strength restricts the repeated use of heavy equipment on log landings and haul roads. This restriction can be reduced by using the equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas of the Seaton soil used for log landings and haul roads can be strengthened with gravel or crushed rock. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

Because of the slope, these soils are poorly suited to septic tank absorption fields. This limitation can be overcome by installing a trench absorption system on the contour. Also, included areas that have slopes of less than 6 percent may possibly be used.

Because of the slope, these soils are poorly suited to dwellings. This limitation can be overcome by cutting and filling, by installing retaining walls, or by designing the dwellings so that one side of the basement fronts on the lower part of the slope. Also, the dwellings can be constructed in included areas where the slope is less than 6 percent.

Because of the slope in areas of both soils and the low strength and the potential for frost action in areas of the Seaton soil, these soils are poorly suited to local roads and streets. Low strength and frost action can be overcome by replacing the upper part of the soil with coarse textured base material, such as sand or gravel. Low strength also can be overcome by increasing the thickness of the pavement or the base material. The slope can be overcome by shaping the roadway through cutting and filling or by building the road in the less sloping areas.

The land capability classification is IVe. The woodland ordination symbol is 4R (Northern red oak)

for the Council soil and 5R (Northern red oak) for the Seaton soil. The forest habitat type for this unit commonly is ArCi.

CsE—Council and Seaton soils, 20 to 30 percent slopes

These very deep, steep, well drained soils are on head slopes. Individual areas are irregular in shape and generally range from 5 to 80 acres in size. The mottles in the lower part of the subsoil and the substratum are relict and are not associated with a seasonal high water table. The Council and Seaton soils are so similar in morphology and behavior characteristics that mapping them separately was not practical. Each mapped area consists of one or both of the soils in varying proportions.

Typically, the surface layer of the Council soil is very dark brown loam about 4 inches thick. It is covered by about 2 inches of partially decomposed leaf and grass litter. The subsurface layer is dark brown loam about 3 inches thick. The subsoil is about 37 inches thick. It is dark yellowish brown, friable loam in the upper part and dark yellowish brown, mottled, friable silt loam in the lower part. The substratum to a depth of about 60 inches is mottled, yellowish brown silt loam. In places the surface layer is silt loam, fine sandy loam, or sandy loam. In some areas the substratum is loam, fine sandy loam, or sand.

Typically, the surface layer of the Seaton soil is very dark grayish brown silt loam about 4 inches thick. It is covered by about 2 inches of partially decomposed leaf and grass litter. The subsurface layer is yellowish brown silt loam about 10 inches thick. The subsoil is dark yellowish brown, friable silt loam about 35 inches thick. The substratum to a depth of about 60 inches is yellowish brown, mottled silt loam. In places the substratum is loamy or sandy.

Included with these soils in mapping are small areas of the well drained Elevasil, Hixton, and Gale soils and the moderately well drained Sebbo soils. Also included are some areas where the slope is less than 20 percent or more than 30 percent. Elevasil, Hixton, and Gale soils are in the slightly higher positions on the landscape. They are underlain by sand and sandstone. Sebbo soils are on toe slopes. They have a perched water table. They have more clay than the Council soil and more sand than the Seaton soil. Included areas make up 10 to 25 percent of the unit.

Permeability is moderate in the Council and Seaton soils. The available water capacity is high in the Council soil and very high in the Seaton soil. The content of organic matter is moderately low in the surface layer of the Council soil and moderately low or moderate in the surface layer of the Seaton soil.

Most areas are wooded. A few areas are used as pasture. These soils are not suited to cultivated crops because of the slope and the severe hazard of water erosion.

A cover of pasture plants is effective in controlling erosion. The surface layer is subject to crusting, which restricts the emergence of plants. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

These soils are suited to trees. The erosion hazard and the equipment limitation are management concerns. Erosion is accelerated where runoff is concentrated on skid trails, log landings, and haul roads. Removing water with water bars, establishing out-sloping road surfaces, crowning the road surfaces, providing ditches and culverts, and establishing skid trails and haul roads on the contour minimize erosion. Erosion also can be controlled by seeding areas where logging has exposed the surface.

Equipment is restricted by the slope. Low strength is an additional limitation in areas of the Seaton soil. Skid trails and haul roads can be designed so that they conform to the topography and so that grades are kept as low as possible. Log landings can be established in the nearly level or gently sloping included or adjacent areas. Low strength restricts the repeated use of heavy equipment on log landings and haul roads. This restriction can be reduced by using the equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas of the Seaton soil used for log landings and haul roads can also be strengthened with gravel or crushed rock. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or mechanical removal.

These soils generally are not suited to septic tank absorption fields, dwellings, or local roads, mainly because of the slope. Overcoming this limitation is difficult. It may be possible to use some of the small, less sloping included areas for these uses, but in general a better suited site should be considered.

The land capability classification is VIe. The

woodland ordination symbol is 4R (Northern red oak) for the Council soil and 5R (Northern red oak) for the Seaton soil. The forest habitat type for this unit commonly is ArCi.

Da—Dawsil mucky peat, 0 to 1 percent slopes

This very deep, nearly level, very poorly drained soil is in depressions. It is subject to ponding. Individual areas are oblong or irregularly shaped and generally range from 20 to 1,000 acres in size.

Typically, the upper 20 inches is dark reddish brown and dark brown mucky peat. The next 20 inches is black muck. The substratum to a depth of about 60 inches is light brownish gray sand. In places the organic layers are mostly peat.

Included with this soil in mapping are small areas of the very poorly drained Loxley and poorly drained Ponycreek soils. Loxley soils are in positions on the landscape similar to those of the Dawsil soil. They have organic material throughout. Ponycreek soils are in the slightly higher positions on the landscape. They are mostly sandy throughout. Included soils make up 5 to 15 percent of the unit.

Permeability is moderately slow to moderately rapid in the organic material in the Dawsil soil and rapid in the substratum. The available water capacity and the content of organic matter are very high. The rooting depth of most plants is limited by an apparent seasonal high water table, which is near or above the surface in undrained areas.

Most areas support wetland vegetation. Because of the wetness, a scarcity of suitable drainage outlets, and an extremely acid reaction, this soil is generally not suited to cultivated crops or pasture. If drained, cultivated areas are subject to burning, subsidence, and soil blowing. If intensive management is applied, some areas of this soil are suited to cranberries and other specialty crops.

Generally, this soil is not suited to trees. In most areas trees grow so poorly that they are barely merchantable at best. A few areas support merchantable stands of conifers. The equipment limitation, seedling mortality, and the windthrow hazard are management concerns. Overcoming these limitations is difficult. A more suitable site should be selected.

This soil generally is not suitable as a site for septic tank absorption fields, dwellings, or local roads and streets because of the subsidence and the ponding. Overcoming these limitations is difficult. A better suited site should be considered.

The land capability classification is VIIw in undrained areas. The woodland ordination symbol is 2W (Black spruce). No forest habitat type is assigned.

DuA—Dunnville sandy loam, 0 to 3 percent slopes

This very deep, nearly level and gently sloping, well drained soil is on low stream terraces. Individual areas are long and narrow and generally range from 4 to 40 acres in size.

Typically, the surface layer and the subsurface layer are dark reddish brown sandy loam about 16 inches thick. The subsoil is about 11 inches thick. It is dark reddish brown, friable sandy loam in the upper part and reddish brown, very friable loamy sand in the lower part. The substratum to a depth of about 60 inches is reddish yellow sand. In places the surface layer is fine sandy loam or loam. In some areas the slope is more than 3 percent.

Included with this soil in mapping are small areas of the excessively drained Sparta soils. These soils are in the slightly higher positions on the landscape. They have more sand throughout. They make up 5 to 15 percent of the unit.

Permeability is moderate or moderately rapid in the loamy alluvium in the Dunnville soil and rapid or very rapid in the sandy alluvium. The available water capacity is moderate. The content of organic matter is moderately low or moderate in the surface layer. The surface layer is friable and can be easily tilled throughout a wide range in moisture content. The rooting depth of most crops is limited by the sandy substratum.

Most areas are used as cropland. A few areas are used as pasture. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, the soil is subject to soil blowing. Conservation tillage, winter cover crops, and field windbreaks help to control soil blowing. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and reduces the hazard of soil blowing.

A cover of pasture plants is effective in controlling soil blowing. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, measures that improve fertility, and pasture rotation help to keep the pasture in good condition.

This soil is suited to trees. The only soil-related management concern is competing vegetation, which

interferes with tree planting and natural regeneration following harvest. Plant competition can be controlled by herbicides or by mechanical removal.

This soil is suited to dwellings and to local roads and streets. The soil readily absorbs the effluent in septic tank absorption fields. It does not adequately filter the effluent, however, because of the rapid or very rapid permeability in the substratum. The poor filtering capacity can result in the pollution of ground water. Mounding the site with suitable filtering material helps to overcome the poor filtering capacity. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas.

The land capability classification is IIIs. The woodland ordination symbol is 3A (Northern red oak). The primary forest habitat type commonly is ArDe-V, and the secondary forest habitat type is PVCr.

EIB—Elevasil sandy loam, 2 to 6 percent slopes

This moderately deep, gently sloping, well drained soil is on the summits of hills. Individual areas are long and narrow or irregularly shaped and generally range from 5 to 60 acres in size.

Typically, the surface layer is very dark grayish brown sandy loam about 8 inches thick. The subsoil is about 22 inches thick. It is mostly dark brown and friable. The upper part is sandy loam, the next part is loam, and the lower part is sandy loam. The upper part of the substratum is brownish yellow sand about 6 inches thick. The lower part to a depth of about 60 inches is weakly cemented sandstone. In some places the surface layer is fine sandy loam. In other places the slope is more than 6 percent. In some areas in northern Jackson County, near Clark and Eau Claire Counties, the loamy upper part of the soil contains igneous coarse fragments.

Included with this soil in mapping are small areas of the well drained Bilson, excessively drained Boone, and well drained Hixton soils. Bilson soils are in the slightly lower positions on the landscape. They are underlain by sand. Boone soils are in landscape positions similar to or slightly higher than those of the Elevasil soil. They formed in siliceous sandy residuum. Hixton soils are in positions similar to those of the Elevasil soil. They have more silt and clay in the surface layer and subsoil than the Elevasil soil. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate or moderately rapid in the loamy part of the subsoil in the Elevasil soil. It is rapid in the sandy part of the subsoil and substratum and moderately slow or moderate in the underlying sandstone. The available water capacity is low. The content of organic matter is moderately low in the surface layer. The surface layer is friable and can be easily tilled throughout a wide range in moisture content. The rooting depth of most crops is limited by the underlying sandstone.

Most areas are used as cropland or pasture. A few areas are wooded. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, water erosion is a slight or moderate hazard. Also, the soil is subject to soil blowing. Contour farming, contour stripcropping, grassed waterways, winter cover crops, field windbreaks, and conservation tillage help to prevent excessive soil loss. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and helps to control water erosion and soil blowing.

A cover of pasture plants is effective in controlling water erosion and soil blowing. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, and measures that improve fertility help to keep the pasture in good condition.

This soil is poorly suited to hardwood trees, which grow slowly and are poorly shaped. It is better suited to pine trees. The only soil-related management concern is competing vegetation, which interferes with tree planting and natural regeneration following harvest. Plant competition can be controlled by herbicides or mechanical removal.

Because of a thin layer over bedrock and a poor filtering capacity, this soil is poorly suited to septic tank absorption fields. These limitations can result in the pollution of ground water. Mounding the site with suitable filtering material helps to overcome the limitations. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas.

This soil is suited to dwellings. Because of the potential for frost action, the soil is only moderately suited to local roads and streets. Replacing the upper part of the soil with coarse textured base material, such as sand or gravel, helps to prevent the damage caused by frost action.

The land capability classification is IIIs. The woodland ordination symbol is 2A (Black oak). The primary forest habitat type commonly is PVCr, and the secondary forest habitat type is ArDe-V.

EIC2—Elevasil sandy loam, 6 to 12 percent slopes, eroded

This moderately deep, sloping, well drained soil is on shoulder slopes and back slopes and the upper foot slopes of hills. Individual areas are round or irregularly shaped and generally range from 5 to 80 acres in size.

In most cultivated areas, erosion has removed much of the original surface layer. Typically, the remaining surface layer is dark brown sandy loam about 8 inches thick. It is mixed with some brown subsoil material. The subsoil is mostly dark yellowish brown, friable sandy loam. It is about 18 inches thick. The upper part of the substratum is brownish yellow sand about 8 inches thick. The lower part to a depth of about 60 inches is weakly cemented sandstone. In some places the surface layer is fine sandy loam. In other places the slope is less than 6 percent or more than 12 percent. In some areas in northern Jackson County, near Clark and Eau Claire Counties, the loamy upper part of the soil contains igneous coarse fragments.

Included with this soil in mapping are small areas of the well drained Bilson, excessively drained Boone, well drained Council, and excessively drained Tarr soils. Bilson, Council, and Tarr soils are in the lower positions on the landscape. Bilson and Council soils are very deep. Bilson soils are underlain by sand, and Council soils are loamy throughout. Tarr soils are sandy throughout. Boone soils are in the higher positions on the landscape. They formed in siliceous sandy residuum. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate or moderately rapid in the loamy part of the subsoil in the Elevasil soil. It is rapid in the sandy part of the subsoil and substratum and moderately slow or moderate in the underlying sandstone. The available water capacity is low. The content of organic matter is moderately low in the surface layer. The surface layer is friable and can be easily tilled throughout a wide range in moisture content. The rooting depth of most crops is limited by the underlying sandstone.

Most areas are used as cropland or pasture. A few areas are wooded. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. In most years crop yields are limited by the low available water capacity. The soil is poorly suited to irrigation because of the slope. If cultivated crops are grown, water erosion is a moderate hazard. Also, the soil is subject to soil blowing. Contour farming, contour stripcropping, field windbreaks, and conservation tillage help to prevent excessive soil loss. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and helps to control erosion and soil blowing.

A cover of pasture plants is effective in controlling erosion and soil blowing. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, and measures that improve fertility help to keep the pasture in good condition.

This soil is poorly suited to hardwood trees, which grow slowly and are poorly shaped. It is better suited to pine trees. Equipment use at log landings is restricted by the slope. Log landings can be established in nearly level and gently sloping included or adjacent areas. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or mechanical removal.

Because of a thin layer over bedrock and a poor filtering capacity, this soil is poorly suited to septic tank absorption fields. These limitations can result in the pollution of ground water. Mounding the site with suitable filtering material helps to overcome the limitations. Also, the effluent can be pumped to an absorption field on a better suited soil in a nearby area.

Because of the slope, this soil is only moderately suited to dwellings. This limitation can be overcome by cutting and filling, by installing retaining walls, or by designing the dwellings so that one side of the basement fronts on the lower part of the slope. Also, the dwellings can be constructed in included areas where the slope is less than 6 percent.

Because of the slope and the potential for frost action, this soil is only moderately suited to local roads and streets. The slope can be overcome by shaping the roadway through cutting and filling. Also, the roads can be built in the less sloping areas. Replacing the upper part of the soil with coarse textured base material, such as sand or gravel, helps to prevent the damage caused by frost action.

The land capability classification is IIIe. The woodland ordination symbol is 2A (Black oak). The primary forest habitat type commonly is PVCr, and the secondary forest habitat type is ArDe-V.

EID2—Elevasil sandy loam, 12 to 20 percent slopes, eroded

This moderately deep, moderately steep, well drained soil is on shoulders, nose slopes, back

slopes, and the upper foot slopes of hills and ridges. Individual areas are irregular in shape and generally range from 5 to 60 acres in size.

In most cultivated areas, erosion has removed much of the original surface layer. Typically, the remaining surface layer is dark brown sandy loam about 8 inches thick. It is mixed with some brown subsoil material. The subsoil is about 16 inches thick. It is dark brown and yellowish brown, friable sandy loam in the upper part and dark brown and reddish yellow loamy sand in the lower part. The upper part of the substratum is reddish yellow sand about 9 inches thick. The lower part to a depth of about 60 inches is weakly cemented sandstone. In places the surface layer is fine sandy loam. In some areas the slope is less than 12 percent or more than 20 percent.

Included with this soil in mapping are small areas of the well drained Bilson, excessively drained Boone, well drained Council, and excessively drained Tarr soils. The very deep Bilson, Council, and Tarr soils are in the lower positions on the landscape. Bilson soils are underlain by sand, Council soils are loamy throughout, and Tarr soils are sandy throughout. Boone soils are in the higher positions on the landscape. They are sandy throughout. Included soils make up 10 to 15 percent of the unit.

Permeability is moderate or moderately rapid in the loamy part of the subsoil in the Elevasil soil. It is rapid in the sandy part of the subsoil and substratum and moderately slow or moderate in the underlying sandstone. The available water capacity is low. The content of organic matter is moderately low in the surface layer. The surface layer is friable and can be easily tilled throughout a wide range in moisture content. The rooting depth of most crops is limited by the underlying sandstone.

Most areas are used as cropland or pasture. A few areas are wooded. This soil is suited to corn and small grain and to grasses and legumes for hay and pasture. In most years crop yields are limited by the low available water capacity. The soil is not suited to irrigation because of the slope. If cultivated crops are grown, water erosion is a severe hazard. Also, the soil is subject to soil blowing. Contour farming, contour stripcropping, crop rotations that include grasses and legumes, and conservation tillage help to prevent excessive soil loss. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and helps to control water erosion and soil blowing.

A cover of pasture plants is effective in controlling water erosion and soil blowing. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, and measures that improve fertility help to keep the pasture in good condition.

This soil is poorly suited to hardwood trees, which grow slowly and are poorly shaped. It is better suited to pine trees. The erosion hazard and the equipment limitation are management concerns. Erosion is accelerated where runoff is concentrated on skid trails, log landings, and haul roads. Removing water with water bars, establishing out-sloping road surfaces, crowning the road surfaces, providing ditches and culverts, and establishing skid trails and haul roads on the contour minimize erosion. Erosion also can be controlled by seeding areas where logging has exposed the surface.

The use of equipment is restricted by the slope. Skid trails and haul roads can be designed so that they conform to the topography and so that grades are kept as low as possible. Log landings can be established in nearly level or gently sloping included or adjacent areas. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or mechanical removal.

Because of a thin layer over bedrock, a poor filtering capacity, and the slope, this soil generally is poorly suited to septic tank absorption fields. It readily absorbs but does not adequately filter the effluent. The poor filtering capacity can result in the pollution of ground water. The thin layer and the poor filtering capacity can be overcome by mounding the site with suitable filtering material. The slope can be overcome by cutting and filling or by installing a trench absorption system on the contour.

Because of the slope, this soil is poorly suited to dwellings. This limitation can be overcome by cutting and filling, installing retaining walls, or designing the dwellings so that one side of the basement fronts on the lower part of the slope. Also, the dwellings can be constructed in included areas where the slope is less than 6 percent.

Because of the slope, this soil is poorly suited to local roads and streets. This limitation can be overcome by shaping the roadway through cutting and filling.

The land capability classification is IVe. The woodland ordination symbol is 2R (Black oak). The primary forest habitat type commonly is PVCr, and the secondary forest habitat type is ArDe-V.

Eo—Elm Lake mucky sand, 0 to 2 percent slopes

This moderately deep, nearly level, poorly drained soil is in drainageways and depressions. It is subject to ponding. Individual areas are long and narrow and generally range from 10 to 100 acres in size.

Typically, the surface layer is black mucky sand about 2 inches thick. The upper part of the substratum is mostly light brownish gray and light gray, mottled sand and yellowish brown, mottled sandy clay loam. The lower part of the substratum, from a depth of about 38 to 60 inches, is weakly cemented interbedded sandstone and shale. In places the surface layer is muck, mucky loamy sand, or loamy sand.

Included with this soil in mapping are small areas of the somewhat poorly drained Fairchild and poorly drained Veedum soils. Fairchild soils are in the slightly higher positions on the landscape. Veedum soils are in positions on the landscape similar to those of the Elm Lake soil. They have more silt and clay throughout than the Elm Lake soil. Included soils make up 5 to 15 percent of the unit.

Permeability is rapid in the sandy upper part of the substratum in the Elm Lake soil. It is moderately slow or moderate in the loamy lower part of the substratum and extremely slow to moderately slow in the underlying interbedded sandstone and shale. The available water capacity is low. The content of organic matter is very high in the surface layer. A perched seasonal high water table is near or above the surface in undrained areas. The rooting depth of most plants is limited by the seasonal high water table and by the interbedded sandstone and shale.

Most areas of this soil are used as unimproved pasture or as woodland. Some areas are used as wetland wildlife habitat. Undrained areas generally are not suited to cultivated crops because of the wetness and the frost hazard. Drained areas are suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Planting early maturing corn varieties or growing the corn for silage helps to overcome the frost hazard.

Unless it is drained, this soil is poorly suited to pasture. Establishing an improved pasture is difficult because of the wetness. Grazing is limited to the short periods when the soil is dry. The native vegetation generally is of poor quality for forage.

This soil is suited to some conifers but is poorly suited to most other trees. Most trees grow slowly and are poorly shaped. The equipment limitation, seedling mortality, and the windthrow hazard are management concerns. Equipment use is restricted by the wetness. This restriction can be reduced by using equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. They also can be established in better suited included or adjacent areas. Culverts and ditches can be used to maintain natural drainage systems along haul roads. Seedling mortality caused by wetness can be reduced by careful machine planting on prepared ridges or by hand planting on cradle knolls and in the drier included areas. Selecting vigorous nursery stock for planting reduces the seedling mortality rate. Harvesting by clearcut or area-selection methods helps to prevent windthrow of the remaining trees. Natural seeding from unharvested trees promotes regeneration. Maintaining permanent all-season roads allows quick salvage of downed trees after periodic storms. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or mechanical removal.

This soil generally is not suitable as a site for septic tank absorption fields, dwellings, or local roads and streets, mainly because of the ponding. Overcoming this limitation is difficult. A better suited site should be considered.

The land capability classification is VIw in undrained areas. The woodland ordination symbol is 3W (Red maple). No forest habitat type is assigned.

Et—Ettrick silt loam, 0 to 2 percent slopes

This very deep, nearly level, poorly drained soil is on flood plains along streams and small rivers. It is subject to ponding and to frequent flooding for brief periods. Individual areas are long and narrow and generally range from 4 to 100 acres in size.

Typically, the surface layer is very dark gray silt loam about 4 inches thick. The subsurface layer is black, mottled silt loam about 11 inches thick. The subsoil is mottled, friable silt loam about 25 inches thick. It is gray in the upper part and grayish brown in the lower part. The substratum to a depth of about 60 inches is gray, mottled silt loam. In places the surface layer is thinner and lighter colored or is muck. In some areas the substratum is fine sand.

Included with this soil in mapping are small areas of the somewhat poorly drained Coffton, poorly

drained Kalmarville, somewhat poorly drained Orion, and very poorly drained Palms soils. Coffton and Orion soils are in the slightly higher positions on flood plains. Kalmarville and Palms soils are in positions similar to those of the Ettrick soil. Kalmarville soils are underlain by sand. Palms soils formed in 16 to 51 inches of organic material. Also included are small areas of silty alluvium underlain by organic material. Included areas make up 5 to 15 percent of the unit.

Permeability is moderately slow in the subsoil of the Ettrick soil and moderate or moderately slow in the substratum. The available water capacity is very high. The content of organic matter is high or very high in the surface layer. The surface layer is friable and can be easily tilled, but it tends to crust and puddle after hard rains or forms hard clods if tilled when too wet. The rooting depth of most plants is limited by an apparent seasonal high water table, which is above or near the surface in undrained areas.

Most areas of this soil are used as unimproved pasture or support brushy or grassy wetland vegetation. A few areas, mainly along entrenched streams, are used for cultivated crops or for pasture. Undrained areas of this soil are poorly suited to crops because of the wetness and the flooding. If drained and protected from flooding, most areas are well suited to corn, soybeans, and small grain and, to a lesser extent, to grasses and legumes for hay and pasture.

A cover of pasture plants is effective in controlling scouring by floodwater. If drained and protected from flooding, this soil is suited to pasture. Alfalfa is generally short lived because of some seasonal wetness and frost action. Red clover and grasses are generally grown. Overgrazing or grazing when the soil is wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, measures that improve fertility, pasture rotation, and restricted use during wet periods help to keep the pasture in good condition.

Most areas of this soil are not naturally forested and generally are not managed for trees. The trees grow slowly and are poorly shaped. The equipment limitation, seedling mortality, and the windthrow hazard are management concerns. Overcoming these limitations is difficult. Better sites should be considered if merchantable trees are to be grown.

This soil generally is not suitable as a site for septic tank absorption fields, dwellings, or local roads because of the flooding and the ponding. Overcoming these limitations is difficult. A better suited site should be considered.

The land capability classification is VIw in undrained areas and IIw in drained areas. No woodland ordination symbol or forest habitat type is assigned.

FaA—Fairchild sand, 0 to 3 percent slopes

This moderately deep, nearly level and gently sloping, somewhat poorly drained soil is on toe slopes. Individual areas are irregular in shape and generally range from 10 to 80 acres in size.

Typically, the surface layer is black sand about 2 inches thick. It is covered by about 2 inches of very dark grayish brown mucky peat, which is a mat of partially decomposed forest litter. The subsurface layer is grayish brown sand about 7 inches thick. The subsoil is about 30 inches thick. The upper part is dark reddish brown, very friable sand. The next part is yellowish brown and brownish yellow, mottled, very friable sand. The lower part is light brownish gray, mottled, firm loam. The substratum to a depth of about 60 inches is weakly cemented interbedded sandstone and shale. In places the surface layer is loamy sand.

Included with this soil in mapping are small areas of the poorly drained Elm Lake, moderately well drained Ludington, and somewhat poorly drained Merrillan soils. Elm Lake soils are in the slightly lower positions on the landscape. Ludington soils are in the higher positions. Merrillan soils are in positions similar to those of the Fairchild soil. Merrillan soils have more silt and clay in the upper part of the solum than the Fairchild soil. Included soils make up 10 to 15 percent of the unit.

Permeability is rapid in the sandy upper part of the subsoil in the Fairchild soil. It is moderately slow or moderate in the loamy lower part of the subsoil and extremely slow to moderately slow in the underlying interbedded sandstone and shale. The available water capacity is low. The content of organic matter is moderate or high in the surface layer. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content. A seasonal high water table is perched at a depth of 1 to 2 feet. The rooting depth of most crops is limited by the seasonal high water table during wet periods of the growing season and by the underlying interbedded sandstone and shale.

Most areas are wooded. Some areas are used for

pasture. Most of the few areas that are used as cropland are reverting to woodland. A cover of pasture plants is effective in controlling soil blowing. Forage yields are generally low unless fertilizer is applied and an adequate amount of moisture is supplied either through a controlled drainage system or through irrigation. Alfalfa is short lived unless the soil is drained. Red clover is generally grown. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is suited to trees. The equipment limitation, seedling mortality, and the windthrow hazard are management concerns. Equipment use is restricted by the wetness, loose sand, and low soil strength. These restrictions can be reduced by using the equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Culverts and ditches can be used to maintain natural drainage systems along haul roads. Seedling mortality caused by seasonal droughtiness can be reduced by careful planting of vigorous nursery stock or containerized seedlings and by planting when the soil is moist. Harvesting by clearcut or area-selection methods helps to prevent windthrow of the remaining trees. Natural seeding from unharvested trees promotes regeneration. Maintaining permanent all-season roads allows quick salvage of downed trees after periodic storms. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

Because of a thin layer over bedrock, the wetness, and the restricted permeability, this soil is poorly suited to septic tank absorption fields. Mounding the site with suitable filtering material helps to overcome these limitations. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas.

Because of the wetness, this soil is poorly suited to dwellings. The wetness can be overcome by installing tile drains around foundations and providing gravity outlets or other dependable outlets and by constructing the foundations on coarse textured fill material above the level of wetness.

Because of the wetness and the potential for frost action, this soil is only moderately suited to local roads and streets. Installing a subsurface drainage system and replacing the upper part of the soil with coarse textured base material, such as sand or gravel, helps to prevent the damage caused by wetness and by frost action.

The land capability classification is IIIw. The woodland ordination symbol is 5W (Jack pine). The primary forest habitat type commonly is PVHa, and the secondary forest habitat type is PVRh.

FeA—Fairchild-Elm Lake complex, 0 to 3 percent slopes

These moderately deep soils are nearly level and gently sloping. The somewhat poorly drained Fairchild soil is on toe slopes. The poorly drained Elm Lake soil is in drainageways and depressions. The Elm Lake soil is subject to ponding. The Fairchild and Elm Lake soils occur as areas so intricately mixed or so small that it was not practical to map them separately. Individual areas are irregular in shape and generally range from 40 to 1,000 acres in size. They are about 40 to 50 percent Fairchild soil and 35 to 45 percent Elm Lake soil.

Typically, the surface layer of the Fairchild soil is black sand about 2 inches thick. It is covered by about 2 inches of very dark grayish brown mucky peat, which is a mat of partially decomposed forest litter. The subsurface layer is grayish brown sand about 9 inches thick. The subsoil is about 26 inches thick. The upper part is dark reddish brown, very friable sand. The next part is dark brown and brownish yellow, mottled, very friable sand. The lower part is pale olive, mottled, firm clay loam. The substratum to a depth of about 60 inches is weakly cemented interbedded sandstone and shale. In places the surface layer is loamy sand.

Typically, the surface layer of the Elm Lake soil is black muck about 4 inches thick. The subsurface layer is very dark gray sand about 4 inches thick. The upper part of the substratum is gray, loose sand. The next part is grayish brown, mottled, loose loamy sand over light brownish gray, mottled, firm clay loam. The lower part of the substratum, from a depth of about 38 to 60 inches, is weakly cemented interbedded sandstone and shale. In places the surface layer is mucky sand, mucky loamy sand, or loamy sand.

Included with these soils in mapping are small

areas of the very poorly drained Dawsil and somewhat poorly drained Merrillan soils. Dawsil soils are in positions on the landscape similar to those of the Elm Lake soil. Dawsil soils formed in 16 to 51 inches of organic material. Merrillan soils are in positions similar to those of the Fairchild soil. They have more silt and clay in the solum than the Fairchild soil. Included soils make up 5 to 20 percent of the unit.

Permeability is rapid in the sandy upper part of the Fairchild and Elm Lake soils, moderately slow or moderate in the loamy part, and extremely slow to moderately slow in the underlying interbedded sandstone and shale. The available water capacity is low in both soils. The content of organic matter is moderate or high in the surface layer of the Fairchild soil and very high in the surface layer of the Elm Lake soil. The surface layer of the Fairchild soil is very friable and can be easily tilled throughout a wide range in moisture content. A perched seasonal high water table is at a depth of 1 to 2 feet in the Fairchild soil and is at or near the surface in the Elm Lake soil. The rooting depth of most crops is limited by the seasonal high water table and the interbedded sandstone and shale.

Most areas of these soils are wooded or support wetland vegetation. Most of the few areas that are used for pasture are reverting to woodland. The Fairchild soil is suited to trees. The Elm Lake soil is suited to some conifers but is poorly suited to most other trees. The equipment limitation, seedling mortality, and the windthrow hazard are management concerns.

Equipment use is restricted by the wetness of the Fairchild and Elm Lake soils and by the loose sand and low strength in areas of the Fairchild soil. These restrictions can be reduced by using the equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Culverts and ditches can be used to maintain natural drainage systems along haul roads. Seedling mortality caused by seasonal droughtiness in areas of the Fairchild soil can be reduced by careful planting of vigorous nursery stock or containerized seedlings and by planting when the soil is moist. Seedling mortality resulting from the seasonal wetness of the Elm Lake soil can be reduced by careful machine planting on prepared ridges or by hand planting on cradle knolls and in the drier included areas. Selecting vigorous nursery stock for planting also reduces the seedling mortality rate. Harvesting by clearcut or area-selection methods helps to prevent windthrow of the remaining trees. Natural seeding from unharvested trees promotes regeneration. Maintaining permanent all-season roads allows quick salvage of downed trees after periodic storms. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

Because of a thin layer over bedrock, the wetness, and the restricted permeability, the Fairchild soil is poorly suited to septic tank absorption fields. Mounding the site with suitable filtering material helps to overcome these limitations. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas. Because of a thin layer over bedrock, the ponding, and the restricted permeability, the Elm Lake soil generally is not suitable as a site for septic tank absorption fields. Overcoming these limitations is difficult. A better suited site should be considered.

Because of the wetness, the Fairchild soil is poorly suited to dwellings. This limitation can be overcome by installing tile drains around foundations and providing gravity outlets or other dependable outlets and by constructing the foundations on coarse textured fill material above the level of wetness. Because of the ponding, the Elm Lake soil is generally not suitable as a site for dwellings. Overcoming the ponding is difficult. A better suited site should be considered.

Because of the wetness and the potential for frost action, the Fairchild soil is only moderately suited to local roads and streets. Installing a subsurface drainage system and replacing the upper part of the soil with coarse textured base material, such as sand or gravel, help to prevent the damage caused by wetness and by frost action. Because of the ponding, the Elm Lake soil generally is not suited to local roads and streets. Overcoming this limitation is difficult. A better suited site should be considered.

The land capability classification is VIw in undrained areas. The woodland ordination symbol is 5W (Jack pine) for the Fairchild soil and 3W (Red maple) for the Elm Lake soil. The primary forest habitat type commonly is PVHa for the Fairchild soil, and the secondary forest habitat type is PVRh. No forest habitat type is assigned for the Elm Lake soil.

GaC2—Gale silt loam, 6 to 12 percent slopes, eroded

This moderately deep, sloping, well drained soil is on summits and shoulders of ridges, knolls, and hills. Individual areas are irregular in shape and generally range from 5 to 25 acres in size.

In most cultivated areas, erosion has removed much of the original surface layer. Typically, the remaining surface layer is dark brown silt loam about 9 inches thick. It is mixed with some yellowish brown subsoil material. The subsoil is about 19 inches thick. It is yellowish brown and dark brown, friable silt loam in the upper part and dark brown, friable loam in the lower part. The upper part of the substratum is yellowish brown sand about 10 inches thick. The lower part to a depth of about 60 inches is weakly cemented sandstone. In places the surface layer is thicker and darker. In some areas the slope is less than 6 percent or more than 12 percent.

Included with this soil in mapping are small areas of the well drained Hixton and Seaton soils. Hixton soils are in the higher positions on the landscape. They have more sand in the subsoil than the Gale soil. Seaton soils are in positions similar to those of the Gale soil. They are silty throughout. Included soils make up 10 to 15 percent of the unit.

Permeability is moderate in the subsoil of the Gale soil. It is rapid in the sandy substratum and moderately slow or moderate in the underlying sandstone. The available water capacity is moderate. The content of organic matter is moderately low or moderate in the surface layer. The surface layer is friable and can be easily tilled, but it tends to crust and puddle after hard rains or forms hard clods if it is tilled when too wet. The rooting depth of most crops is limited by the underlying sandstone.

Most areas are used as cropland. A few areas are used as pasture or woodland. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, water erosion is a moderate hazard. It can be controlled by contour farming, contour stripcropping, grassed waterways, and conservation tillage. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and reduces the hazard of water erosion.

A cover of pasture plants is effective in controlling water erosion. The surface layer is subject to crusting, which restricts the emergence of plants. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

This soil is suited to trees. Equipment use is restricted by the slope and by low strength. Log landings can be established in nearly level or gently sloping included or adjacent areas. Low strength can be overcome by using equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in more suitable included or adjacent areas. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

Because of a thin layer over bedrock, seepage, and a poor filtering capacity, this soil is poorly suited to septic tank absorption fields. These limitations can result in the pollution of ground water. Mounding the site with suitable filtering material helps to overcome the limitations. The effluent can also be pumped to an absorption field on a better suited soil in nearby areas.

Because of the slope and the potential for shrinking and swelling, this soil is only moderately suited to dwellings. The slope can be overcome by cutting and filling, by installing retaining walls, or by designing the dwellings so that one side of the basement fronts on the lower part of the slope. Also, the dwellings can be constructed in the less sloping included areas. The shrink-swell potential can be overcome by excavating the soil and replacing it with coarse textured material, such as sand or gravel; by strengthening the basement walls; and by installing a subsurface drainage system around the dwellings at or below the basement elevation.

Because of the low strength and the potential for frost action, this soil is poorly suited to local roads and streets. These limitations can be overcome by replacing the upper part of the soil with coarse textured base material, such as sand or gravel. Low strength also can be overcome by increasing the thickness of the pavement or base material.

The land capability classification is IIIe. The woodland ordination symbol is 5A (Northern red oak). The primary forest habitat type commonly is ArCi, and the secondary forest habitat type is ArDe-V.

GaD2—Gale silt loam, 12 to 25 percent slopes, eroded

This moderately deep, moderately steep and steep, well drained soil is on shoulders, nose slopes, and the upper foot slopes of ridges, knolls, and hills. Individual areas are irregular in shape and generally range from 5 to 25 acres in size.

In most cultivated areas, erosion has removed much of the original surface layer. Typically, the remaining surface layer is dark grayish brown silt loam about 8 inches thick. It is mixed with some yellowish brown subsoil material. The subsoil is about 23 inches thick. It is dark yellowish brown and yellowish brown, friable silt loam in the upper part and yellowish brown, friable sandy loam in the lower part. The upper part of the substratum is brownish yellow sand about 8 inches thick. The lower part to a depth of about 60 inches is weakly cemented sandstone bedrock. In places the surface layer is thicker and darker. In some areas the slope is less than 12 percent or more than 25 percent.

Included with this soil in mapping are small areas of the well drained Hixton and Seaton soils. Hixton soils are in the slightly higher positions on the landscape. They have more sand in the subsoil than the Gale soil. Seaton soils are in positions similar to those of the Gale soil. They are silty throughout. Included soils make up 10 to 15 percent of the unit.

Permeability is moderate in the subsoil of the Gale soil. It is rapid in the sandy substratum and moderately slow or moderate in the underlying sandstone. The available water capacity is moderate. The content of organic matter is moderately low or moderate in the surface layer. The surface layer is friable and can be easily tilled, but it tends to crust and puddle after hard rains or forms hard clods if it is tilled when too wet. The rooting depth of most crops is limited by the underlying sandstone.

Most areas are used as cropland or pasture. A few extensive areas are wooded. This soil is suited to corn and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, water erosion is a severe hazard. It can be controlled by contour farming, contour stripcropping, crop rotations that include grasses and legumes, and conservation tillage. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and reduces the hazard of water erosion.

A cover of pasture plants is effective in controlling water erosion. The surface layer is subject to crusting, which restricts the emergence of plants. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

This soil is suited to trees. The erosion hazard and the equipment limitation are management concerns. Erosion is accelerated where runoff is concentrated on skid trails, log landings, and haul roads. Removing water with water bars, establishing out-sloping road surfaces, crowning the road surfaces, providing ditches and culverts, and establishing skid trails and haul roads on the contour minimize erosion. Erosion also can be controlled by seeding areas where logging has exposed the surface.

Equipment use is restricted by the slope and by low strength. Skid trails and haul roads can be designed so that they conform to the topography and so that grades are kept as low as possible. Log landings can be established in the nearly level or gently sloping included or adjacent areas. Low strength can be overcome by using the equipment during dry periods or during periods when the surface is frozen or has an adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in more suitable included or adjacent areas. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

Because of a thin layer over bedrock, a poor filtering capacity, and the slope, this soil generally is poorly suited to septic tank absorption fields. It readily absorbs but does not adequately filter the effluent. The thin layer and the poor filtering capacity can be overcome by mounding the site with suitable filtering material. The slope can be overcome by cutting and filling or by installing a trench absorption system on the contour.

Because of the slope, this soil is poorly suited to dwellings. This limitation can be overcome by cutting and filling, by installing retaining walls, or by designing the dwellings so that one side of the basement fronts on the lower part of the slope. Also, the dwellings can be constructed in the included areas where the slope is less than 6 percent.

Because of the low strength, the slope, and the potential for frost action, this soil is poorly suited to local roads and streets. Low strength and the potential for frost action can be overcome by

replacing the upper part of the soil with coarse textured base material, such as sand or gravel. Low strength also can be overcome by increasing the thickness of the pavement or base material. The slope can be overcome by shaping the roadway through cutting and filling. Also, the roads can be built in the less sloping areas.

The land capability classification is IVe. The woodland ordination symbol is 5R (Northern red oak). The primary forest habitat type commonly is ArCi, and the secondary forest habitat type is ArDe-V.

GoB—Gosil loamy sand, 0 to 6 percent slopes

This very deep, nearly level and gently sloping, excessively drained soil is on flats and knolls. Individual areas are irregular in shape and generally range from 5 to 80 acres in size.

Typically, the surface layer is dark brown loamy sand about 9 inches thick. The subsoil is about 18 inches thick. It is dark brown and brown, very friable loamy sand in the upper part and strong brown, very friable sand in the lower part. The substratum to a depth of about 60 inches is reddish yellow and very pale brown sand. In places the subsoil is sandy loam or loamy fine sand. In some areas the slope is more than 6 percent.

Included with this soil in mapping are small areas of the well drained Bilson and excessively drained Tarr soils. These soils are in positions on the landscape similar to those of the Gosil soil. Bilson soils have more silt and clay in the surface layer and subsoil than the Gosil soil, and Tarr soils have more sand and slightly less silt and clay in the solum. Included soils make up 5 to 15 percent of the unit.

Permeability is rapid in the Gosil soil. The available water capacity is low. The content of organic matter is low or moderately low in the surface layer. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content.

Most areas are used as cropland. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. In many years crop yields are limited by the low available water capacity. If irrigated, the soil is suited to the commonly grown farm crops and to vegetables, such as snap beans and sweet corn. If cultivated crops are grown, water erosion is a slight hazard. Also, the soil is subject to soil blowing. Winter cover crops, conservation tillage, wind stripcropping, and field windbreaks help to prevent excessive soil loss. Returning crop residue to the soil or adding other organic material reduces the hazard of soil blowing and the amount of water lost through evaporation, increases the rate of water infiltration, and helps to maintain fertility and good tilth.

A cover of pasture plants is effective in controlling soil blowing and water erosion. Forage yields are generally low unless fertilizer is applied and the supply of moisture is adequate. Planting early in spring, before the soil has a chance to dry, helps to overcome the droughtiness. Later plantings are likely to have a poor survival rate. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Measures that improve fertility, proper stocking rates, and pasture rotation help to keep the pasture in good condition.

This soil is suited to trees. The only soil-related management concern is competing vegetation, which interferes with tree planting and natural regeneration after trees are harvested. Plant competition can be controlled by herbicides or by mechanical removal.

This soil is suited to dwellings and to local roads and streets. It readily absorbs the effluent in septic tank absorption fields, but it does not adequately filter the effluent because of the rapid permeability. The poor filtering capacity can result in the pollution of ground water.

The land capability classification is IVs. The woodland ordination symbol is 3A (Northern red oak). The primary forest habitat type commonly is PVHa, and the secondary forest habitat type is PVCr.

GoC—Gosil loamy sand, 6 to 12 percent slopes

This very deep, sloping, excessively drained soil is on back slopes and foot slopes. Individual areas are long and narrow and generally range from 5 to 30 acres in size.

Typically, the surface layer is dark brown loamy sand about 9 inches thick. The subsoil is about 18 inches thick. It is dark brown and dark yellowish brown, very friable loamy sand in the upper part and yellowish brown, very friable sand in the lower part. The substratum to a depth of about 60 inches is brownish yellow sand that has thin lamellae of reddish brown loamy sand. In places the subsoil is sandy loam.

Included with this soil in mapping are small areas of the well drained Bilson and excessively drained Tarr soils. These soils are in positions on the landscape similar to those of the Gosil soil. Bilson soils have more silt and clay in the surface layer and

subsoil than the Gosil soil, and Tarr soils have more sand and slightly less silt and clay in the solum. Included soils make up 5 to 15 percent of the unit.

Permeability is rapid in the Gosil soil. The available water capacity is low. The content of organic matter is low or moderately low in the surface layer. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content.

Most areas are used as cropland. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. In many years crop yields are limited by the low available water capacity. The soil is poorly suited to irrigation because of the slope. If cultivated crops are grown, water erosion is a moderate hazard. Also, the soil is subject to soil blowing. Conservation tillage, wind stripcropping, field windbreaks, contour farming, and contour stripcropping help to prevent excessive soil loss. Returning crop residue or other organic material to the soil reduces the amount of water lost through evaporation, increases the rate of water infiltration, helps to maintain fertility and good tilth, and helps to control erosion and soil blowing.

A cover of pasture plants is effective in controlling water erosion and soil blowing. Forage yields are generally low unless fertilizer is applied and adequate moisture is available. Planting early in spring, before the soil has a chance to dry, helps to overcome the droughtiness. Later plantings are likely to have a poor survival rate. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Measures that improve fertility, proper stocking rates, and pasture rotation help to keep the pasture in good condition.

This soil is suited to trees. Equipment use on log landings is restricted by the slope. Log landings can be established in nearly level or gently sloping included or adjacent areas. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or mechanical removal.

This soil readily absorbs the effluent in septic tank absorption fields. It does not adequately filter the effluent, however, because of the rapid permeability. The poor filtering capacity can result in the pollution of ground water.

Because of the slope, this soil is only moderately suited to dwellings. This limitation can be overcome by cutting and filling, by installing retaining walls, or by designing the dwellings so that one side of the basement fronts on the lower part of the slope. Also, the dwellings can be constructed in included areas where the slope is less than 6 percent.

Because of the slope, this soil is only moderately suited to local roads and streets. This limitation can be overcome by shaping the roadway through cutting and filling or building the roads in the less sloping areas.

The land capability classification is IVs. The woodland ordination symbol is 3A (Northern red oak). The primary forest habitat type commonly is PVHa, and the secondary forest habitat type is PVCr.

HkB—Hiles-Kert silt loams, 0 to 6 percent slopes

These soils are moderately deep, nearly level and gently sloping, and moderately well drained and somewhat poorly drained. The Hiles soil is on the summits and shoulders of knolls. The Kert soil is on the foot slopes of knolls. The Hiles and Kert soils occur as areas so intricately mixed or so small that it was not practical to map them separately. Individual areas are irregular in shape and generally range from 5 to 60 acres in size. They are about 40 to 50 percent Hiles soil and 30 to 40 percent Kert soil.

Typically, the surface layer of the Hiles soil is dark brown silt loam about 8 inches thick. The subsurface layer is brown silt loam about 4 inches thick. The subsoil is about 16 inches thick. It is mixed dark yellowish brown and brown, friable silt loam in the upper part and dark yellowish brown, mottled, friable loam in the lower part. The substratum to a depth of about 60 inches is weakly cemented interbedded sandstone and shale. In places the surface layer is loam. In some areas the slope is more than 6 percent.

Typically, the surface layer of the Kert soil is very dark grayish brown silt loam about 8 inches thick. The subsurface layer is brown, mottled silt loam about 2 inches thick. The subsoil is about 29 inches thick. The upper part is a mixture of yellowish brown and brown, mottled, friable silt loam, and the lower part is light brownish gray and light gray, mottled, firm loam and clay loam. The substratum to a depth of about 60 inches is weakly cemented interbedded sandstone and shale. In places the surface layer is loam.

Included with these soils in mapping are small areas of the moderately well drained Humbird, somewhat poorly drained Merrillan, and poorly drained Veedum soils. Humbird soils are in positions on the landscape similar to those of the Hiles soil. They contain more sand in the upper part of the subsoil than the Hiles soil. Merrillan soils are in positions similar to those of the Kert soil. They

contain more sand in the upper part of the subsoil than the Kert soil. Veedum soils are in the lower positions on the landscape. Included soils make up 10 to 20 percent of the unit.

Permeability is moderate in the upper part of the subsoil in the Hiles and Kert soils. It is moderately slow or moderate in the lower part of the subsoil and extremely slow to moderately slow in the underlying interbedded sandstone and shale. The available water capacity is moderate in both soils. The content of organic matter is moderately low or moderate in the surface layer of the Hiles soil and moderate in the surface layer of the Kert soil. The surface layer of both soils is very friable and can be easily tilled, but it tends to crust and puddle after hard rains or forms hard clods if it is tilled when too wet. A perched seasonal high water table is at a depth of 1.5 to 3.0 feet in the Hiles soil and at a depth of 1.0 to 2.5 feet in the Kert soil. The rooting depth of most crops is limited by the seasonal high water table during wet periods of the growing season and by the interbedded sandstone and shale.

Most areas are used as cropland. Some areas are wooded. The Hiles soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If drained, the Kert soil is also suited to these crops. If cultivated crops are grown, water erosion is a slight or moderate hazard. It can be controlled by contour farming, contour stripcropping, conservation tillage, and grassed waterways. Land smoothing, surface drains, diversions, and tile drains help to remove excess water from the Kert soil. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and reduces the hazard of erosion.

A cover of pasture plants is effective in controlling erosion. The surface layer is subject to crusting, which restricts the emergence of plants. Alfalfa is generally short lived because of the seasonal high water table and winterkill from frost heave. Overgrazing or grazing when the soils are wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

These soils are suited to trees. The equipment limitation on both soils and the windthrow hazard on the Kert soil are management concerns. Equipment use is restricted by the low strength of both soils and by wetness in areas of the Kert soil. These restrictions can be reduced by using equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Culverts and ditches can be used to maintain natural drainage systems along haul roads. Harvesting by clearcut or area-selection methods helps to prevent windthrow of the remaining trees on the Kert soil. Natural seeding from unharvested trees promotes regeneration. Maintaining permanent all-season roads allows quick salvage of downed trees after periodic storms. Competing vegetation, which interferes with tree planting and natural regeneration after trees are harvested, can be controlled by herbicides or mechanical removal.

Because of the wetness, a thin layer over bedrock, and the restricted permeability, these soils are poorly suited to septic tank absorption fields. Mounding the site with suitable filtering material helps to overcome these limitations. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas.

Because of the wetness and the shrink-swell potential, the Hiles soil is only moderately suited to dwellings without basements. The shrink-swell potential can be overcome by excavating the soil and replacing it with coarse textured material, such as sand and gravel. The wetness can be overcome by installing a subsurface drainage system with gravity outlets or other dependable outlets or by raising the site elevation with fill material.

Because of the wetness, the Hiles soil is poorly suited to dwellings with basements. Also, the Kert soil is poorly suited to all dwellings. The wetness can be overcome by constructing foundations on coarse textured fill material above the level of wetness and by installing tile drains around the foundations and providing gravity outlets or other dependable outlets.

Because of the wetness and the potential for shrinking and swelling, the Hiles soil is only moderately suited to local roads and streets. Because of the potential for frost action and the low strength, the Kert soil is poorly suited to local roads and streets. Installing a subsurface drainage system and replacing the upper part of the soil with coarse textured base material, such as sand or gravel, helps to overcome these limitations.

The land capability classification is IIw. The woodland ordination symbol is 4L (Northern red oak)

for the Hiles soil and 4W (Northern red oak) for the Kert soil. The forest habitat type commonly is ArCi for the Hiles soil and PVHa for the Kert soil.

HnB—Hixton loam, 2 to 6 percent slopes

This moderately deep, gently sloping, well drained soil is on summits of knolls and hills. Individual areas are irregular in shape and generally range from 5 to 80 acres in size.

Typically, the surface layer is dark brown loam about 8 inches thick. The subsoil is about 18 inches thick. It is dark brown and friable. The upper part is loam, and the lower part is sandy loam. The upper part of the substratum is strong brown sand about 10 inches thick. The lower part to a depth of about 60 inches is weakly cemented sandstone. In places the surface layer is silt loam. In some areas the slope is more than 6 percent.

Included with this soil in mapping are small areas of the well drained Elevasil, Gale, and Merit soils and the moderately well drained Merimod soils. Elevasil and Gale soils are in landscape positions similar to those of the Hixton soil. Elevasil soils have more sand in the surface layer and subsoil than the Hixton soil, and Gale soils have more silt and clay in the subsoil. Merit and Merimod soils are underlain by sand and are very deep. Merit soils are in positions on pediments similar to those of the Hixton soil. Merimod soils are in the lower positions on pediments. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate in the loamy subsoil of the Hixton soil. It is rapid in the sandy residuum and moderately slow or moderate in the underlying sandstone. The available water capacity is moderate. The content of organic matter is moderately low in the surface layer. The surface layer is friable and can be easily tilled throughout a wide range in moisture content. The rooting depth of most crops is limited by the underlying sandstone.

Most areas are used as cropland. A few areas are used as pasture or woodland. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, water erosion is a slight or moderate hazard. It can be controlled by contour farming, contour stripcropping, conservation tillage, and grassed waterways. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and reduces the hazard of erosion.

A cover of pasture plants is effective in controlling water erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

This soil is suited to trees. Equipment use on log landings and haul roads is restricted by low strength. Low strength can be overcome by using equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in more suitable included or adjacent areas. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

Because of a thin layer over bedrock and a poor filtering capacity, this soil is poorly suited to septic tank absorption fields. These limitations can result in the pollution of ground water. Mounding the site with suitable filtering material helps to overcome the limitations. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas.

This soil is suited to dwellings. Because of the potential for frost action, it is only moderately suited to local roads and streets. Replacing the upper part of the soil with coarse textured base material, such as sand or gravel, helps to prevent the damage caused by frost action.

The land capability classification is IIe. The woodland ordination symbol is 4A (Northern red oak). The forest habitat type commonly is ArDe-V.

HnC2—Hixton loam, 6 to 12 percent slopes, eroded

This moderately deep, sloping, well drained soil is on the shoulders and back slopes of knolls, ridges, and hills. Individual areas are irregular in shape and generally range from 5 to 60 acres in size.

In most cultivated areas, erosion has removed much of the original surface layer. Typically, the remaining surface layer is dark brown loam about 9 inches thick. It is mixed with some dark yellowish brown subsoil material. The subsoil is about 23 inches thick. It is dark yellowish brown, friable loam in the upper part and dark yellowish brown, friable sandy loam in the lower part. The upper part of the

substratum is brownish yellow sand about 7 inches thick. The lower part to a depth of about 60 inches is weakly cemented sandstone. In places the surface layer is silt loam. In some areas the slope is less than 6 percent or more than 12 percent.

Included with this soil in mapping are small areas of the well drained Elevasil, Gale, Gardenvale, and Merit soils and the moderately well drained Merimod soils. Elevasil, Gale, and Gardenvale soils are in landscape positions similar to those of the Hixton soil. Elevasil soils have more sand in the surface layer and subsoil than the Hixton soil, and Gale soils have more silt and clay in the subsoil. Gardenvale soils are deep to weakly cemented sandstone. Merit soils are in positions on pediments similar to those of the Hixton soil. They are underlain by sand and are very deep. Merimod soils are in the lower positions on pediments. They are underlain by sand. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate in the loamy subsoil of the Hixton soil. It is rapid in the sandy residuum and moderately slow or moderate in the underlying sandstone. The available water capacity is moderate. The content of organic matter is moderately low in the surface layer. The surface layer is friable and can be easily tilled throughout a wide range in moisture content. The rooting depth of most crops is limited by the underlying sandstone.

Most areas are used as cropland or pasture. A few areas are wooded. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, water erosion is a moderate hazard. It can be controlled by contour farming, contour stripcropping, conservation tillage, and grassed waterways. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and reduces the hazard of water erosion.

A cover of pasture plants is effective in controlling water erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

This soil is suited to trees. Equipment use is restricted by the slope at log landings and by low strength at log landings and on haul roads. Log landings can be established in nearly level or gently sloping included or adjacent areas. Low strength can be overcome by using equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

Because of a thin layer over bedrock and a poor filtering capacity, this soil is poorly suited to septic tank absorption fields. These limitations can result in the pollution of ground water. Mounding the site with suitable filtering material helps to overcome the limitations. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas.

Because of the slope, this soil is only moderately suited to dwellings. This limitation can be overcome by cutting and filling, by installing retaining walls, or by designing the dwellings so that one side of the basement fronts on the lower part of the slope. Also, the dwellings can be constructed in the less sloping included areas.

Because of the slope and the potential for frost action, this soil is only moderately suited to local roads and streets. The slope can be overcome by shaping the roadway through cutting and filling. Also, the roads can be built in the less sloping areas. Replacing the upper part of the soil with coarse textured base material, such as sand or gravel, helps to prevent the damage caused by frost action.

The land capability classification is IIIe. The woodland ordination symbol is 4A (Northern red oak). The forest habitat type commonly is ArDe-V.

HnD2—Hixton loam, 12 to 20 percent slopes, eroded

This moderately deep, moderately steep, well drained soil is on shoulders, back slopes, nose slopes, and the upper foot slopes of hills and ridges. Individual areas are irregular in shape and generally range from 5 to 60 acres in size.

In most cultivated areas, erosion has removed much of the original surface layer. Typically, the remaining surface layer is dark brown loam about 8 inches thick. It is mixed with some dark yellowish brown subsoil material. The subsoil is about 18 inches thick. The upper part is dark yellowish brown, friable loam, and the lower part is yellowish brown,

friable sandy loam. The upper part of the substratum is yellowish brown sand about 6 inches thick. The lower part to a depth of about 60 inches is weakly cemented sandstone. In places the surface layer is silt loam. In some areas the slope is less than 12 percent or more than 20 percent.

Included with this soil in mapping are small areas of the well drained Council, Elevasil, and Gale soils. These soils are in landscape positions similar to those of the Hixton soil. Council soils are loamy throughout and are very deep. Elevasil soils have more sand in the surface layer than the Hixton soil, and Gale soils have more silt and clay in the subsoil. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate in the loamy subsoil of the Hixton soil. It is rapid in the sandy residuum and moderately slow or moderate in the underlying sandstone. The available water capacity is moderate. The content of organic matter is moderately low in the surface layer. The surface layer is friable and can be easily tilled throughout a wide range in moisture content. The rooting depth of most crops is limited by the underlying sandstone.

Most areas are used as cropland or pasture. A few areas are wooded. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, water erosion is a moderate hazard. It can be controlled by contour farming, contour stripcropping, crop rotations that include grasses and legumes, conservation tillage, and grassed waterways. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and reduces the hazard of water erosion.

A cover of pasture plants is effective in controlling water erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

This soil is suited to trees. The erosion hazard and the equipment limitation are management concerns. Erosion is accelerated where runoff is concentrated on skid trails, log landings, and haul roads. Removing water with water bars, establishing out-sloping road surfaces, crowning the road surfaces, providing ditches and culverts, and establishing skid trails and haul roads on the contour minimize erosion. Erosion also can be controlled by seeding areas where logging has exposed the surface.

Equipment use is restricted by the slope on skid trails and by the slope and low strength at log landings and on haul roads. Skid trails and haul roads can be designed so that they conform to the topography and so that grades are kept as low as possible. Log landings can be established in nearly level or gently sloping included or adjacent areas. Low strength can be overcome by using the equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

Because of a thin layer over bedrock, a poor filtering capacity, and the slope, this soil generally is poorly suited to septic tank absorption fields. It readily absorbs but does not adequately filter the effluent. The poor filtering capacity can result in the pollution of ground water. The thin layer and the poor filtering capacity can be overcome by mounding the site with suitable filtering material. The slope can be overcome by cutting and filling or by installing a trench absorption system on the contour.

Because of the slope, this soil is poorly suited to dwellings. This limitation can be overcome by cutting and filling, by installing retaining walls, or by designing the dwellings so that one side of the basement fronts on the lower part of the slope. Also, the dwellings can be constructed in the less sloping included areas.

Because of the slope, this soil is poorly suited to local roads and streets. The slope can be overcome by shaping the roadway through cutting and filling. Also, the roads can be built in the less sloping included areas.

The land capability classification is IVe. The woodland ordination symbol is 4R (Northern red oak). The forest habitat type commonly is ArDe-V.

HpA—Hoop sandy loam, 0 to 3 percent slopes

This very deep, nearly level and gently sloping, somewhat poorly drained soil is in drainageways and depressions. Individual areas are irregular in shape and range from about 4 to 40 acres in size.

Typically, the surface layer and the subsurface

layer are very dark grayish brown sandy loam about 11 inches thick. The subsoil is mottled, friable sandy loam about 13 inches thick. It is dark yellowish brown in the upper part and grayish brown in the lower part. The substratum to a depth of about 60 inches is brownish yellow and light brownish gray, mottled sand. In places the surface layer is thinner and lighter colored.

Included with this soil in mapping are small areas of the moderately well drained Bilmod and somewhat poorly drained Sooner soils. Bilmod soils are in the slightly higher positions on the landscape. Sooner soils are in positions similar to those of the Hoop soil. They have more clay in the subsoil than the Hoop soil. Also included are small areas of poorly drained sandy loam. These areas are in the slightly lower landscape positions. Included areas make up 5 to 15 percent of the unit.

Permeability is moderate in the loamy mantle in the Hoop soil and rapid or very rapid in the sandy alluvium. The available water capacity is low. The content of organic matter is moderate in the surface layer. The surface layer is friable and can be easily tilled throughout a wide range in moisture content. An apparent seasonal high water table is at a depth of 1 to 2 feet. The rooting depth of most crops is limited by the seasonal high water table during wet periods of the growing season.

Most areas are used as cropland. A few areas are used for pasture or are wooded. This soil is not naturally forested and is not generally managed for woodland. If it is drained, the soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Land smoothing, a surface drainage system, diversions, and interception drains help to remove excess water. If tile drainage is installed, fine sand enters the tile lines unless a suitable filter is used to cover the tile. If the water table is excessively lowered, however, crop yields are limited by a low available water capacity. If irrigated, the soil is also suited to vegetables, such as snap beans, potatoes, sweet corn, and peas. In cultivated areas, it is subject to soil blowing. Applying a system of conservation tillage, wind stripcropping, and returning crop residue or other organic material to the soil help to maintain fertility and good tilth, increase the rate of water infiltration, and reduce the hazard of soil blowing.

This soil is suited to pasture. A cover of pasture plants is effective in controlling soil blowing. Alfalfa is generally short lived because of the seasonal high water table and winterkill from frost heave. Red clover is generally grown. Overgrazing or grazing when the soil is wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, measures that improve fertility, pasture rotation, and restricted use during wet periods help to keep the pasture in good condition.

Because of the wetness and a poor filtering capacity in the substratum, this soil is poorly suited to septic tank absorption fields. The soil readily absorbs the effluent in septic tank absorption fields. It does not adequately filter the effluent, however, because of the rapid permeability. The poor filtering capacity can result in the pollution of ground water. Mounding the site with suitable filtering material helps to overcome the wetness and the poor filtering capacity. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas.

Because of the wetness, this soil is poorly suited to dwellings. This limitation can be overcome by installing tile drains around foundations and providing gravity outlets or other dependable outlets and by constructing the foundations on coarse textured fill material above the level of wetness.

Because of the wetness and the potential for frost action, this soil is poorly suited to local roads and streets. Installing a subsurface drainage system and replacing the upper part of the soil with a coarse textured base material, such as sand or gravel, helps to overcome these limitations.

The land capability classification is IIIw. No woodland ordination symbol or forest habitat type is assigned.

Ht—Houghton muck, 0 to 1 percent slopes

This very deep, nearly level, very poorly drained soil is on flood plains along small rivers and streams. It is subject to frequent flooding for long periods. Individual areas are long and narrow or irregularly shaped and generally range from 5 to 100 acres in size.

Typically, the organic layers extend to a depth of more than 51 inches. They are mostly very dark brown and black muck. In places the organic layers are mostly mucky peat or peat.

Included with this soil in mapping are small areas of the very poorly drained Adder soils and areas of very poorly drained silty alluvium underlain by organic material. These soils are in positions on the landscape similar to those of the Houghton soil. Adder soils have a sandy substratum. Included soils make up 5 to 15 percent of the unit.

Permeability is moderately slow to moderately rapid in the Houghton soil. The available water capacity and the organic matter content are very high. The rooting depth of most plants is limited by the apparent seasonal high water table, which is near or above the surface in undrained areas.

Most areas support wetland vegetation. Because of the wetness, frequent flooding, and the hazard of frost late in spring and early in fall, this soil is generally not suited to cultivated crops or to pasture. If drained and cultivated, it is subject to burning, subsidence, and soil blowing.

In most areas, this soil is not suited to trees. Generally, trees grow poorly, are poorly shaped, and are barely merchantable. In a few areas that are naturally drained by stream entrenchment, the soil is suited to trees. Overcoming the limitations affecting management is difficult, however, and a more suitable site should be selected.

This soil generally is not suitable as a site for septic tank absorption fields, dwellings, or local roads and streets, mainly because of the wetness, the flooding, the subsidence, and low strength. Overcoming these limitations is difficult. A better suited site should be considered.

The land capability classification is VIIIw in undrained areas. No woodland ordination symbol or forest habitat type is assigned.

HuB—Humbird fine sandy loam, 1 to 6 percent slopes

This moderately deep, gently sloping, moderately well drained soil is on summits and shoulders of low knolls. Individual areas are irregular in shape and generally range from 5 to 120 acres in size.

Typically, the surface layer is very dark brown fine sandy loam about 8 inches thick. The subsurface layer is dark grayish brown fine sandy loam about 4 inches thick. The subsoil is about 22 inches thick. The upper part is brown and dark yellowish brown, friable fine sandy loam. The next part is olive gray, mottled, friable fine sandy loam. The lower part is light olive gray, mottled, firm silty clay. Weakly cemented interbedded sandstone and shale is at a depth of about 34 inches. In places the surface layer is sandy loam.

Included with this soil in mapping are small areas of the moderately well drained Ludington and somewhat poorly drained Merrillan soils. Ludington soils are in positions on the landscape similar to those of the Humbird soil. They have more sand in the surface layer and subsoil than the Humbird soil. Merrillan soils are in the slightly lower positions. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate or moderately rapid in the loamy upper part of the subsoil in the Humbird soil. It is slow in the clayey lower part of the subsoil and extremely slow to moderately slow in the underlying interbedded sandstone and shale. The available water capacity is low. The content of organic matter is moderately low or moderate in the surface layer. The surface layer is friable and can be easily tilled throughout a wide range in moisture content. A seasonal high water table is perched at a depth of 1.5 to 3.0 feet. The rooting depth of most crops is limited by the seasonal high water table during wet periods of the growing season or by the underlying interbedded sandstone and shale.

Most areas are used as cropland or pasture. A few areas are wooded. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. In most years crop yields are limited by the low available water capacity. If irrigated, the soil is also suited to vegetables, such as snap beans, potatoes, sweet corn, and peas. If cultivated crops are grown, water erosion is a slight or moderate hazard. Also, the soil is subject to soil blowing. Contour farming, contour stripcropping, winter cover crops, field windbreaks, conservation tillage, and grassed waterways help to prevent excessive soil loss. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and helps to control erosion and soil blowing.

A cover of pasture plants is effective in controlling water erosion and soil blowing. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, and measures that improve fertility help to keep the pasture in good condition.

This soil is suited to trees. Equipment use is restricted by low strength. This restriction can be reduced by using equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Competing

vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or mechanical removal.

Because of a thin layer over bedrock, wetness, and the restricted permeability, this soil is poorly suited to septic tank absorption fields. Mounding the site with suitable filtering material helps to overcome these limitations. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas.

Because of the wetness, this soil is only moderately suited to dwellings without basements and is poorly suited to dwellings with basements. The wetness can be overcome by installing a subsurface drainage system with gravity outlets or other dependable outlets or by adding fill to raise the elevation of the site.

Because of the wetness and the potential for frost action, this soil is only moderately suited to local roads and streets. Excavating and replacing the soil with coarse textured base material, such as sand or gravel, help to prevent the damage caused by wetness and by frost action.

The land capability classification is IIe. The woodland ordination symbol is 4L (Northern red oak). The primary forest habitat type commonly is ArDe-V, and the secondary forest habitat type is PVHa.

HxB—Humbird-Merrillan fine sandy loams, 0 to 6 percent slopes

These moderately deep soils are nearly level and gently sloping. The moderately well drained Humbird soil is on the gently sloping summits and shoulders of knolls. The somewhat poorly drained Merrillan soil is on toe slopes. The Humbird and Merrillan soils occur as areas so intricately mixed or so small that it was not practical to map them separately. Individual areas are irregular in shape and generally range from 5 to 450 acres in size. They are about 35 to 45 percent Humbird soil and 35 to 45 percent Merrillan soil.

Typically, the surface layer of the Humbird soil is black fine sandy loam about 2 inches thick. It is covered by about 1 inch of very dark grayish brown mucky peat, which is a mat of partially decomposed forest litter. The subsurface layer is grayish brown fine sandy loam about 3 inches thick. The subsoil is about 24 inches thick. The upper part is dark brown, very friable fine sandy loam. The next part is reddish brown, firm silty clay. The lower part is light olive gray, mottled, firm silty clay. The substratum to a depth of about 60 inches is weakly cemented interbedded sandstone and shale. In places the surface layer is sandy loam. In some areas the slope is more than 6 percent.

Typically, the surface layer of the Merrillan soil is black fine sandy loam about 2 inches thick. It is covered by about 1 inch of very dark grayish brown mucky peat, which is a mat of partially decomposed forest litter. The subsurface layer is pinkish gray fine sandy loam about 2 inches thick. The subsoil is about 25 inches thick. It is dark brown, friable fine sandy loam in the upper part; light yellowish brown and very pale brown, friable fine sandy loam in the next part; and light gray, mottled, firm clay loam in the lower part. The substratum to a depth of about 60 inches is weakly cemented interbedded sandstone and shale. In places the surface layer is sandy loam or loam.

Included with these soils in mapping are small areas of the somewhat poorly drained Fairchild, moderately well drained Ludington, and poorly drained Veedum soils. Also included are small areas that have slopes of more than 6 percent. Fairchild soils are in positions on the landscape similar to those of the Merrillan soil. They are sandy in the upper part of the subsoil. Ludington soils are in positions similar to those of the Humbird soil. They are sandy in the upper part of the profile. Veedum soils are in the lower landscape positions. Included soils make up 10 to 25 percent of the unit.

Permeability is moderate or moderately rapid in the loamy upper part of the subsoil in the Humbird and Merrillan soils. It is slow in the clayey lower part of the subsoil and extremely slow to moderately slow in the underlying interbedded sandstone and shale. The available water capacity is low in both soils. The content of organic matter is moderately low or moderate in the surface layer of the Humbird soil and moderate or high in the surface layer of the Merrillan soil. A perched seasonal high water table is at a depth of 1.5 to 3.0 feet in the Humbird soil and at a depth of 1.0 to 2.0 feet in the Merrillan soil. The rooting depth of most crops is limited by the seasonal high water table during wet periods of the growing season and by the interbedded sandstone and shale.

Most areas are wooded. A few areas are used as cropland. If drained, these soils are suited to corn, soybeans, and small grain. The soils are suited to grasses and legumes for hay and pasture. In most years crop yields are limited by the low available water capacity. Irrigation improves the suitability of these soils for most crops. If cultivated crops are grown, water erosion is a slight or moderate hazard. Also, the soils are subject to soil blowing. Contour farming, contour stripcropping, winter cover crops, field windbreaks, conservation tillage, and grassed

waterways help to prevent excessive soil loss. Land smoothing, surface drains, diversions, and interceptor subsurface drains are needed to help remove excess water in areas of the Merrillan soil. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and reduces the hazard of erosion.

A cover of pasture plants is effective in controlling erosion and soil blowing. Alfalfa is generally short lived because of the seasonal high water table and winterkill from frost heave. Red clover generally is grown. Overgrazing or grazing when the soils are wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

These soils are suited to trees. The equipment limitation on both soils and the windthrow hazard on the Merrillan soil are management concerns. Equipment use is restricted by the low strength of both soils and by the wetness in areas of the Merrillan soil. These restrictions can be reduced by using equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Culverts and ditches can be used to maintain natural drainage systems along haul roads. Harvesting by clearcut or area-selection methods helps to prevent windthrow of the remaining trees on the Merrillan soil. Natural seeding from unharvested trees promotes regeneration. Maintaining permanent all-season roads allows quick salvage of downed trees after periodic storms. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or mechanical removal.

Because of a thin layer over bedrock, wetness, and the restricted permeability, these soils are poorly suited to septic tank absorption fields. Mounding the site with suitable filtering material helps to overcome these limitations. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas.

Because of the wetness, the Humbird soil is only moderately suited to dwellings without basements and is poorly suited to dwellings with basements. The Merrillan soil is poorly suited to all dwellings. The wetness can be overcome by installing a subsurface drainage system with gravity outlets or other dependable outlets or by adding fill to raise the elevation of the site.

Because of the wetness and the potential for frost action, the Humbird soil is only moderately suited to local roads and streets. Because of the low strength, the wetness, and the potential for frost action, the Merrillan soil is poorly suited to local roads and streets. Using a coarse textured fill material, replacing the soil with coarse textured base material, such as sand or gravel, and installing a subsurface drainage system help to prevent the damage caused by wetness and by frost action. Increasing the thickness of the pavement or base material also helps to overcome the low strength of the Merrillan soil.

The land capability classification is IIw. The woodland ordination symbol is 4L (Northern red oak) for the Humbird soil and 4W (Northern red oak) for the Merrillan soil. The forest habitat type commonly is ArDe-V for the Humbird soil and PVHa for the Merrillan soil.

ImA—Impact sand, 0 to 3 percent slopes

This very deep, nearly level and gently sloping, excessively drained soil is on toe slopes and low knolls. Individual areas are irregular in shape and generally range from 4 to 200 acres in size.

Typically, the surface layer is very dark grayish brown sand about 6 inches thick. The subsurface layer is about 8 inches thick. It is very dark grayish brown sand in the upper part and dark brown sand in the lower part. The subsoil is dark brown and strong brown, very friable sand about 16 inches thick. The substratum to a depth of about 60 inches is brownish yellow sand. In places the surface layer is loamy sand, fine sand, or loamy fine sand. In some areas the substratum has thin bands of reddish or brownish sandy or loamy material.

Included with this soil in mapping are small areas of the moderately well drained Bilmod, well drained Bilson, somewhat excessively drained Gosil, and excessively drained Tarr soils. Bilson, Gosil, and Tarr soils are in positions on the landscape similar to those of the Impact soil. Bilson soils have more silt and clay in the surface layer and subsoil than the Impact soil, and Gosil soils have slightly more silt and clay in the subsoil. Tarr soils have a thinner and lighter colored surface layer than the Impact soil.

Bilmod soils are in the slightly lower positions on the landscape. They have more silt and clay in the surface layer and subsoil than the Impact soil. Included soils make up 5 to 15 percent of the unit.

Permeability is rapid in the Impact soil. The available water capacity is low. The content of organic matter is moderately low in the surface layer. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content.

Most areas are used as cropland. A few areas are wooded, and some areas have been planted to pine trees. This soil is poorly suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. In most years crop yields are limited by the low available water capacity. If irrigated, the soil is suited to the commonly grown farm crops and to vegetables, such as snap beans and sweet corn. If cultivated crops are grown, the soil is subject to soil blowing. Winter cover crops, conservation tillage, wind stripcropping, and field windbreaks help to prevent excessive soil loss. Returning crop residue to the soil or adding other organic material reduces the hazard of soil blowing and the amount of water lost through evaporation, increases the rate of water infiltration, and helps to maintain fertility and soil tilth.

A cover of pasture plants is effective in controlling soil blowing and water erosion. Forage yields are generally low unless fertilizer is applied and the supply of moisture is adequate. Planting early in the spring, before the soil has a chance to dry, helps to overcome the droughtiness. Later plantings are likely to have a poor survival rate. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Measures that improve fertility, proper stocking rates, and pasture rotation help to keep the pasture in good condition.

This soil is suited to pine trees. Hardwood trees grow slowly and are poorly shaped. The equipment limitations and seedling mortality are management concerns. Equipment use is restricted by the loose sand. This restriction can be reduced by using equipment when the surface is frozen. Equipment with flotation tires or with tracks has better traction in loose sand than standard wheeled equipment. Sandy areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be stabilized by gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Seedling mortality caused by droughtiness can be reduced by careful planting of containerized seedlings or vigorous nursery stock. It can also be reduced by planting when the soil is moist. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

This soil is suited to dwellings and to local roads and streets. The soil readily absorbs the effluent in septic tank absorption fields, but it does not adequately filter the effluent because of the rapid permeability. The poor filtering capacity can result in the pollution of ground water.

The land capability classification is IVs. The woodland ordination symbol is 5S (Jack pine). The primary forest habitat type commonly is PVGy, and the secondary forest habitat type is PVCr.

IrA—Ironrun sand, 0 to 3 percent slopes

This very deep, nearly level and gently sloping, somewhat poorly drained soil is on the lower toe slopes and in slight depressions. Individual areas are irregular in shape and generally range from 10 to 500 acres in size.

Typically, the surface layer is black sand about 2 inches thick. It is covered by about 2 inches of very dark grayish brown mucky peat, which is a mat of partially decomposed forest litter. The subsurface layer is pinkish gray sand about 12 inches thick. The subsoil is dark reddish brown and brown, mottled, very friable sand about 23 inches thick. The substratum to a depth of about 60 inches is pale brown, mottled sand. In places the surface layer is loamy sand or coarse sand. In some areas the subsoil or substratum has layers of grayish brown loamy sand or sand.

Included with this soil in mapping are small areas of the moderately well drained Rockdam and poorly drained Ponycreek soils. Rockdam soils are in the slightly higher positions on the landscape. Ponycreek soils are in the lower positions. Included soils make up 10 to 15 percent of the unit.

Permeability is rapid or very rapid in the Ironrun soil. The available water capacity is low. The content of organic matter is moderate or high in the surface layer. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content. An apparent seasonal high water table is at a depth of 1 to 2 feet in undrained areas. The rooting depth of most crops is limited by the seasonal high water table during wet periods of the growing season.

Most areas are wooded. A few areas are used as cropland or pasture. Areas of idle cropland are reverting to woodland. This soil is suited to trees. The

equipment limitation, seedling mortality, and the windthrow hazard are management concerns. Equipment use is restricted by the wetness, the loose sand, and low soil strength. These restrictions can be reduced by using equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Culverts and ditches can be used to maintain natural drainage systems along haul roads. Seedling mortality caused by seasonal droughtiness can be reduced by careful planting of vigorous nursery stock or containerized seedlings and by planting when the soil is moist. Harvesting by clearcut or area-selection methods helps to prevent windthrow of the remaining trees. Natural seeding from unharvested trees promotes regeneration. Maintaining permanent all-season roads allows quick salvage of downed trees after periodic storms. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

Because of wetness and a poor filtering capacity, this soil is poorly suited to septic tank absorption fields. These limitations can result in the pollution of ground water. Mounding the site with suitable filtering material helps to overcome the limitations. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas.

Because of the wetness, this soil is poorly suited to dwellings. This limitation can be overcome by installing tile drains around foundations and providing gravity outlets or other dependable outlets and by constructing the foundations on coarse textured fill material above the level of wetness.

Because of the wetness and the potential for frost action, this soil is poorly suited to local roads and streets. Installing a subsurface drainage system and replacing the upper part of the soil with coarse textured base material, such as sand or gravel, helps to prevent the damage caused by wetness and by frost action.

The land capability classification is IVw. The woodland ordination symbol is 6W (Quaking aspen). The primary forest habitat type commonly is PVHa, and the secondary forest habitat type is PVRh.

IxA—Ironrun-Ponycreek complex, 0 to 3 percent slopes

These very deep soils are nearly level and gently sloping. The somewhat poorly drained Ironrun soil is on the lower toe slopes and in slight depressions. The poorly drained Ponycreek soil is in depressions. The Ironrun and Ponycreek soils occur as areas so intricately mixed or so small that it was not practical to map them separately. Individual areas are irregular in shape and generally range from 40 to 1,000 acres in size. They are about 45 to 55 percent Ironrun soil and 30 to 40 percent Ponycreek soil.

Typically, the surface layer of the Ironrun soil is black sand about 2 inches thick. It is covered by about 2 inches of very dark grayish brown mucky peat, which is a mat of partially decomposed forest litter. The subsurface layer is gray sand about 8 inches thick. The subsoil is very friable sand about 18 inches thick. It is dark reddish brown in the upper part and mottled reddish brown and dark brown in the lower part. The substratum to a depth of about 60 inches is yellow, mottled sand. In places the surface layer is loamy sand or coarse sand. In some areas the subsoil or substratum has layers of grayish or reddish loamy sand or sand.

Typically, the surface layer of the Ponycreek soil is black muck about 4 inches thick. The subsurface layer is black mucky sand about 2 inches thick. The subsoil is dark grayish brown and grayish brown, mottled, very friable sand about 23 inches thick. The substratum to a depth of about 60 inches is light yellowish brown sand. In places the surface layer is mucky sand or mucky coarse sand. In some areas the upper part of the subsoil is reddish brown. In other areas the substratum has thin strata of silt loam, loam, or sandy loam.

Included with these soils in mapping are small areas of the very poorly drained Dawsil, poorly drained Elm Lake, and moderately well drained Rockdam soils. Dawsil and Elm Lake soils are in positions on the landscape similar to those of the Ponycreek soil. Dawsil soils formed in 16 to 51 inches of organic material. Elm Lake soils formed in sandy deposits underlain by loamy material weathered from interbedded sandstone and shale. Rockdam soils are in the slightly higher positions on the landscape. Included soils make up 5 to 20 percent of the unit.

Permeability is rapid or very rapid in the Ironrun and Ponycreek soils. The available water capacity is low. The content of organic matter is moderate or high in the surface layer of the Ironrun soil and very

high in the surface layer of the Ponycreek soil. The surface layer of both soils is very friable and can be easily tilled throughout a wide range in moisture content. An apparent seasonal high water table is at a depth of 1 to 2 feet in the Ironrun soil and is above or near the surface in the Ponycreek soil. The rooting depth of most crops is limited by the seasonal high water table.

Most areas of these soils are wooded or support wetland vegetation. Most areas of idle cropland or pasture are reverting to woodland.

The Ironrun soil is suited to trees. The Ponycreek soil is poorly suited to most trees, but it is somewhat suited to some conifers. The equipment limitation, seedling mortality, and the windthrow hazard are management concerns in areas of both soils.

Equipment use is restricted by the wetness in areas of both soils and by low strength and loose sand in areas of the Ironrun soil. These restrictions can be reduced by using equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Culverts and ditches can be used to maintain natural drainage systems along haul roads. Seedling mortality caused by seasonal droughtiness in areas of the Ironrun soil can be reduced by careful planting of vigorous nursery stock or containerized seedlings and by planting when the soil is moist. Seedling mortality caused by the seasonal wetness in areas of the Ponycreek soil can be reduced by careful machine planting of vigorous nursery stock on prepared ridges or by hand planting on cradle knolls and in the drier included areas. Harvesting by clearcut or area-selection methods helps to prevent windthrow of the remaining trees. Natural seeding from unharvested trees promotes regeneration. Maintaining permanent all-season roads allows quick salvage of downed trees after periodic storms. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

Because of the wetness and a poor filtering capacity, the Ironrun soil is poorly suited to septic tank absorption fields. These limitations can result in the pollution of ground water. Mounding the site with suitable filtering material helps to overcome the limitations. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas. Because of the ponding and a poor filtering capacity, the Ponycreek soil is not suitable as a site for septic tank absorption fields. Overcoming these limitations is difficult. A better suited site should be considered.

Because of the wetness, the Ironrun soil is poorly suited to dwellings. This limitation can be overcome by installing tile drains around foundations and providing gravity outlets or other dependable outlets and by constructing the foundations on coarse textured fill material above the level of wetness. Because of the ponding, the Ponycreek soil is generally not suitable as a site for dwellings. Overcoming the ponding is difficult. A better suited site should be considered.

Because of the wetness and the potential for frost action, the Ironrun soil is poorly suited to local roads and streets. Installing a subsurface drainage system and replacing the upper part of the soil with coarse textured base material, such as sand or gravel, helps to prevent the damage caused by wetness and by frost action. Because of the ponding, the Ponycreek soil generally is not suitable as a site for local roads and streets. Overcoming the ponding is difficult. A better suited site should be considered.

The land capability classification in undrained areas is VIw. The woodland ordination symbol is 6W (Quaking aspen) for the Ironrun soil and 6W (Jack pine) for the Ponycreek soil. The primary forest habitat type for the Ironrun soil commonly is PVHa, and the secondary forest habitat type is PVRh. No forest habitat type is assigned for the Ponycreek soil.

IzB—Ironrun-Ponycreek-Arbutus complex, 0 to 6 percent slopes

These moderately deep and very deep soils are nearly level and gently sloping. The somewhat poorly drained Ironrun soil is in slight depressions. The poorly drained Ponycreek soil is in depressions and drainageways. The excessively drained Arbutus soil is on knolls. The Ironrun, Ponycreek, and Arbutus soils occur as areas so intricately mixed or so small that it was not practical to map them separately. Individual areas are irregular in shape and generally range from 40 to 100 acres in size. They are about 30 to 40 percent Ironrun soil, 25 to 35 percent Ponycreek soil, and 15 to 25 percent Arbutus soil.

Typically, the surface layer of the Ironrun soil is very dark gray sand about 3 inches thick. It is covered by about 2 inches of very dark grayish brown mucky peat (hemic material), which is a mat

of partially decomposed forest litter. The subsurface layer is grayish brown sand about 4 inches thick. The subsoil is very friable sand about 16 inches thick. It is dark brown in the upper part and brownish yellow and mottled in the lower part. The substratum to a depth of about 60 inches is brownish yellow and yellow, mottled sand. In places the surface layer is loamy sand or coarse sand. In some areas the subsoil or substratum has layers of grayish or reddish loamy sand or sand.

Typically, the surface layer of the Ponycreek soil is black muck about 3 inches thick. The subsurface layer is black mucky sand about 3 inches thick. The subsoil is brown, mottled sand about 20 inches thick. The substratum to a depth of about 60 inches is light brownish gray and very pale brown, mottled sand. In places the surface layer is muck or mucky coarse sand. In some areas the upper part of the subsoil is reddish brown.

Typically, the surface layer of the Arbutus soil is very dark grayish brown loamy sand about 2 inches thick. It is covered by about 1 inch of very dark grayish brown mucky peat, which is a mat of partially decomposed forest litter. The subsurface layer is grayish brown loamy sand about 3 inches thick. The subsoil is about 26 inches thick. It is dark brown, very friable sand in the upper part and brown and yellowish brown, loose sand in the lower part. Igneous bedrock is at a depth of about 32 inches. In places the surface layer is sand.

Included with these soils in mapping are small areas of the very poorly drained Dawsil and moderately well drained Rockdam soils. Also included are small areas of rock outcrop and areas that have stones and boulders on the surface. Dawsil soils are in positions on the landscape similar to those of the Ponycreek soil. They formed in 16 to 51 inches of organic material. Rockdam soils are slightly higher on the landscape than the Ironrun soil. Included areas make up 5 to 20 percent of the unit.

Permeability is rapid or very rapid in the Ironrun and Ponycreek soils. It is rapid in the sandy mantle of the Arbutus soil and rapid to very slow in the underlying bedrock. The available water capacity is low in all three soils. The content of organic matter is moderate or high in the surface layer of the Ironrun soil, very high in the surface layer of the Ponycreek soil, and low or moderately low in the surface layer of the Arbutus soil. The surface layer of all three soils is very friable and can be easily tilled throughout a wide range in moisture content. An apparent seasonal high water table is at a depth of 1 to 2 feet in the Ironrun soil and is above or near the surface in the Ponycreek soil. The rooting depth of most crops is limited by the seasonal high water table in the Ironrun and Ponycreek soils and by the underlying bedrock in the Arbutus soil.

Most areas of these soils are wooded. The Ironrun and Arbutus soils are suited to trees. The Ponycreek soil is suited to some conifers but is poorly suited to most other trees. The equipment limitation and seedling mortality are management concerns on these soils. Also, windthrow is a hazard on the Ironrun and Ponycreek soils.

Equipment use is restricted by wetness in areas of the Ironrun and Ponycreek soils and by low strength in areas of the Ironrun soil. It is also restricted by loose sand in areas of the Arbutus and Ironrun soils and by the depth to rock in areas of the Arbutus soil. Most of these restrictions can be reduced by using equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas used for log landings and haul roads can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Culverts and ditches can be used to maintain natural drainage systems along haul roads. Seedling mortality caused by seasonal droughtiness in areas of the Ironrun and Arbutus soils can be reduced by careful planting of vigorous nursery stock or containerized seedlings and by planting when the soils are moist. Seedling mortality caused by seasonal wetness in areas of the Ponycreek soil can be reduced by careful machine planting of vigorous nursery stock on prepared ridges or by hand planting on cradle knolls and in the drier included areas. Harvesting by clearcut or area-selection methods helps to prevent windthrow of the remaining trees. Natural seeding from unharvested trees promotes regeneration. Maintaining permanent all-season roads allows quick salvage of downed trees after periodic storms. Competing vegetation, which interferes with tree planting and natural regeneration following harvest in areas of the Ironrun and Ponycreek soils, can be controlled by herbicides or by mechanical removal.

Because of the wetness, a poor filtering capacity, and the depth to rock, the Ironrun and Arbutus soils are poorly suited to septic tank absorption fields. These limitations can result in the pollution of ground water. Mounding the site with suitable filtering material helps to overcome the limitations. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas. Because of ponding and a poor filtering capacity, the Ponycreek soil generally is not suitable as a site for septic tank

absorption fields. Overcoming these limitations is difficult. A better suited site should be considered.

Because of the wetness, the Ironrun soil is poorly suited to dwellings. This limitation can be overcome by installing tile drains around foundations and providing gravity outlets or other dependable outlets and by constructing the foundations on coarse textured fill material above the level of wetness. Because of the ponding, the Ponycreek soil is generally not suitable as a site for dwellings. Overcoming the ponding is difficult. A better suited site should be considered. Because of the depth to bedrock, the Arbutus soil is only moderately suited to dwellings without basements and is poorly suited to dwellings with basements. This limitation can be overcome by ripping and excavating the bedrock with suitable power equipment, by adding fill material to raise the elevation of the site, or by constructing the dwellings with partially exposed basements.

Because of the wetness and the potential for frost action, the Ironrun soil is poorly suited to local roads and streets. Installing a subsurface drainage system and replacing the upper part of the soil with coarse textured base material, such as sand or gravel, helps to prevent the damage caused by wetness and by frost action. Because of the ponding, the Ponycreek soil generally is not suited to local roads and streets. Overcoming the ponding is difficult. A better suited site should be considered. Because of the depth to bedrock, the Arbutus soil is only moderately suited to local roads and streets. The bedrock can be removed by blasting or by using suitable power equipment.

The land capability classification is VIw. The woodland ordination symbol is 6W (Quaking aspen) for the Ironrun soil, 6W (Jack pine) for the Ponycreek soil, and 2S (Red maple) for the Arbutus soil. The forest habitat type commonly is PVRh for the Ironrun soil and PVGy for the Arbutus soil. No forest habitat type is assigned for the Ponycreek soil.

JaA—Jackson silt loam, 0 to 2 percent slopes

This very deep, nearly level, moderately well drained soil is on toe slopes. Individual areas are irregular in shape and generally range from 10 to 50 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsoil is friable silt loam about 46 inches thick. The upper part is dark brown, the next part is dark brown and mottled, and the lower part is pale brown and mottled. The substratum to a depth of about 60 inches is mostly very pale brown and reddish yellow fine sand. In places the slope is more than 2 percent.

Included with this soil in mapping are small areas of the well drained Bertrand and moderately well drained Toddville soils. Bertrand soils are in the slightly higher positions on the landscape. Toddville soils are in positions similar to those of the Jackson soil. They have a thicker and darker surface layer than the Jackson soil. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate in the silty and loamy subsoil of the Jackson soil and rapid in the sandy substratum. The available water capacity is high. The content of organic matter is moderate in the surface layer. The surface layer is friable and can be easily tilled, but it tends to crust and puddle after hard rains or forms hard clods if tilled when too wet. An apparent seasonal high water table is at a depth of 3.5 to 6.0 feet.

Most areas are used as cropland. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Using a system of conservation tillage and returning crop residue to the soil or adding other organic material can help to maintain fertility and good tilth and increase the rate of water infiltration.

This soil is suited to pasture. The surface layer is subject to crusting, which restricts the emergence of plants. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

This soil is suited to trees. Equipment use at log landings and on haul roads is restricted by low strength. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

Because of the wetness, this soil is poorly suited to septic tank absorption fields. This limitation can be overcome by constructing a filtering mound of suitable material. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas.

Because of the shrink-swell potential, this soil is only moderately suited to dwellings without basements. This limitation can be overcome by

excavating the soil and replacing it with coarse textured material, such as sand or gravel; by strengthening the foundation; and by installing a subsurface drainage system around the dwellings. Because of the wetness, the soil is only moderately suited to dwellings with basements. The wetness can be overcome by constructing the foundations on coarse textured fill material above the level of wetness or by installing tile drains around foundations and providing gravity outlets or other dependable outlets.

Because of the low strength and the potential for frost action, this soil is poorly suited to local roads and streets. These limitations can be overcome by replacing the upper part of the soil with a coarse textured base material, such as sand or gravel. Low strength can also be overcome by increasing the thickness of the pavement or base material.

The land capability classification is I. The woodland ordination symbol is 5A (Northern red oak). The forest habitat type commonly is ArCi.

JaB—Jackson silt loam, 2 to 6 percent slopes

This very deep, gently sloping, moderately well drained soil is on foot slopes and toe slopes. Individual areas are irregular in shape and generally range from 5 to 60 acres in size.

Typically, the surface layer is dark brown silt loam about 9 inches thick. The subsoil is friable silt loam about 41 inches thick. It is dark brown in the upper part and dark yellowish brown and mottled in the lower part. The substratum to a depth of about 60 inches is mostly brownish yellow and yellowish brown fine sand. In places the surface layer is darker and thicker. In some areas the slope is less than 2 percent or more than 6 percent.

Included with this soil in mapping are small areas of the well drained Bertrand and moderately well drained Toddville soils. Bertrand soils are in the slightly higher positions on the landscape. Toddville soils are in positions similar to those of the Jackson soil. They have a thicker and darker surface layer than the Jackson soil. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate in the silty and loamy subsoil of the Jackson soil and rapid in the sandy substratum. The available water capacity is high. The content of organic matter is moderate in the surface layer. The surface layer is friable and can be easily tilled, but it tends to crust and puddle after hard rains or forms hard clods if tilled when too wet. An apparent seasonal high water table is at a depth of 3.5 to 6.0 feet.

Most areas are used as cropland. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, water erosion is a slight or moderate hazard. It can be controlled by terraces, grassed waterways, contour farming, contour stripcropping, and conservation tillage. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth and increases the rate of water infiltration.

A cover of pasture plants is effective in controlling erosion. The surface layer is subject to crusting, which restricts the emergence of plants. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

This soil is suited to trees. Equipment use at log landings and on haul roads is restricted by low soil strength. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or mechanical removal.

Because of wetness, this soil is poorly suited to septic tank absorption fields. This limitation can be overcome by constructing a filtering mound of suitable material. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas.

Because of the shrink-swell potential, this soil is only moderately suited to dwellings without basements. This limitation can be overcome by excavating the soil and replacing it with a coarse textured material, such as sand or gravel; by strengthening the foundation; and by installing a subsurface drainage system around the dwellings. Because of the wetness, the soil is only moderately suited to dwellings with basements. The wetness can be overcome by constructing the foundations on coarse textured fill material above the level of wetness or by installing tile drains around foundations and providing gravity outlets or other dependable outlets.

Because of the low strength and the potential for frost action, this soil is poorly suited to local roads and streets. These limitations can be overcome by

replacing the upper part of the soil with a coarse textured base material, such as sand or gravel. Low strength can also be overcome by increasing the thickness of the pavement or base material.

The land capability classification is IIe. The woodland ordination symbol is 5A (Northern red oak). The forest habitat type commonly is ArCi.

Ka—Kalmarville silt loam, 0 to 1 percent slopes

This very deep, nearly level, poorly drained soil is on flood plains along rivers and streams. It is subject to frequent flooding for brief periods. Individual areas are long and narrow and generally range from 10 to 100 acres in size.

Typically, the surface layer is very dark brown, mottled silt loam about 6 inches thick. The next layer is about 31 inches thick. It is dark gray, mottled very fine sandy loam that has strata of grayish brown and dark grayish brown silt loam and fine sandy loam. The upper part of the substratum is light brownish gray, mottled fine sandy loam about 5 inches thick. It has strata of grayish brown very fine sandy loam and silt loam. The lower part of the substratum to a depth of about 60 inches is light brownish gray sand. In places the surface layer is loam. In some areas part of the substratum is organic material.

Included with this soil in mapping are small areas of the very poorly drained Adder, somewhat poorly drained Coffton, and poorly drained Ettrick soils. Adder and Ettrick soils are in positions on the landscape similar to those of the Kalmarville soil. Adder soils formed in 16 to 51 inches of organic material. Ettrick soils are silty throughout. Coffton soils are in the slightly higher positions on the landscape. They are silty throughout. Included soils make up 10 to 15 percent of the unit.

Permeability is moderate or moderately rapid in the loamy alluvium in the Kalmarville soil and rapid in the sandy alluvium. The available water capacity is high. The content of organic matter is moderate in the surface layer. The rooting depth of most plants is limited by the apparent seasonal high water table, which is at or near the surface in undrained areas.

Most areas of this soil support brushy or grassy wetland vegetation. Some areas are wooded, and a few areas are used for pasture. Because of the wetness, a scarcity of drainage outlets, and the frequent flooding, this soil generally is not suited to cultivated crops. Also, it is poorly suited to pasture. A cover of pasture plants is effective in controlling scouring by floodwater. The quality of wetland or native forage plants generally is poor. Grazing is limited to short periods when the soil is dry.

Most areas of this soil are not forested or managed for trees. Because of the wetness and the flooding, trees grow slowly and are poorly shaped. Better suited sites should be considered if merchantable trees are to be grown.

This soil generally is not suitable as a site for septic tank absorption fields, dwellings, or local roads and streets, mainly because of the flooding and the wetness. Overcoming these limitations is difficult. A better suited site should be considered.

The land capability classification is Vw. No woodland ordination symbol or forest habitat type is assigned.

KeA—Kert silt loam, 0 to 3 percent slopes

This moderately deep, nearly level and gently sloping, somewhat poorly drained soil is on toe slopes. Individual areas are irregular in shape and generally range from 5 to 80 acres in size.

Typically, the surface layer is black silt loam about 2 inches thick. It is covered by about 1 inch of very dark grayish brown mucky peat, which is a mat of partially decomposed forest litter. The subsurface layer is brown silt loam about 5 inches thick. The subsoil is about 23 inches thick. It is mottled. The upper part is a mixture of dark yellowish brown and brown, friable silt loam, and the lower part is olive gray, firm silty clay loam. The substratum to a depth of about 60 inches is weakly cemented interbedded sandstone and shale. In places the surface layer is loam.

Included with this soil in mapping are small areas of the somewhat poorly drained Merrillan and poorly drained Veedum soils. Merrillan soils are in positions on the landscape similar to those of the Kert soil. They have more sand in the surface layer and subsoil than the Kert soil. Veedum soils are in the lower positions on the landscape. Included soils make up 5 to 10 percent of the unit.

Permeability is moderate in the upper part of the subsoil in the Kert soil. It is moderately slow or moderate in the lower part of the subsoil and extremely slow to moderately slow in the underlying interbedded sandstone and shale. The available water capacity is moderate. The content of organic matter is moderate or high in the surface layer. The surface layer is friable and can be easily tilled, but it tends to crust and puddle after hard rains and forms hard clods if tilled when too wet. A seasonal high water table is perched at a depth of 1.0 to 2.5 feet. The

rooting depth of most crops is limited by the seasonal high water table during wet periods of the growing season and by the interbedded sandstone and shale.

Areas of this soil are wooded or are used as cropland. Some areas are used as pasture. If drained, this soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, water erosion is a slight or moderate hazard. It can be controlled by contour farming, contour stripcropping, conservation tillage, and grassed waterways. Land smoothing, surface drains, diversions, and interceptor subsurface drains help to remove excess water. If tile drains are installed, the finer sand and the silt enter the tile lines unless suitable filters cover the tile. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and helps to control water erosion and soil blowing.

This soil is suited to pasture. A cover of pasture plants is effective in controlling erosion. The surface layer is subject to crusting, which restricts the emergence of plants. Alfalfa is generally short lived because of the seasonal high water table and the winterkill caused by frost heave. Red clover is generally grown. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

This soil is suited to trees. The equipment limitation and the windthrow hazard are management concerns. Equipment use is restricted by the wetness and by low soil strength. These restrictions can be reduced by using equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Culverts and ditches can be used to maintain natural drainage systems along haul roads. Harvesting by clearcut or area-selection methods helps to prevent windthrow of the remaining trees. Natural seeding from unharvested trees promotes regeneration. Maintaining permanent all-season roads allows quick salvage of downed trees after periodic storms. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

Because of a thin layer over bedrock, the wetness, and the restricted permeability, this soil is poorly suited to septic tank absorption fields. Mounding the site with suitable filtering material helps to overcome these limitations. The effluent can also be pumped to an absorption field on a better suited soil in nearby areas.

Because of the wetness, this soil is poorly suited to dwellings. This limitation can be overcome by constructing foundations on coarse textured fill material above the level of wetness and by installing tile drains around the foundations and providing gravity outlets or other dependable outlets.

Because of the low strength and the potential for frost action, this soil is poorly suited to local roads and streets. These limitations can be overcome by installing a subsurface drainage system and replacing the upper part of the soil with coarse textured base material, such as sand or gravel. Low strength can also be overcome by increasing the thickness of the pavement or base material.

The land capability classification is IIw. The woodland ordination symbol is 4W (Northern red oak). The primary forest habitat type commonly is ArCi, and the secondary forest habitat type is PVHa.

LfC2—La Farge silt loam, 4 to 12 percent slopes, eroded

This moderately deep, gently sloping and sloping, well drained soil is on summits and shoulders of knolls, ridges, and hills. Individual areas are long and narrow or oblong and generally range from 5 to 30 acres in size.

In most cultivated areas, water erosion has removed much of the original surface layer. Typically, the remaining surface layer is dark grayish brown silt loam about 6 inches thick. It is mixed with some yellowish brown subsoil material. The subsoil is about 31 inches thick. It is yellowish brown and dark yellowish brown, friable silt loam in the upper part and olive brown, friable loam in the lower part. The substratum to a depth of about 60 inches is weakly cemented, fine grained glauconitic sandstone. In places the surface layer is thicker and darker. In some areas the sandstone is nonglauconitic and siliceous. In other areas the slope is less than 4 percent or more than 12 percent.

Included with this soil in mapping are small areas of the well drained Council, Seaton, and Urne soils. These soils are in landscape positions similar to

those of the La Farge soil. Council and Seaton soils are very deep. Council soils are loamy throughout, and Seaton soils are silty throughout. Urne soils have more sand in the surface layer and subsoil than the La Farge soil. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate in the loess and loamy residuum in the La Farge soil and slow to moderate in the underlying sandstone. The available water capacity is moderate. The content of organic matter is moderately low or moderate in the surface layer. The surface layer is friable and can be easily tilled, but it tends to crust and puddle after hard rains or forms hard clods if it is tilled when too wet. The rooting depth of some crops is limited by the underlying sandstone.

Most areas are used as cropland. Some areas are wooded. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, water erosion is a moderate hazard. It can be controlled by contour farming, contour stripcropping, grassed waterways, and conservation tillage. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and reduces the hazard of water erosion.

A cover of pasture plants is effective in controlling erosion. The surface layer is subject to crusting, which restricts the emergence of plants. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

This soil is suited to trees. Equipment use is restricted by the slope and low soil strength at log landings. Low strength also restricts the use of equipment on haul roads. Log landings can be established in nearly level or gently sloping included or adjacent areas. Low strength can be overcome by using equipment during dry periods or during periods when the surface layer is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Log landings and haul roads can be strengthened with gravel or crushed rock. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

Because of seepage and a thin layer over bedrock, this soil is poorly suited to septic tank absorption fields. The poor filtering capacity can result in the pollution of ground water. Mounding the site with suitable filtering material helps to overcome these limitations. The effluent can also be pumped to an absorption field on a better suited soil in a nearby area.

Because of the shrink-swell potential and the slope, this soil is only moderately suited to dwellings. The shrink-swell potential can be overcome by excavating the soil around and below the foundation and replacing it with coarse textured material, such as sand or gravel; by increasing the strength of basement walls; and by installing a subsurface drainage system around the dwellings at or below the basement elevation. The slope can be overcome by cutting and filling, by installing retaining walls, or by designing the dwellings so that one side of the basement fronts on the lower part of the slope. Also, the dwellings can be constructed in the less sloping included areas.

Because of the low strength and the potential for frost action, this soil is poorly suited to local roads and streets. These limitations can be overcome by replacing the upper part of the soil with coarse textured base material, such as sand or gravel. Low strength also can be overcome by increasing the thickness of the pavement or base material.

The land capability classification is IIIe. The woodland ordination symbol is 4A (Northern red oak). The primary forest habitat type commonly is ArCi, and the secondary forest habitat type is ArDe-V.

LfD2—La Farge silt loam, 12 to 25 percent slopes, eroded

This moderately deep, moderately steep and steep, well drained soil is on shoulders, back slopes, nose slopes, and the upper foot slopes of knolls, ridges, and hills. Individual areas are long and narrow or oblong and generally range from 5 to 300 acres in size.

In most cultivated areas, erosion has removed much of the original surface layer. Typically, the remaining surface layer is dark brown silt loam about 8 inches thick. It is mixed with some yellowish brown subsoil material. The subsoil is about 31 inches thick. The upper part is dark brown and dark yellowish brown, friable silt loam. The next part is olive, friable loam. The lower part is pale olive and brownish yellow, friable loam. The substratum to a depth of about 60 inches is weakly cemented, fine grained glauconitic sandstone. In places the slope is less than 12 percent or more than 25 percent.

Included with this soil in mapping are small areas

of the well drained Council, Seaton, and Urne soils. These soils are in landscape positions similar to those of the La Farge soil. Council and Seaton soils are very deep. Council soils are loamy throughout, and Seaton soils are silty throughout. Urne soils have more sand in the surface layer and subsoil than the La Farge soil. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate in the loess and loamy residuum in the La Farge soil and slow to moderate in the underlying sandstone. The available water capacity is moderate. The content of organic matter is moderately low or moderate in the surface layer. The surface layer is friable and can be easily tilled, but it tends to crust and puddle after hard rains or forms hard clods if it is tilled when too wet. The rooting depth of most crops is limited by the underlying sandstone.

Most areas are used as cropland or pasture. A few extensive areas are wooded. This soil is suited to corn and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, water erosion is a severe hazard. It can be controlled by contour farming, contour stripcropping, crop rotations that include grasses and legumes, and conservation tillage. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and reduces the hazard of water erosion.

A cover of pasture plants is effective in controlling water erosion. The surface layer is subject to crusting, which restricts the emergence of plants. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

This soil is suited to trees. The erosion hazard and the equipment limitation are management concerns. Erosion is accelerated where runoff is concentrated on skid trails, log landings, and haul roads. Removing water with water bars, establishing out-sloping road surfaces, crowning the road surfaces, providing ditches and culverts, and establishing skid trails and haul roads on the contour minimize erosion. Erosion also can be controlled by seeding areas where logging has exposed the surface.

Equipment use is restricted by the slope and low soil strength. Skid trails and haul roads can be designed so that they conform to the topography and so that grades are kept as low as possible. Log landings can be established in the nearly level or gently sloping included or adjacent areas. The low strength can be overcome by using the equipment during dry periods or during periods when the surface is frozen or has an adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

Because of seepage, a thin layer over bedrock, and the slope, this soil generally is poorly suited to septic tank absorption fields. The poor filtering capacity can result in the pollution of ground water. The thin layer and seepage can be overcome by mounding the site with suitable filtering material. The slope can be overcome by cutting and filling or by installing a trench absorption system on the contour.

Because of the slope, this soil is poorly suited to dwellings. The slope can be overcome by cutting and filling or by installing retaining walls. Also, the dwellings can be designed so that one side of the basement fronts on the lower part of the slope, or the dwellings can be constructed in the less sloping included areas.

Because of the low strength, the slope, and the potential for frost action, this soil is poorly suited to local roads and streets. Low strength and frost action can be overcome by replacing the upper part of the soil with coarse textured base material, such as sand or gravel. Low strength also can be overcome by increasing the thickness of the pavement or base material. The slope can be overcome by shaping the roadway through cutting and filling. Also, the roads can be built in the less sloping areas.

The land capability classification is IVe. The woodland ordination symbol is 4R (Northern red oak). The primary forest habitat type commonly is ArCi, and the secondary forest habitat type is ArDe-V.

LsD2—La Farge-Seaton silt loams, 12 to 25 percent slopes, eroded

These soils are moderately deep and very deep, moderately steep and steep, and well drained. The La Farge soil is on back slopes and nose slopes of knolls, ridges, and hills. The Seaton soil is on the upper foot slopes and head slopes. The La Farge and Seaton soils occur as areas so intricately mixed or so small that it was not practical to map them separately. Individual areas are long and narrow or irregularly shaped and generally range from 10 to 80

acres in size. They are about 40 to 50 percent La Farge soil and 30 to 40 percent Seaton soil. In most cultivated areas much of the original surface layer of both soils has been lost through water erosion.

Typically, the surface layer of the La Farge soil is dark brown silt loam about 8 inches thick. It is mixed with some yellowish brown subsoil material. The subsoil is about 31 inches thick. The upper part is yellowish brown, friable silt loam. The next part is yellowish brown, friable loam. The lower part is light olive brown, friable fine sandy loam. The substratum to a depth of about 60 inches is weakly cemented fine grained glauconitic sandstone. In places the slope is less than 12 percent or more than 25 percent. In many areas the sandstone is nonglauconitic and siliceous.

Typically, the surface layer of the Seaton soil is dark brown silt loam about 8 inches thick. It is mixed with some dark yellowish brown subsoil material. The subsoil is dark yellowish brown, friable silt loam about 34 inches thick. The substratum to a depth of about 60 inches is yellowish brown silt loam.

Included with these soils in mapping are the well drained Council, moderately well drained Sebbo, and well drained Urne soils. Council soils are in positions on the landscape similar to those of the Seaton soil. They have more sand and less silt in the surface layer and subsoil than the Seaton soil. Urne soils are in positions similar to those of the La Farge soil. They have more sand and less silt and clay in the soil than the La Farge soil. The very deep Sebbo soils are in the lower positions on foot slopes. They have more sand than the Seaton and La Farge soils. Included soils make up 10 to 25 percent of the unit.

Permeability is moderate in the loess and loamy residuum in the La Farge soil and slow to moderate in the underlying sandstone. It is moderate in the Seaton soil. The available water capacity is moderate in the La Farge soil and very high in the Seaton soil. The content of organic matter is moderately low or moderate in the surface layer of both soils. The surface layer is friable and can be easily tilled, but it tends to crust and puddle after hard rains or forms hard clods if tilled when too wet. The rooting depth of most crops is limited by the underlying sandstone in the La Farge soil.

Most areas are used as cropland or pasture. These soils are suited to corn and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, water erosion is a severe hazard. It can be controlled by contour farming, contour stripcropping, crop rotations that include grasses and legumes, and conservation tillage. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and reduces the hazard of erosion.

A cover of pasture plants is effective in controlling erosion. The surface layer is subject to crusting, which restricts the emergence of the plants. Overgrazing or grazing when the soils are too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

These soils are suited to trees. The erosion hazard and equipment limitations are management concerns. Erosion is accelerated where runoff is concentrated on skid trails, log landings, and haul roads. Removing water with water bars, establishing out-sloping road surfaces, crowning the road surfaces, providing ditches and culverts, and establishing skid trails and haul roads on the contour minimize erosion. Erosion also can be controlled by seeding areas where logging has exposed the surface.

Equipment use is restricted by the slope and by low soil strength. Skid trails and haul roads can be designed so that they conform to the topography and so that grades are kept as low as possible. Log landings and haul roads can be established in the nearly level or gently sloping included or adjacent areas. Low strength can be overcome by using the equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

These soils are generally poorly suited to septic tank absorption fields because of a thin layer over bedrock, seepage, and the slope in areas of the La Farge soil and because of the slope in areas of the Seaton soil. The thin layer and seepage can be overcome by mounding the site with suitable filtering material. The slope can be overcome by installing a trench absorption system on the contour. Also, the less sloping included areas may be used.

Because of the slope, these soils are poorly suited to dwellings. This limitation can be overcome by cutting and filling, by installing retaining walls, or by designing the dwellings so that one side of the basement fronts on the lower part of the slope. Also,

the dwellings can be constructed in the less sloping included areas.

Because of the low strength, the slope, and the potential for frost action, these soils are poorly suited to local roads and streets. Low strength and frost action can be overcome by replacing the upper part of the soil with a coarse textured base material, such as sand or gravel. Low strength also can be overcome by increasing the thickness of the pavement or base material. The slope can be overcome by shaping the roadway through cutting and filling or by building the road in the less sloping areas.

The land capability classification is IVe. The woodland ordination symbol is 4R (Northern red oak) for the La Farge soil and 5R (Northern red oak) for the Seaton soil. The forest habitat type commonly is ArDe-V for the La Farge soil and ArCi for the Seaton soil.

Lt—Loxley peat, 0 to 1 percent slopes

This very deep, nearly level, very poorly drained soil is in depressions. It is subject to ponding. Individual areas are oblong or irregularly shaped and generally range from 10 to 1,500 acres in size.

Typically, the organic layers extend to a depth of more than 51 inches. The upper part is reddish brown peat about 4 inches thick, and the lower part is mostly black muck. In places the organic layers are less than 51 inches thick.

Included with this soil in mapping are small areas of the very poorly drained Dawsil and poorly drained Ponycreek soils. Dawsil soils are in positions on the landscape similar to those of the Loxley soil. They formed in 16 to 51 inches of organic material. Ponycreek soils are in the slightly higher positions. They are mostly sandy throughout. Included soils make up 2 to 10 percent of the unit.

Permeability is moderately slow to moderately rapid in the Loxley soil. The available water capacity is very high. The content of organic matter also is very high. The rooting depth of most plants is limited by the apparent seasonal high water table, which is near or above the surface in undrained areas.

Most areas support wetland vegetation. Because of the wetness, a scarcity of suitable drainage outlets, and the hazard of frost late in spring and early in fall, this soil is generally not suited to cultivated crops or to pasture. If drained and cultivated, the soil is subject to burning and subsidence. Also, it is subject to soil blowing. If intensive management is applied, some areas are suited to cranberries and other specialty crops.

Generally, this soil is poorly suited to trees. In most areas the trees grow slowly and are poorly shaped. Some areas, mainly areas that are naturally drained by stream entrenchment, support merchantable stands of conifers. The equipment limitation, seedling mortality, and the windthrow hazard are management concerns.

Equipment use is restricted by the wetness and by low soil strength. These restrictions can be reduced by using equipment when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than wheeled equipment. Log landings and haul roads can be established in better suited included or adjacent areas. Seedling mortality caused by wetness can be reduced by careful machine planting on prepared ridges or by hand planting on cradle knolls and in the drier included areas. The selection of vigorous nursery stock is essential. Harvesting by clearcut or area-selection methods helps to prevent windthrow of the remaining trees. Natural seeding from unharvested trees promotes regeneration. Maintaining permanent all-season roads allows quick salvage of downed trees after periodic storms. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

This soil generally is not suitable as a site for septic tank absorption fields, dwellings, or local roads and streets, mainly because of the subsidence, the ponding, and the low strength. Overcoming these limitations is difficult. A better suited site should be considered.

The land capability classification is VIIw in undrained areas. The woodland ordination symbol is 2W (Black spruce). No forest habitat type is assigned.

LuB—Ludington sand, 1 to 6 percent slopes

This moderately deep, nearly level to gently sloping, moderately well drained soil is on summits and shoulders of knolls. Individual areas are irregular in shape and generally range from 4 to 100 acres in size.

Typically, the surface layer is very dark gray sand about 2 inches thick. It is covered by about 2 inches of very dark grayish brown mucky peat, which is a mat of partially decomposed forest litter. The subsurface layer is grayish brown sand about 2 inches thick. The subsoil is about 33 inches thick. The upper part is dark brown and brown, very friable

sand. The next part is yellowish brown, mottled, very friable sand. The lower part is pale olive, mottled, firm clay loam. The substratum to a depth of about 60 inches is weakly cemented interbedded sandstone and shale. In places the surface layer is fine sand or loamy sand.

Included with this soil in mapping are small areas of the somewhat poorly drained Fairchild and moderately well drained Humbird soils. Fairchild soils are in the lower positions on the landscape. Humbird soils are in positions similar to those of the Ludington soil. They have more clay in the solum than the Ludington soil. Included soils make up 5 to 15 percent of the unit.

Permeability is rapid in the sandy upper part of the subsoil in the Ludington soil. It is moderately slow or moderate in the loamy lower part of the subsoil and extremely slow to moderately slow in the underlying interbedded sandstone and shale. The available water capacity is low. The content of organic matter is moderately low or moderate in the surface layer. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content. A seasonal high water table is perched at a depth of 1.5 to 3.5 feet. The rooting depth for most crops is limited by the seasonal high water table during wet periods of the growing season and by the underlying interbedded sandstone and shale.

Most areas are wooded. A few areas are used as cropland. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Crop yields in most years are limited by the low available water capacity. If irrigated, this soil is also suited to vegetables, such as snap beans, potatoes, sweet corn, and peas. If cultivated crops are grown, water erosion is a slight hazard. Also, the soil is subject to soil blowing. Wind stripcropping, field windbreaks, winter cover crops, and conservation tillage help to prevent excessive soil loss. Returning crop residue to the soil or adding other organic material reduces the effects of soil blowing, minimizes the amount of water lost through evaporation, increases the rate of water infiltration, helps to maintain fertility and good tilth, and reduces the hazard of erosion.

A cover of pasture plants is effective in controlling soil blowing and water erosion. Forage yields are generally low unless fertilizer is applied and adequate moisture is available. Planting early in spring, before the soil has a chance to dry, helps to overcome the droughtiness. Later plantings are likely to have a poor survival rate. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Measures that improve fertility, proper stocking rates, and pasture rotation help to keep the pasture in good condition.

This soil is suited to trees. The equipment limitation and seedling mortality are management concerns. Equipment use is restricted by the loose sand. This restriction can be reduced by using equipment when the surface is frozen. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Sandy areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be stabilized with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Seedling mortality caused by droughtiness can be reduced by careful planting of containerized seedlings or vigorous nursery stock. It can also be reduced by planting when the soil is moist. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or mechanical removal.

Because of wetness, a thin layer over bedrock, and the restricted permeability, this soil is poorly suited to septic tank absorption fields. Mounding the site with suitable filtering material helps to overcome these limitations. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas.

Because of the wetness, this soil is only moderately suited to dwellings without basements and is poorly suited to dwellings with basements. This limitation can be overcome by constructing the basement above the level of wetness, by raising the site with fill material, and by installing tile drains around the foundation and providing gravity outlets or other dependable outlets.

Because of the wetness, this soil is only moderately suited to local roads and streets. Installing a subsurface drainage system and replacing part of the soil with a coarse textured base material, such as sand or gravel, help to overcome the wetness.

The land capability classification is IVs. The woodland ordination symbol is 5A (Jack pine). The primary forest habitat type commonly is PVHa, and the secondary forest habitat type is PVCr.

LxB—Ludington-Fairchild sands, 0 to 6 percent slopes

These moderately deep soils are nearly level to gently sloping. The moderately well drained Ludington

soil is on the summits and shoulders of knolls. The somewhat poorly drained Fairchild soil is on toe slopes. The Ludington and Fairchild soils occur as areas so intricately mixed or so small that it was not practical to map them separately. Individual areas are irregular in shape and generally range from 10 to 80 acres in size. They are about 40 to 50 percent Ludington soil and 35 to 45 percent Fairchild soil.

Typically, the surface layer of the Ludington soil is very dark gray sand about 2 inches thick. It is covered by about 1 inch of partially decomposed leaf and grass litter. The subsurface layer is pinkish gray sand about 10 inches thick. The subsoil is about 26 inches thick. The upper part is dark brown, very friable sand. The next part is brownish yellow, mottled, very friable sand. The lower part is pale olive, mottled, firm loam. The substratum to a depth of about 60 inches is weakly cemented interbedded sandstone and shale. In places the surface layer is fine sand or loamy sand.

Typically, the surface layer of the Fairchild soil is black sand about 2 inches thick. It is covered by about 1 inch of partially decomposed leaf and grass litter. The subsurface layer is pinkish gray sand about 11 inches thick. The subsoil is about 22 inches thick. The upper part is dark reddish brown, very friable sand; the next part is dark brown, light yellowish brown, and pale brown, mottled, loose sand; and the lower part is light gray, mottled, firm loam. The substratum to a depth of about 60 inches is weakly cemented interbedded sandstone and shale. In places the surface layer is sandy loam, fine sand, or loamy sand.

Included with these soils in mapping are small areas of the moderately well drained Humbird and somewhat poorly drained Merrillan soils. Humbird soils are in positions on the landscape similar to those of the Ludington soil. They have more silt and clay in the upper part of the solum than the Ludington soil. Merrillan soils are in positions similar to those of the Fairchild soil. They have more silt and clay in the upper part of the subsoil than the Fairchild soils. Included soils make up 10 to 25 percent of the unit.

Permeability is rapid in the sandy upper part of the subsoil in the Ludington and Fairchild soils. It is moderately slow or moderate in the loamy lower part of the subsoil and extremely slow to moderately slow in the underlying interbedded sandstone and shale. The available water capacity is low in both soils. The content of organic matter is moderately low or moderate in the surface layer of the Ludington soil and moderate or high in the surface layer of the Fairchild soil. The seasonal high water table is perched at a depth of 1.5 to 3.5 feet in the Ludington soil and at a depth of 1.0 to 2.0 feet in the Fairchild soil. The rooting depth of most crops is limited by the seasonal high water table during wet periods of the growing season and by the interbedded sandstone and shale.

Most areas are wooded. The few areas that are used as cropland or pasture are reverting to woodland. These soils are suited to trees. The equipment limitation and seedling mortality in areas of both soils and the windthrow hazard in areas of the Fairchild soil are management concerns. Equipment use is restricted by loose sand. It is also restricted by the wetness and the low strength of the Fairchild soil. These restrictions can be reduced by using the equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Culverts and ditches can be used to maintain natural drainage systems along haul roads. Harvesting by clearcut or area-selection methods helps to prevent windthrow of the remaining trees. Natural seeding from unharvested trees promotes regeneration. Maintaining permanent all-season roads allows quick salvage of downed trees after periodic storms. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

Because of a thin layer over bedrock, the wetness, and the restricted permeability, these soils are poorly suited to septic tank absorption fields. Mounding the site with suitable filtering material helps to overcome these limitations. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas.

Because of the wetness, the Ludington soil is only moderately suited to dwellings without basements and is poorly suited to dwellings with basements. The Fairchild soil is poorly suited to all dwellings because of the wetness. This limitation can be overcome by constructing the foundation on coarse textured fill material above the level of wetness and by installing tile drains around the foundations and providing gravity outlets or other dependable outlets.

Because of the wetness, the Ludington soil is only moderately suited to local roads and streets and the Fairchild soil is poorly suited. Replacing the soil with coarse textured base material, such as sand or

gravel, and installing a subsurface drainage system help to overcome the wetness.

The land capability classification is IVs. The woodland ordination symbol is 5A (Jack pine) for the Ludington soil and 5W (Jack pine) for the Fairchild soil. The forest habitat type commonly is PVHa for the Ludington soil and PVRh for the Fairchild soil.

MaB—Mahtomedi loamy sand, 0 to 6 percent slopes

This very deep, nearly level and gently sloping, excessively drained soil is on flats and knolls. Individual areas are irregular in shape and generally range from 10 to 50 acres in size.

Typically, the surface layer is very dark brown loamy sand about 4 inches thick. The subsoil is about 22 inches thick. It is dark yellowish brown and dark brown, very friable sand in the upper part and strong brown, loose gravelly coarse sand in the lower part. The substratum to a depth of about 60 inches is light brown, stratified gravelly sand and very gravelly sand. In places the surface layer is sand. In some areas the slope is more than 6 percent.

Included with this soil in mapping are small areas of the well drained Dunnville and excessively drained Tarr soils. Dunnville soils are in the lower positions on the landscape. They have more silt and clay in the surface layer and subsoil than the Mahtomedi soil. Tarr soils are in positions similar to those of the Mahtomedi soil on the higher terraces. They have more sand and less gravel throughout than the Mahtomedi soil. Included soils make up 5 to 10 percent of the unit.

Permeability is rapid in the Mahtomedi soil. The available water capacity is low. The content of organic matter is low or moderately low in the surface layer. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content. The rooting depth of most crops is limited by droughtiness.

Most areas are wooded. A few areas are used as cropland. This soil is poorly suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If irrigated, however, it is suited to the commonly grown farm crops and to vegetables, such as snap beans and sweet corn. In most years crop yields are limited by the low available water capacity. If cultivated crops are grown, water erosion is a slight hazard. Also, the soil is subject to soil blowing. Winter cover crops, conservation tillage, wind stripcropping, and field windbreaks help to prevent excessive soil loss. Returning crop residue to the soil or adding other organic material reduces the hazard of soil blowing and the amount of water lost through evaporation, increases the rate of water infiltration, and helps to maintain fertility and tilth.

A cover of pasture plants is effective in controlling soil blowing and water erosion. Forage yields are generally low unless fertilizer is applied and the supply of moisture is adequate. Planting early in spring, before the soil has a chance to dry, helps to overcome the droughtiness. Planting later in the year is likely to result in a poor survival rate. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Measures that improve fertility, proper stocking rates, and pasture rotation help to keep the pasture in good condition.

This soil is suited to pine trees. Hardwood trees grow slowly and are poorly shaped. The equipment limitation and seedling mortality are management concerns. Equipment with flotation tires or with tracks has better traction in loose sand than standard wheeled equipment. Sandy areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be stabilized by gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Seedling mortality caused by droughtiness can be reduced by careful planting of containerized seedlings or vigorous nursery stock. It can also be reduced by planting when the soil is moist.

This soil is suited to dwellings and to local roads and streets. The soil readily absorbs the effluent in septic tank absorption fields, but it does not adequately filter the effluent because of the rapid permeability. The poor filtering capacity can result in the pollution of ground water.

The land capability classification is IVs. The woodland ordination symbol is 8S (Red pine). The primary forest habitat type commonly is PVGy, and the secondary forest habitat type is PVCr.

MbA—Majik loamy fine sand, 0 to 3 percent slopes

This very deep, nearly level and gently sloping, somewhat poorly drained soil is in depressions and drainageways. Individual areas are irregular in shape and generally range from 4 to 100 acres in size.

Typically, the surface layer is very dark brown loamy fine sand about 4 inches thick. The subsurface layer is dark grayish brown loamy fine sand about 3 inches thick. The subsoil is about 22 inches thick. It is dark yellowish brown, very friable loamy fine sand in the upper part; yellowish brown, mottled, very friable fine sand in the next part; and reddish yellow,

mottled, loose fine sand in the lower part. The substratum to a depth of about 60 inches is white, mottled fine sand. In places the surface layer is loamy sand or fine sand. In some areas the subsoil or substratum has layers of reddish or brownish loamy sand.

Included with this soil in mapping are small areas of the moderately well drained Tint and poorly drained Newlang soils. Tint soils are in the slightly higher positions on the landscape. Newlang soils are in the lower positions. Included soils make up 10 to 15 percent of the unit.

Permeability is rapid in the Majik soil. The available water capacity is low. The content of organic matter is moderate or high in the surface layer. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content. An apparent seasonal high water table is at a depth of 1.0 to 2.5 feet in undrained areas. The rooting depth of most crops is limited by the seasonal high water table during wet periods of the growing season.

Most areas are used as pasture or woodland. A few areas are used for cultivated crops. If drained, this soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Excess water can be removed by diversions, grassed waterways, surface drains, and drainage tile. If the water table is excessively lowered, however, crop yields in most years are limited by the low available water capacity. If irrigated, the soil is also suited to vegetables, such as snap beans, potatoes, and peas. If tile drains are installed, the fine sand enters the tile lines unless a suitable filter covers the tile. In areas that are drained and cultivated, the soil is subject to soil blowing. Soil blowing can be controlled by wind stripcropping, field windbreaks, and conservation tillage. Returning crop residue to the soil or adding other organic material reduces the hazard of soil blowing and the amount of water lost through evaporation, increases the rate of water infiltration, and helps to maintain fertility and tilth.

A cover of pasture plants is effective in controlling soil blowing. Forage yields are generally low unless fertilizer is applied and an adequate amount of moisture is supplied either through a controlled drainage system or through irrigation. Alfalfa is short lived unless the soil is drained. Red clover is generally grown. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is suited to trees. Equipment use is restricted by the wetness. This limitation can be overcome by using the equipment during dry periods or during periods when the surface is frozen or has an adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited adjacent areas.

Because of the wetness and a poor filtering capacity, this soil is poorly suited to septic tank absorption fields. These limitations can result in the pollution of ground water. Mounding the site with suitable filtering material helps to overcome the limitations. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas.

Because of the wetness, this soil is poorly suited to dwellings. This limitation can be overcome by installing tile drains around foundations and providing gravity outlets or other dependable outlets and by constructing the foundations on coarse textured fill material above the level of wetness.

Because of the wetness and the potential for frost action, this soil is only moderately suited to local roads and streets. Installing a subsurface drainage system and replacing the upper part of the soil with coarse textured base material, such as sand or gravel, helps to prevent the damage caused by wetness and by frost action.

The land capability classification is IVw. The woodland ordination symbol is 5W (Jack pine). The forest habitat type commonly is PVRh.

MmA—Merimod silt loam, 0 to 3 percent slopes

This very deep, nearly level and gently sloping, moderately well drained soil is on toe slopes. Individual areas are irregular in shape and generally range from 5 to 50 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsoil is about 23 inches thick. The upper part is dark yellowish brown and dark brown, friable silt loam, and the lower part is dark brown loam and dark yellowish brown, friable sandy loam. The substratum extends to a depth of about 60 inches. It is yellowish brown sand

in the upper part and brownish yellow, mottled sand in the lower part. In places the surface layer is loam.

Included with this soil in mapping are small areas of the well drained Gardenvale and Merit soils and the somewhat poorly drained Sooner soils. Gardenvale and Merit soils are in the slightly higher positions on the landscape. Gardenvale soils are underlain by sandstone at a depth of 40 to 60 inches. Sooner soils are in the slightly lower positions. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate in the silty and loamy mantle in the Merimod soil and rapid in the substratum. The available water capacity is moderate. The content of organic matter is moderate in the surface layer. The surface layer is friable and can be easily tilled throughout a wide range in moisture content. An apparent seasonal high water table is at a depth of 3.5 to 6.0 feet. The rooting depth of most crops is limited by the sandy substratum.

Most areas are used as cropland. Very few areas are wooded. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Using a system of conservation tillage and returning crop residue to the soil or adding other organic material can help to maintain fertility and good tilth and increase the rate of water infiltration.

This soil is suited to pasture. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

This soil is suited to trees. Equipment use at log landings and on haul roads is restricted by low soil strength. This restriction can be reduced by using equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

This soil readily absorbs the effluent in septic tank absorption fields. It does not adequately filter the effluent, however, because of the rapid permeability in the substratum. The poor filtering capacity can result in the pollution of ground water. The wetness also is a limitation. Mounding the site with suitable filtering material helps to overcome the wetness and the poor filtering capacity. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas.

This soil is only moderately suited to dwellings without basements because of the shrink-swell potential. It is only moderately suited to dwellings with basements because of the wetness. These limitations can be overcome by installing tile drains around foundations and providing gravity outlets or other dependable outlets and by constructing the foundations on coarse textured fill material above the level of wetness. Strengthening the foundation also helps to prevent the damage caused by shrinking and swelling.

Because of the shrink-swell potential and the potential for frost action, this soil is only moderately suited to local roads and streets. Replacing the upper part of the soil with coarse textured base material, such as sand or gravel, helps to prevent the damage caused by frost action and by shrinking and swelling.

The land capability classification is IIe. The woodland ordination symbol is 4A (Northern red oak). The forest habitat type commonly is ArDe-V.

MnB—Merit silt loam, 0 to 6 percent slopes

This very deep, nearly level and gently sloping, well drained soil is on toe slopes and knolls. Individual areas are irregular in shape and generally range from 4 to 60 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsoil is about 21 inches thick. The upper part is dark yellowish brown, friable silt loam. The lower part is dark brown, friable loam. The substratum to a depth of about 60 inches is strong brown sand. In places the surface layer is loam. In some areas the substratum has thin strata of loamy material. In other areas the slope is more than 6 percent.

Included with this soil in mapping are small areas of the well drained Bilson and Gardenvale soils and the moderately well drained Merimod soils. Bilson and Gardenvale soils are in positions on the landscape similar to those of the Merit soil. Bilson soils have more sand and less silt and clay in the surface layer and subsoil than the Merit soil. Gardenvale soils are underlain by sandstone at a depth of 40 to 60 inches. Merimod soils are in the slightly lower positions on the landscape. Included soils make up 10 to 15 percent of the unit.

Permeability is moderate in the silty and loamy

mantle in the Merit soil. It is rapid in the substratum. The available water capacity is moderate. The content of organic matter is moderate in the surface layer. The surface layer is friable and can be easily tilled throughout a wide range in moisture content. The rooting depth of most crops is limited by the sandy substratum.

Most areas are used as cropland. Very few areas are wooded. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, water erosion is a slight or moderate hazard. It can be controlled by grassed waterways, contour farming, contour stripcropping, and conservation tillage. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and reduces the hazard of erosion.

A cover of pasture plants is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

This soil is suited to trees. Equipment use at log landings and on haul roads is restricted by low soil strength. This restriction can be reduced by using equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings or haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

This soil readily absorbs the effluent in septic tank absorption fields. It does not adequately filter the effluent, however, because of the rapid permeability in the substratum. The poor filtering capacity can result in the pollution of ground water.

This soil is suited to dwellings with basements but is only moderately suited to dwellings without basements because of the shrink-swell potential. This limitation can be overcome by strengthening the foundation and by constructing the foundation on coarse textured fill material, such as sand or gravel.

This soil is only moderately suited to local roads and streets because of the potential for frost action and the shrink-swell potential. Replacing the upper part of the soil with coarse textured base material, such as sand or gravel, helps to prevent the damage caused by frost action and by shrinking and swelling.

The land capability classification is IIe. The woodland ordination symbol is 4A (Northern red oak). The forest habitat type commonly is ArDe-V.

MoB—Merit-Gardenvale silt loams, 1 to 6 percent slopes

These soils are deep and very deep, nearly level and gently sloping, and well drained. The Merit soil is on toe slopes and knolls. The Gardenvale soil is on summits and shoulders of knolls. The Merit and Gardenvale soils occur as areas so intricately mixed or so small that it was not practical to map them separately. Individual areas are irregular in shape and generally range from 20 to 200 acres in size. They are about 55 to 65 percent Merit soil and 20 to 30 percent Gardenvale soil.

Typically, the surface layer of the Merit soil is very dark grayish brown silt loam about 9 inches thick. The subsoil is about 21 inches thick. It is friable. The upper part is dark yellowish brown silt loam, and the lower part is dark brown loam. The substratum to a depth of about 60 inches is strong brown sand. In places the surface layer is loam. In some areas the loamy mantle is more than 40 inches thick. In other areas the substratum has thin strata of loamy material or has channery sand.

Typically, the surface layer of the Gardenvale soil is dark brown silt loam about 8 inches thick. The upper part of the subsoil is dark brown, friable silt loam about 18 inches thick. The lower part is brown, friable sandy loam about 4 inches thick. The substratum to a depth of about 60 inches is reddish yellow fine sand over weakly cemented sandstone. In places the surface layer is loam. In some areas the substratum contains thin strata of loamy material weathered from the sandstone.

Included with these soils in mapping are small areas of the well drained Bilson and Elevasil soils and the moderately well drained Merimod soils. Also included are some areas where the slope is more than 6 percent. Bilson soils are in positions on the landscape similar to those of the Merit soil. They have more sand and less silt and clay in the surface layer and subsoil than the Merit soil. Elevasil soils are slightly higher on the landscape than the Gardenvale soil. They are underlain by sandstone at a depth of less than 40 inches. Also, they have more sand and less silt and clay in the surface layer and

subsoil than the Gardenvale soil. Merimod soils are slightly lower on the landscape than the Merit soil. Included soils make up 10 to 25 percent of the unit.

Permeability is moderate in the silty and loamy mantle in the Merit soil and rapid in the substratum. It is moderate in the silty and loamy mantle in the Gardenvale soil, rapid in the sandy substratum, and moderately slow or moderate in the underlying sandstone. The available water capacity and the organic matter content in the surface layer are moderate in both soils. The surface layer is friable and can be easily tilled throughout a wide range in moisture content. The rooting depth of most crops is limited by the sandy substratum.

Most areas are used as cropland. Very few areas are wooded. These soils are suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, water erosion is a slight or moderate hazard. It can be controlled by grassed waterways, contour farming, contour stripcropping, and conservation tillage. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and reduces the hazard of erosion.

A cover of pasture plants is effective in controlling water erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

These soils are suited to trees. Equipment use at log landings and on haul roads is restricted by low soil strength. This restriction can be reduced by using equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

These soils readily absorb the effluent in septic absorption fields. They do not adequately filter the effluent, however, because of the rapid permeability in the substratum. The poor filtering capacity can result in the pollution of ground water.

The Gardenvale soil is suited to dwellings. The Merit soil is suited to dwellings with basements but is only moderately suited to dwellings without basements because of the shrink-swell potential. This limitation can be overcome by strengthening the foundation and by constructing the foundation on coarse textured fill material, such as sand or gravel.

These soils are only moderately suited to local roads and streets because of the potential for frost action in both soils, the shrink-swell potential of the Merit soil, and the low strength of the Gardenvale soil. Replacing the upper part of the soil with coarse textured base material, such as sand or gravel, helps to overcome these limitations. Low strength can also be overcome by increasing the thickness of the pavement or base material.

The land capability classification is IIe. The woodland ordination symbol is 4A (Northern red oak). The forest habitat type commonly is ArDe-V.

MpA—Merrillan fine sandy loam, 0 to 3 percent slopes

This moderately deep, nearly level and gently sloping, somewhat poorly drained soil is on toe slopes. Individual areas are irregular in shape and generally range from 5 to 100 acres in size.

Typically, the surface layer is black fine sandy loam about 4 inches thick. It is covered by about 1 inch of very dark grayish brown mucky peat, which is a mat of partially decomposed forest litter. The subsurface layer is grayish brown fine sandy loam about 5 inches thick. The subsoil is about 24 inches thick. It is dark brown and brown, friable fine sandy loam in the upper part and olive gray, firm, mottled silty clay in the lower part. Weakly cemented interbedded sandstone and shale is at a depth of about 34 inches. In places the surface layer is loamy fine sand, sandy loam, or loam.

Included with this soil in mapping are small areas of the moderately well drained Humbird and poorly drained Veedum soils. Humbird soils are in the slightly higher positions on the landscape. Veedum soils are in the lower positions. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate or moderately rapid in the loamy upper part of the subsoil in the Merrillan soil. It is slow in the clayey lower part of the subsoil and extremely slow to moderately slow in the underlying interbedded sandstone and shale. The available water capacity is low. The content of organic matter is moderate to high in the surface layer. The surface layer is friable and can be easily tilled throughout a wide range in moisture content. A

seasonal high water table is perched at a depth of 1 to 2 feet in undrained areas. The rooting depth of most crops is limited by the seasonal high water table during wet periods of the growing season and by the interbedded sandstone and shale.

Most areas are wooded. A few areas are used as cropland or pasture. This soil is suited to grasses and legumes for hay and pasture. If drained, it is suited to corn, soybeans, and small grain. If the water table is excessively lowered, however, crop yields are limited by the low available water capacity. Irrigation improves the suitability of this soil for most crops. If cultivated crops are grown, water erosion is a slight hazard. Also, the soil is subject to soil blowing. Winter cover crops, conservation tillage, wind stripcropping, and field windbreaks help to prevent excessive soil loss. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and helps to control water erosion and soil blowing. Land smoothing, a surface drainage system, diversions, and interceptor subsurface drains help to remove excess water.

A cover of pasture plants is effective in controlling water erosion and soil blowing. Alfalfa is generally short lived because of the seasonal high water table and the winterkill caused by frost heave. Red clover is generally grown. Overgrazing or grazing when the soil is wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, measures that improve fertility, pasture rotation, and restricted use during wet periods help to keep the pasture in good condition.

This soil is suited to trees. The equipment limitation and the windthrow hazard are management concerns. Equipment use is restricted by the wetness and by low soil strength. These restrictions can be reduced by using the equipment during dry periods or during periods when the surface is frozen or has an adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Harvesting by clearcut or area-selection methods helps to prevent windthrow of the remaining trees. Natural seeding from unharvested trees promotes regeneration. Maintaining permanent all-season roads allows quick salvage of downed trees after periodic storms. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or mechanical removal.

Because of a thin layer over bedrock, the wetness, and the restricted permeability, this soil is poorly suited to septic tank absorption fields. Mounding the site with suitable filtering material helps to overcome these limitations. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas.

Because of the wetness, this soil is poorly suited to dwellings. This limitation can be overcome by constructing foundations on coarse textured fill material above the level of wetness and by installing tile drains around the foundations and providing gravity outlets or other dependable outlets.

Because of the wetness, the low strength, and the potential for frost action, this soil is poorly suited to local roads and streets. Low strength can be overcome by replacing the upper part of the soil with coarse textured base material, such as sand or gravel, and by increasing the thickness of the pavement or base material. Installing a subsurface drainage system and replacing the upper part of the soil with coarse textured base material help to prevent the damage caused by frost action and wetness.

The land capability classification is IIw. The woodland ordination symbol is 4W (Northern red oak). The primary forest habitat type commonly is PVHa, and the secondary forest habitat type is PVRh.

MrA—Merrillan-Veedum complex, 0 to 3 percent slopes

These moderately deep soils are nearly level and gently sloping. The somewhat poorly drained Merrillan soil is on toe slopes. The poorly drained Veedum soil is in drainageways and depressions. The Merrillan and Veedum soils occur as areas so intricately mixed or so small that it was not practical to map them separately. Individual areas are irregular in shape and generally range from 40 to 1,000 acres in size. They are about 40 to 50 percent Merrillan soil and 35 to 45 percent Veedum soil.

Typically, the surface layer of the Merrillan soil is very dark brown fine sandy loam about 3 inches thick. It is covered by about 1 inch of very dark grayish brown mucky peat, which is a mat of partially decomposed forest litter. The subsurface layer is grayish brown fine sandy loam about 2 inches thick. The subsoil is about 25 inches thick. The upper part

is dark brown, friable fine sandy loam. The next part is dark brown, mottled, friable fine sandy loam. The lower part is pale brown, mottled, firm silty clay loam and light brownish gray, mottled, firm clay loam. The substratum to a depth of about 60 inches is weakly cemented interbedded sandstone and shale. In some places the surface layer is loamy fine sand, sandy loam, or loam.

Typically, the surface layer of the Veedum soil is black muck about 3 inches thick. The subsurface layer is black silt loam about 6 inches thick. The subsoil is about 24 inches thick. It is dark grayish brown, mottled, friable silt loam in the upper part and grayish brown, mottled, firm clay loam in the lower part. The substratum to a depth of about 60 inches is weakly cemented interbedded sandstone and shale. In places the surface layer is mucky silt loam, silt loam, or loam.

Included with these soils in mapping are small areas of the very poorly drained Citypoint and somewhat poorly drained Fairchild soils. Citypoint soils are in positions on the landscape similar to those of the Veedum soil. They formed in 16 to 51 inches of organic material. Fairchild soils are in positions similar to those of the Merrillan soil. They are sandy in the upper part of the subsoil. Included soils make up 5 to 20 percent of the unit.

Permeability is moderate or moderately rapid in the upper loamy part of the subsoil in the Merrillan soil. It is slow in the clayey lower part of the subsoil and extremely slow to moderately slow in the underlying interbedded sandstone and shale. It is moderate in the silty upper part of the Veedum soil, moderately slow or moderate in the loamy residuum, and extremely slow to moderately slow in the interbedded sandstone and shale. The available water capacity is low in the Merrillan soil and moderate in the Veedum soil. The content of organic matter is moderate or high in the surface layer of the Merrillan soil and very high in the surface layer of the Veedum soil. The surface layer of both soils is very friable and can be easily tilled throughout a wide range in moisture content. A perched seasonal high water table is at a depth of 1 to 2 feet in the Merrillan soil and is above or near the surface in the Veedum soil. The rooting depth of most crops is limited by the seasonal high water table and the interbedded sandstone and shale.

Most areas of these soils are wooded or support wetland vegetation. Most areas of idle cropland or pasture are reverting to woodland.

The Merrillan soil is suited to trees. The Veedum soil is suited to some conifers but is poorly suited to most other trees. The equipment limitation and the windthrow hazard in areas of both soils and seedling mortality in areas of the Veedum soil are management concerns.

Equipment use is restricted by the wetness and by low soil strength. These restrictions can be reduced by using the equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Culverts and ditches can be used to maintain natural drainage systems along haul roads. Seedling mortality caused by seasonal wetness in areas of the Veedum soil can be reduced by careful machine planting of vigorous nursery stock on prepared ridges or by hand planting on cradle knolls and in the drier included areas. Harvesting by clearcut or area-selection methods helps to prevent windthrow of the remaining trees. Natural seeding from unharvested trees promotes regeneration. Maintaining permanent all-season roads allows quick salvage of downed trees after periodic storms. Competing vegetation interferes with tree planting and natural regeneration after trees are harvested. It can be controlled by herbicides or by mechanical removal.

Because of the wetness, a thin layer over bedrock, and the restricted permeability, the Merrillan soil is poorly suited to septic tank absorption fields. Mounding the site with suitable filtering material helps to overcome these limitations. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas. Because of ponding, the Veedum soil generally is not suited to septic tank absorption fields. Overcoming this limitation is difficult. A better suited site should be considered.

Because of the wetness, the Merrillan soil is poorly suited to dwellings. This limitation can be overcome by installing tile drains around foundations and providing gravity outlets or other dependable outlets and by constructing the foundations on coarse textured fill material above the level of wetness. Because of the ponding, the Veedum soil generally is not suitable as a site for dwellings. Overcoming this limitation is difficult. A better suited site should be considered.

Because of the wetness, the low strength, and the potential for frost action, the Merrillan soil is poorly suited to local roads and streets. Low strength can be overcome by replacing the upper part of the soil with coarse textured base material, such as sand or

gravel, and by increasing the thickness of the pavement or base material. Installing a subsurface drainage system and replacing part of the soil with a coarse textured base material help to prevent the damage caused by frost action and wetness. Because of the ponding, the low strength, and the potential for frost action, the Veedum soil generally is not suited to local roads and streets. Overcoming these limitations is difficult. A better suited site should be considered.

The land capability classification is VIw. The woodland ordination symbol is 4W (Northern red oak) for the Merrillan soil and 1W (Black ash) for the Veedum soil. The primary forest habitat type for the Merrillan soil commonly is PVHa, and the secondary forest habitat type is PVRh. No forest habitat type is assigned for the Veedum soil.

MxA—Moppet-Fordum complex, 0 to 3 percent slopes

These very deep, nearly level and gently sloping soils are on flood plains. The moderately well drained Moppet soil is occasionally flooded for very brief periods. The poorly drained Fordum soil is frequently flooded for long periods. The Moppet and Fordum soils occur as areas so intricately mixed or so small that it was not practical to map them separately. Individual areas are long and narrow and generally range from 10 to 200 acres in size. They are about 40 to 50 percent Moppet soil and 30 to 40 percent Fordum soil.

Typically, the surface layer of the Moppet soil is dark brown fine sandy loam about 4 inches thick. The subsoil is fine sandy loam about 28 inches thick. It is dark brown in the upper part and strong brown and mottled in the lower part. The substratum to a depth of about 60 inches is strong brown, mottled loamy fine sand and sand. In places the surface layer is sandy loam, loamy fine sand, or loamy sand.

Typically, the surface layer of the Fordum soil is black silt loam about 6 inches thick. The substratum extends to a depth of about 60 inches. The upper part is dark grayish brown and grayish brown, mottled fine sandy loam. The lower part is dark grayish brown sand that has common thin strata of dark gray fine sandy loam. In places the surface layer is mucky silt loam or loam.

Included with these soils in mapping are the very poorly drained Dawsil soils in the lower positions on the landscape. These included soils formed in 16 to 51 inches of organic material. They make up 10 to 20 percent of the unit.

Permeability is moderate or moderately rapid in the upper loamy part of the Moppet soil and rapid in the sandy lower part. It is moderate or moderately rapid in the upper loamy part of the Fordum soil and rapid or very rapid in the sandy lower part. The available water capacity is moderate in both soils. The content of organic matter is moderate in the surface layer of the Moppet soil and high or very high in the surface layer of the Fordum soil. An apparent seasonal high water table is at a depth of 2.5 to 3.5 feet in the Moppet soil and is above or near the surface in the Fordum soil. The rooting depth of most plants is limited by the seasonal high water table.

Most areas of these soils are wooded. The Moppet soil is suited to trees. The Fordum soil is poorly suited to most trees. The equipment limitation is a management concern on both soils. Seedling mortality and the windthrow hazard are additional concerns in areas of the Fordum soil.

Equipment use is restricted by the flooding and by the low strength of both soils. It is also restricted by the wetness of the Fordum soil. These restrictions can be reduced by using the equipment during dry periods when the surface is frozen or has adequate snow cover. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be stabilized by gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Culverts and ditches can be used to maintain natural drainage systems. Seedling mortality on the Fordum soil can be reduced by careful machine planting on prepared ridges or by hand planting on cradle knolls and in the drier included areas. Selecting vigorous nursery stock for planting also reduces the seedling mortality rate. Harvesting by clearcut or area-selection methods helps to prevent windthrow of the remaining trees on the Fordum soil. Natural seeding from unharvested trees promotes regeneration. Maintaining permanent all-season roads allows quick salvage of downed trees after periodic storms. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

These soils generally are not suitable as sites for septic tank absorption fields, dwellings, or local roads and streets, mainly because of the flooding. Overcoming this limitation is difficult. A better suited site should be considered.

The land capability classification is VIw. The woodland ordination symbol is 3L (Red maple) for the Moppet soil and 2W (Silver maple) for the Fordum soil. The primary forest habitat type for the Moppet

soil commonly is ArDe-V, and the secondary forest habitat type is PVCr. No forest habitat type is assigned for the Fordum soil.

Ne—Newlang muck, 0 to 2 percent slopes

This very deep, nearly level, poorly drained soil is on flood plains. It is subject to occasional flooding or ponding for brief periods. Individual areas are long and narrow or irregularly shaped and generally range from 5 to 300 acres in size.

Typically, the surface layer is black muck about 3 inches thick. The subsurface layer is black loamy sand about 3 inches thick. The subsoil is dark grayish brown, mottled, very friable sand about 16 inches thick. The substratum to a depth of about 60 inches is pale brown sand. In places the surface layer is mucky sand or loamy sand. In some areas the upper part of the subsoil is reddish brown. In other areas the substratum has thin strata of silt loam, loam, or sandy loam.

Included with this soil in mapping are small areas of the very poorly drained Adder and somewhat poorly drained Majik soils. Adder soils are in positions on the landscape similar to those of the Newlang soil. They formed in 16 to 51 inches of organic material. Majik soils are in the slightly higher positions. Included soils make up 5 to 10 percent of the unit.

Permeability is rapid in the Newlang soil. The available water capacity is low. The content of organic matter is very high in the surface layer. The rooting depth of most plants is limited by the apparent seasonal high water table, which is near or above the surface in undrained areas.

Most areas of this soil are wooded or support wetland vegetation. Some areas are used as pasture. Undrained areas are generally not suited to cultivated crops because of the wetness. Drained areas are suited to the commonly grown farm crops and to certain vegetables. If the water table is excessively lowered, however, crop yields usually are limited by the low available water capacity. Irrigation improves the suitability of this soil for most crops. The number of frost-free days per growing season is limited. Planting early maturing crop varieties or growing corn for silage helps to overcome the frost hazard. If drained and cultivated, the soil is subject to soil blowing.

This soil is poorly suited to pasture unless it is drained. Establishing an improved pasture is difficult because of the wetness. Grazing is limited to the short periods when the soil is dry. The native vegetation is generally of poor quality for forage.

This soil is poorly suited to most trees. It is better suited to conifers. The equipment limitation, seedling mortality, and the windthrow hazard are management concerns.

Equipment use is restricted by the wetness and the flooding. These restrictions can be reduced by using equipment during dry periods when the flooding hazard is less severe or during periods when the surface is frozen or has an adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Culverts and ditches can be used to maintain natural drainage systems along haul roads. Seedling mortality caused by wetness can be reduced by careful machine planting on prepared ridges or by hand planting on cradle knolls and in the drier included areas. Selecting vigorous nursery stock for planting reduces the seedling mortality rate. Harvesting by clearcut or area-selection methods helps to prevent windthrow of the remaining trees. Natural seeding from unharvested trees promotes regeneration. Maintaining permanent all-season roads allows quick salvage of downed trees after periodic storms. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

This soil generally is not suitable as a site for septic tank absorption fields, dwellings, or local roads and streets, mainly because of the flooding and the ponding. Overcoming these limitations is difficult. A better suited site should be considered.

The land capability classification is VIw in undrained areas. The woodland ordination symbol is 6W (Eastern white pine). No forest habitat type is assigned.

OrA—Orion silt loam, 0 to 3 percent slopes

This very deep, nearly level and gently sloping, somewhat poorly drained soil is on flood plains. It is subject to occasional flooding for brief periods. Individual areas are long and narrow and generally range from 4 to 100 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 8 inches thick. The upper part of the substratum, which is about 24 inches thick, is dark brown and dark grayish brown, mottled silt loam that has thin strata of light brownish gray very fine sand. The next 8 inches is a buried surface layer of black, mottled silt loam. The lower part of the substratum to a depth of about 60 inches is light brownish gray, mottled silt loam. In places the surface layer is fine

sandy loam. In some areas the lower part of the substratum contains thin strata of very fine sand.

Included with this soil in mapping are small areas of the moderately well drained Arenzville and poorly drained Ettrick soils. Arenzville soils are in the slightly higher positions on the landscape. Ettrick soils are in the lower positions. Included soils make up 10 to 20 percent of the unit.

Permeability is moderate in the Orion soil. The available water capacity is very high. The content of organic matter is moderately low or moderate in the surface layer. The surface layer is friable and can be easily tilled, but it tends to crust and puddle after hard rains or forms hard clods if it is tilled when too wet. An apparent seasonal high water table is at a depth of 1.0 to 2.5 feet in undrained areas. The rooting depth of most crops is limited by the seasonal high water table during wet periods of the growing season.

Most areas are used as cropland or pasture. Very few areas are wooded. If drained and protected from flooding, this soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Dikes and diversions help to prevent flooding. Land smoothing, diversions, and interceptor subsurface drains help to remove excess water. Restrictive soil layers may limit the movement of water into tile drains. If drainage tile is installed, silt and fine sand enter the tile lines unless a suitable filter is used to cover the tile. Applying a system of conservation tillage and returning crop residue to the soil or adding other organic material can help to maintain fertility and good tilth and increase the rate of water infiltration.

This soil is suited to pasture. The surface layer is subject to crusting, which restricts the emergence of plants. Alfalfa is generally short lived because of the seasonal high water table, the flooding, and winterkill caused by frost heave. Red clover is generally grown. Overgrazing or grazing when the soil is wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, measures that improve fertility, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

This soil is suited to trees. Equipment use is restricted by the wetness, the flooding, and low soil strength. These restrictions can be reduced by using equipment during dry periods when the flooding hazard is less severe or during periods when the surface is frozen or has an adequate snow cover. Log landings and haul roads can be established in better suited included or adjacent areas. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

This soil generally is not suitable as a site for septic tank absorption fields, dwellings, or local roads and streets, mainly because of the flooding and the wetness. Overcoming these limitations is difficult. A better suited site should be considered.

The land capability classification is IIw. The woodland ordination symbol is 2W (Silver maple). The forest habitat type commonly is ArCi.

Pa—Palms muck, 0 to 1 percent slopes

This very deep, nearly level, very poorly drained soil is on flood plains. It is subject to frequent flooding for long periods. Individual areas are long and narrow or irregularly shaped and generally range from 5 to 80 acres in size.

Typically, the upper part of the soil is about 40 inches of black muck. The substratum to a depth of about 60 inches is dark gray silt loam. In places the substratum is loam or sand.

Included with this soil in mapping are small areas of the poorly drained Kalmarville soils. These soils are in positions on the landscape similar to those of the Palms soil. They formed in silty and loamy alluvium. They make up 10 to 20 percent of the unit.

Permeability is moderately slow to moderately rapid in the organic layer in the Palms soil and moderately slow or moderate in the substratum. The available water capacity and the content of organic matter are very high. The rooting depth of most crops is limited by the apparent seasonal high water table, which is near or above the surface in undrained areas.

Most areas support wetland vegetation. Because of the wetness, the flooding, and the hazard of frost late in spring and early in fall, this soil is generally not suited to cultivated crops or pasture. If drained and protected from flooding, cultivated areas are subject to burning, subsidence, and soil blowing.

Generally, this soil is unsuited to trees. Existing trees grow slowly and are poorly shaped. Overcoming the limitations that affect management is difficult. A more suitable site should be selected.

This soil is not suitable as a site for septic tank absorption fields, dwellings, or local roads and streets because of the subsidence, the flooding, and the ponding. Overcoming these limitations is difficult. A better suited site should be considered.

The land capability classification is Vw in undrained areas. No woodland ordination symbol or forest habitat type is assigned.

Pt—Pits

This map unit consists of open excavations from which weakly cemented sandstone, loose sand, and, in a few places, gravel have been removed to a depth of at least several feet. Individual areas are irregular in shape and generally range from 4 to 80 acres in size.

Typically, the material on the bottom and sides of the pits is weakly cemented sandstone or sand. It is droughty. Other soil properties vary.

Included in mapping are piles of soil material that was removed from the area before the excavation was made. Also included are piles of excavated material. Included areas make up less than 5 percent of the unit.

Many pits are still actively mined. Some have been abandoned and are partially covered with brush and weeds. Other abandoned pits contain water.

The main management concern is reclamation of the pits after excavation. In most of the pits, land shaping and additions of suitable topsoil are needed before a plant cover can be established. The suitability of these pits for septic tank absorption fields, dwellings, and local roads and streets should be determined by onsite investigations.

The land capability classification is VIIIs. No woodland ordination symbol or forest habitat type is assigned.

Pu—Ponycreek muck, 0 to 2 percent slopes

This very deep, nearly level, poorly drained soil is in depressions. Individual areas are long and narrow or irregularly shaped and generally range from 5 to 100 acres in size.

Typically, the surface layer is dark reddish brown muck about 6 inches thick. The subsoil is light brownish gray, mottled, very friable sand about 25 inches thick. The substratum to a depth of about 66 inches is very pale brown sand. In places the surface layer is mucky sand or coarse sand. In some areas the substratum has thin strata of sandy loam.

Included with this soil in mapping are small areas of the very poorly drained Dawsil and somewhat poorly drained Ironrun soils. Dawsil soils are in positions on the landscape similar to those of the Ponycreek soil. They formed in 16 to 51 inches of organic material. Ironrun soils are in the slightly higher positions. Included soils make up 5 to 10 percent of the unit.

Permeability is rapid or very rapid in the Ponycreek soil. The available water capacity is low. The content of organic matter is very high in the surface layer. The rooting depth of most plants is limited by the apparent seasonal high water table, which is near or above the surface in undrained areas.

Most areas support wetland vegetation. A few areas are used for cranberries. Because of the wetness, a scarcity of suitable drainage outlets, and an extremely acid reaction, this soil is generally not suited to cultivated crops or pasture. If drained, cultivated areas are subject to soil blowing. If intensive management is applied, some areas are suited to cranberries and other specialty crops.

This soil is suited to trees, but most trees grow so poorly that they are barely merchantable. The soil is better suited to conifers. The equipment limitation, seedling mortality, and the windthrow hazard are management concerns.

Equipment use is restricted by low soil strength and the wetness. These restrictions can be reduced by using equipment during dry periods when the surface is frozen or has an adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Culverts and ditches can be used to maintain natural drainage systems along haul roads. Seedling mortality caused by wetness can be reduced by careful machine planting on prepared ridges or by hand planting on cradle knolls and in the drier included areas. Selecting vigorous nursery stock for planting also reduces the seedling mortality rate. Harvesting by clearcut or area-selection methods helps to prevent windthrow of the remaining trees. Natural seeding from unharvested trees promotes regeneration. Maintaining permanent all-season roads allows quick salvage of downed trees after periodic storms. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

This soil generally is not suitable as a site for septic tank absorption fields, dwellings, or local

roads and streets, mainly because of the ponding. Overcoming the ponding is difficult. A better suited site should be considered.

The land capability classification is VIw in undrained areas. The woodland ordination symbol is 6W (Jack pine). No forest habitat type is assigned.

Pv—Ponycreek-Dawsil complex, 0 to 2 percent slopes

These very deep, nearly level soils are in depressions. The Ponycreek soil is poorly drained, and the Dawsil soil is very poorly drained. The two soils occur as areas so intricately mixed or so small that it was not practical to map them separately. Individual areas are irregular in shape and generally range from 40 to 800 acres in size. They are about 40 to 50 percent Ponycreek soil and 35 to 45 percent Dawsil soil.

Typically, the surface layer of the Ponycreek soil is dark reddish brown muck about 6 inches thick. The subsurface layer is black mucky sand about 2 inches thick. The subsoil is grayish brown, very friable sand about 13 inches thick. The substratum to a depth of about 66 inches is very pale brown sand. In places the surface layer is mucky sand or mucky coarse sand. In some areas the upper part of the subsoil is reddish brown.

Typically, the Dawsil soil has organic layers that are about 40 inches thick. The upper part is very dark grayish brown mucky peat, and the lower part is black muck. The substratum to a depth of about 60 inches is light brownish gray sand. In places the organic layers are more than 51 inches thick.

Included with these soils in mapping are the somewhat poorly drained Ironrun and poorly drained Elm Lake soils. Ironrun soils are in the slightly higher positions on the landscape. They are sandy throughout. Elm Lake soils are in landscape positions similar to those of the Ponycreek and Dawsil soils. They formed in siliceous sandy alluvium overlying loamy residuum derived from the underlying interbedded sandstone and shale. Included soils make up 5 to 15 percent of the unit.

Permeability is rapid or very rapid in the Ponycreek soil. It is moderately slow to moderately rapid in the organic part of the Dawsil soil and rapid in the substratum. The available water capacity is low in the Ponycreek soil and very high in the Dawsil soil. The content of organic matter is very high in the surface layer of both soils. The surface layer has low strength and can be tilled only when the moisture content is low. The rooting depth of most plants is limited by the apparent seasonal high water table, which is near or above the surface in undrained areas.

Most areas support wetland vegetation. A few areas are used for cranberries. Because of the wetness, a scarcity of suitable drainage outlets, and an extremely acid reaction, these soils are generally not suited to cultivated crops or pasture. If drained, cultivated areas are subject to burning, subsidence, and soil blowing. If intensive management is applied, some areas are suited to cranberries and other specialty crops.

The Ponycreek soil is poorly suited to trees. The Dawsil soil generally is not suited to most trees. It is somewhat suited to some conifers in areas where ponding is less frequent. A few areas support merchantable stands of conifers. The equipment limitation, seedling mortality, and the windthrow hazard are management concerns.

Equipment use is restricted by the wetness and by the low strength of these soils. These restrictions can be reduced by using equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be established in better suited included or adjacent areas. The log landings and haul roads can also be strengthened with sand or gravel in some areas of the Ponycreek soil. Culverts and ditches can be used to maintain natural drainage along haul roads. Seedling mortality caused by wetness can be reduced by careful machine planting on prepared ridges or by hand planting on cradle knolls and in the drier included areas. Selecting vigorous nursery stock for planting also reduces the seedling mortality rate. Harvesting by clearcut or area-selection methods helps to prevent windthrow of the remaining trees. Natural seeding from unharvested trees promotes regeneration. Maintaining permanent all-season roads allows quick salvage of downed trees after periodic storms. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

These soils generally are not suitable as sites for septic tank absorption fields, dwellings, or local roads and streets, mainly because of the ponding. Overcoming this limitation is difficult. A better suited site should be considered.

The land capability classification in undrained areas is VIIw. The woodland ordination symbol is 6W (Jack pine) for the Ponycreek soil and 2W (Black

spruce) for the Dawsil soil. No forest habitat type is assigned.

Pw—Psammaquents, nearly level

These poorly drained soils are in depressions. They are drained by an intricate system of dikes and ditches but are frequently flooded on a controlled basis for long periods for the production of cranberries (fig. 11). Most areas are rectangular and range from about 10 to 250 acres in size.

Typically, Psammaquents are sandy and have a wide range in color and thickness of the individual layers. Generally, they consist of the lower part of sandy soils or the lower part of moderately deep organic soils from which the upper 20 to 40 inches has been removed to form the cranberry beds and the surrounding dikes. In places the surface layer is mucky sand.

Included with these soils in mapping are areas of dikes, ditches, small borrow pits, and reservoirs. These included areas make up 10 to 25 percent of the unit.

Permeability is rapid in the Psammaquents. The available water capacity is low. The content of organic matter in the surface layer ranges from moderately low to very high. Depth to the water table is manipulated throughout the year. The water table is near the surface for much of the growing season and is above the surface during some parts of the year.

Psammaquents are suited to cranberries but are not used for any other crop. Frost is a potential hazard in most months of the growing season. An intensive water management system, including controlled drainage and sprinkler irrigation, is needed.

Psammaquents are not suitable for septic tank absorption fields, dwellings, or local roads and streets because of the flooding and the wetness. If the surrounding dikes are removed, some areas are subject to ponding. Overcoming these limitations is difficult. A better suited site should be selected.

The land capability classification is VIw. No woodland ordination symbol or forest habitat type is assigned.

RkA—Rockdam sand, 0 to 3 percent slopes

This very deep, nearly level and gently sloping, moderately well drained soil is on toe slopes. Individual areas are irregular in shape and generally range from 10 to 200 acres in size.

Typically, the surface layer is very dark gray sand about 2 inches thick. It is covered by about 1 inch of very dark grayish brown mucky peat, which is a mat of partially decomposed forest litter. The subsurface layer is dark grayish brown sand about 3 inches thick. The subsoil is dark brown and yellowish brown, very friable sand about 21 inches thick. The upper part of the substratum is brownish yellow sand about 16 inches thick. The next part is yellow, mottled sand about 10 inches thick. The lower part of the substratum to a depth of about 61 inches is light gray, mottled sand. In places the surface layer is coarse sand, loamy sand, or loamy coarse sand.

Included with this soil in mapping are small areas of the somewhat poorly drained Ironrun and excessively drained Tarr soils. Ironrun soils are in the lower positions on the landscape. Tarr soils are in the higher positions. Included soils make up 5 to 15 percent of the unit.

Permeability is rapid or very rapid in the Rockdam soil. The available water capacity is low. The content of organic matter is moderately low or moderate in the surface layer. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content. An apparent seasonal high water table is at a depth of 3.5 to 6.0 feet.

Most areas are wooded. A few areas are used as cropland or pasture. Some areas have been planted to pine. This soil is poorly suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. In most years crop yields are limited by the low available water capacity and by a short growing season.

A cover of pasture plants is effective in controlling soil blowing. Forage yields are generally low unless fertilizer is applied and the soil receives an adequate amount of moisture. Planting early in spring, before the soil has a chance to dry, helps to overcome the droughtiness. Later plantings are likely to have a poor survival rate. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Measures that improve fertility, proper stocking rates, and pasture rotation help to keep the pasture in good condition.

This soil is suited to pine trees. Hardwood trees grow slowly and are poorly shaped. The equipment limitation and seedling mortality are management concerns. Equipment use is restricted by the loose sand. This restriction can be reduced by using equipment when the surface is frozen. Equipment with flotation tires or with tracks has better traction in loose sand than standard wheeled equipment. Sandy areas subject to repeated use by heavy equipment,

Figure 11.—Harvesting cranberries in an area of Psammaquents, nearly level.

such as log landings and haul roads, can be stabilized by gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Seedling mortality caused by droughtiness can be reduced by careful planting of vigorous nursery stock or containerized seedlings and by planting when the soil is moist.

This soil readily absorbs the effluent in septic tank absorption fields. It does not adequately filter the effluent, however, because of the rapid or very rapid permeability in the substratum. The poor filtering capacity can result in the pollution of ground water. Wetness also is a limitation. Mounding the site with suitable filtering material helps to overcome the wetness and the poor filtering capacity. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas.

This soil is suited to local roads and streets and to dwellings without basements. Because of the wetness, however, it is only moderately suited to dwellings with basements. This limitation can be overcome by installing tile drains around foundations and providing gravity outlets or other dependable outlets and by constructing the foundations on coarse textured fill material above the level of wetness.

The land capability classification is IVs. The woodland ordination symbol is 6S (Jack pine). The primary forest habitat type commonly is PVGy, and the secondary forest habitat type is PVCr.

RoA—Rowley silt loam, 0 to 3 percent slopes

This very deep, nearly level and gently sloping, somewhat poorly drained soil is on toe slopes and in

slight depressions. Individual areas are oblong or irregularly shaped and generally range from 10 to 40 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 11 inches thick. The subsoil is about 39 inches thick. The upper part is dark grayish brown, mottled, friable silt loam. The next part is grayish brown, mottled, friable silt loam. The lower part is light brownish gray, mottled silt loam that has strata of yellowish brown sand. The substratum to a depth of about 60 inches is yellowish brown sand. In places the surface layer is thinner or lighter colored. In some areas the slope is more than 3 percent.

Included with this soil in mapping are small areas of the poorly drained Ettrick and moderately well drained Toddville and Jackson soils. Ettrick soils are in the lower positions on the landscape. They are subject to flooding. Jackson and Toddville soils are in the slightly higher positions. Jackson soils have a thinner and lighter colored surface layer than the Rowley soil. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate in the subsoil of the Rowley soil and rapid in the substratum. The available water capacity is very high. The content of organic matter is moderate or high in the surface layer. The surface layer is friable and can be easily tilled, but it tends to crust and puddle after hard rains or forms hard clods if tilled when too wet. An apparent seasonal high water table is at a depth of 1 to 2 feet in undrained areas. The rooting depth of most crops is limited by the seasonal high water table during wet periods of the growing season.

Most areas are used as cropland, and a few areas are used as pasture. This soil is not naturally forested and generally is not managed for trees. If drained, the soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Land smoothing, diversions, and interception subsurface drains help to remove excess water. Restrictive soil layers may limit the movement of water into tile drains. If tile drainage is installed, silt and fine sand enter the tile lines unless a suitable filter is used to cover the tile. Applying a system of conservation tillage and returning crop residue or other organic material to the soil help to maintain fertility and good tilth and increase the rate of water infiltration.

This soil is suited to pasture. The surface layer is subject to crusting, which restricts the emergence of plants. Alfalfa is generally short lived because of the seasonal high water table, flooding, and winterkill from frost heave. Red clover is generally grown. Overgrazing or grazing when the soil is wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable species. Proper stocking rates, measures that improve fertility, pasture rotation, and restricted use during wet periods help to keep the pasture in good condition.

Because of the wetness, this soil is poorly suited to septic tank absorption fields. This limitation can be overcome by mounding the site with suitable filtering material. Also, the effluent can be pumped to an absorption field on a better suited soil in some nearby areas.

Because of the wetness, this soil is poorly suited to dwellings. This limitation can be overcome by installing tile drains around the foundations and providing gravity outlets or other dependable outlets and by constructing foundations on coarse textured fill material above the level of wetness.

Because of low soil strength and the potential for frost action, this soil is poorly suited to local roads and streets. Low strength can be overcome by replacing the upper part of the soil with a coarse textured base material, such as sand or gravel, and by increasing the thickness of the pavement or base material. Installing a subsurface drainage system and replacing the upper part of the soil with a coarse textured base material help to prevent the damage caused by frost action.

The land capability classification is IIw. The woodland ordination symbol is 2A (Silver maple). No forest habitat type is assigned.

SeB—Seaton silt loam, 2 to 6 percent slopes

This very deep, gently sloping, well drained soil is on summits and shoulders. Individual areas are oblong or long and narrow and generally range from 5 to 30 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsoil is friable silt loam about 39 inches thick. It is dark brown in the upper part and dark yellowish brown in the lower part. The substratum to a depth of about 60 inches is yellowish brown, mottled silt loam. The mottles in the substratum are relict and are not associated with a seasonal high water table. In places the surface layer is darker. In some areas the substratum is sandy. In other areas the slope is more than 6 percent.

Included with this soil in mapping are small areas of the well drained Council and La Farge soils. These soils are in positions on the landscape similar to those of the Seaton soil. Council soils have more

sand and less clay in the surface layer and subsoil than the Seaton soil. La Farge soils are underlain by sandstone. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate in the Seaton soil. The available water capacity is very high. The content of organic matter is moderately low or moderate in the surface layer. The surface layer is friable and can be easily tilled, but it tends to crust and puddle after hard rains or forms hard clods if it is tilled when too wet.

Most areas are used as cropland. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, water erosion is a slight or moderate hazard. It can be controlled by terraces, grassed waterways, contour farming, contour stripcropping, and conservation tillage. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and reduces the hazard of erosion.

A cover of pasture plants is effective in controlling water erosion. The surface layer is subject to crusting, which restricts the emergence of plants. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

This soil is suited to trees. Equipment use at log landings and on haul roads is restricted by low soil strength. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Low strength can also be overcome by using equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

This soil is suited to septic tank absorption fields and to dwellings. It is poorly suited to local roads and streets because of low strength and the potential for frost action. These limitations can be overcome by replacing the upper part of the soil with coarse textured base material, such as sand or gravel. Low strength also can be overcome by increasing the thickness of the pavement or base material.

The land capability classification is IIe. The woodland ordination symbol is 5A (Northern red oak). The forest habitat type commonly is ArCi.

SeC2—Seaton silt loam, 6 to 12 percent slopes, eroded

This very deep, sloping, well drained soil is on shoulders and back slopes. Individual areas are long and narrow or irregularly shaped and generally range from 4 to 60 acres in size.

In most cultivated areas, erosion has removed much of the original surface layer. Typically, the remaining surface layer is dark brown silt loam about 9 inches thick. It is mixed with some brown subsoil material. The subsoil is friable silt loam about 37 inches thick. It is brown in the upper part and dark yellowish brown and mottled in the lower part. The substratum to a depth of about 60 inches is pale brown, mottled silt loam. The mottles in the lower part of the subsoil and in the substratum are relict and are not associated with a seasonal high water table. In places the surface layer is thicker and darker. In some areas the substratum is sandy. In other areas the slope is less than 6 percent or more than 12 percent.

Included with this soil in mapping are small areas of the well drained Council and La Farge soils and the moderately well drained Sebbo soils. Council soils are in positions on the landscape similar to those of the Seaton soil. They have more sand and less clay in the surface layer and subsoil than the Seaton soil. La Farge soils are in the higher positions. They are underlain by sandstone. Sebbo soils are on foot slopes. They have more sand in the surface layer and subsoil than the Seaton soil. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate in the Seaton soil. The available water capacity is very high. The content of organic matter is moderately low or moderate in the surface layer. The surface layer is friable and can be easily tilled, but it tends to crust and puddle after hard rains or forms hard clods if it is tilled when too wet.

Most areas are used as cropland. A few areas are used as pasture or are wooded. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, water erosion is a moderate hazard. It can be controlled by terraces, contour farming, contour

stripcropping, grassed waterways, and conservation tillage. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and reduces the hazard of erosion.

A cover of pasture plants is effective in controlling water erosion. The surface layer is subject to crusting, which restricts the emergence of plants. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

This soil is suited to trees. Equipment use is restricted by the slope and by low soil strength at log landings. It is restricted by low strength on haul roads. Log landings can be established in nearly level or gently sloping included or adjacent areas. Low strength can be overcome by using equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

Because of the slope, this soil is only moderately suited to septic tank absorption fields. This limitation can be overcome by installing a trench absorption system on the contour. Also, the absorption field can be installed in included areas where the slope is less than 6 percent.

Because of the slope, this soil is only moderately suited to dwellings. This limitation can be overcome by cutting and filling, by installing retaining walls, or by designing the dwellings so that one side of the basement fronts on the lower part of the slope. Also, the dwellings can be constructed in the less sloping included areas.

Because of the low strength and the potential for frost action, this soil is poorly suited to local roads and streets. These limitations can be overcome by replacing the upper part of the soil with coarse textured base material, such as sand or gravel. Low strength also can be overcome by increasing the thickness of the pavement or base material.

The land capability classification is IIIe. The woodland ordination symbol is 5A (Northern red oak). The forest habitat type commonly is ArCi.

SmB—Sebbo loam, 1 to 6 percent slopes

This very deep, nearly level and gently sloping, moderately well drained soil is on toe slopes. Individual areas are irregular in shape and generally range from 4 to 80 acres in size.

Typically, the surface layer is very dark grayish brown loam about 9 inches thick. The subsoil is about 35 inches thick. It is dark brown, friable loam in the upper part; yellowish brown, mottled, friable loam in the next part; and light yellowish brown, mottled, friable silt loam in the lower part. The substratum to a depth of about 60 inches is yellowish brown, mottled silt loam. In places the surface layer is silt loam or sandy loam. In some areas the slope is more than 6 percent. In other areas the substratum has strata of sand or sandy loam.

Included with this soil in mapping are small areas of the well drained Council and Seaton soils in the higher positions on the landscape. Council soils have more sand in the surface layer and subsoil than the Sebbo soil, and Seaton soils have less sand in the surface layer and subsoil. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate in the Sebbo soil. The available water capacity is very high. The content of organic matter is moderate or high in the surface layer. The surface layer is friable and can be easily tilled, but it tends to crust and puddle after hard rains or forms clods if it is tilled when too wet. A perched seasonal high water table is at a depth of 3.5 to 6.0 feet.

Most areas are used as cropland. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, water erosion is a slight or moderate hazard. It can be controlled by terraces, contour farming, contour stripcropping, grassed waterways, and conservation tillage. Applying a system of conservation tillage and returning crop residue to the soil or adding other organic material can help to maintain fertility and good tilth and increase the rate of water infiltration.

This soil is suited to pasture. The surface layer is subject to crusting, which restricts the emergence of plants. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

This soil is suited to trees. Equipment use at log landings and on haul roads is restricted by low soil

strength. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Low strength can be overcome by using equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

Because of the wetness, this soil is poorly suited to septic tank absorption fields. This limitation can be overcome by mounding the site with suitable filtering material. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas.

This soil is suited to dwellings without basements, but it is only moderately suited to dwellings with basements because of the wetness. This limitation can be overcome by installing tile drains around the foundations and providing gravity outlets or other dependable outlets and by constructing the foundations on coarse textured fill material above the level of wetness.

This soil is poorly suited to local roads and streets because of the low strength and the potential for frost action. These limitations can be overcome by replacing the upper part of the soil with coarse textured base material, such as sand or gravel. Low strength also can be overcome by increasing the thickness of the pavement or base material.

The land capability classification is IIe. The woodland ordination symbol is 4A (Northern red oak). The forest habitat type commonly is ArCi.

SnA—Sechler loam, 0 to 3 percent slopes

This very deep, nearly level and gently sloping, somewhat poorly drained soil is on flood plains. It is subject to occasional flooding for brief periods. Individual areas are oblong and generally range from 10 to 50 acres in size.

Typically, the surface layer is black loam about 9 inches thick. The subsurface layer also is black loam. It is about 3 inches thick. The subsoil is about 15 inches thick. The loamy part contains gravel-sized iron nodules. The upper part is dark reddish brown, friable very gravelly loam. The next part is reddish brown, mottled, friable very gravelly fine sandy loam. The lower part is pinkish gray, mottled, very friable loamy fine sand. The substratum to a depth of about 60 inches is mostly very pale brown, mottled, loose fine sand. In places the surface layer is gravelly loam or silt loam. In some areas the surface layer is thinner or lighter colored. In other areas the subsoil is not gravelly.

Included with this soil in mapping are small areas of the moderately well drained Whitehall and poorly drained Kalmarville soils. Whitehall soils are in the slightly higher positions on the landscape. They have more silt and clay and less sand in the surface layer and subsoil than the Sechler soil. Kalmarville soils are in the lower positions on flood plains. Included soils make up 10 to 15 percent of the unit.

Permeability is moderate in the loamy part of the subsoil in the Sechler soil. It is moderately rapid in the sandy part of the subsoil and rapid in the substratum. The available water capacity is moderate. The content of organic matter is moderate or high in the surface layer. The surface layer is friable and can be easily tilled throughout a wide range in moisture content. An apparent seasonal high water table is at a depth of 1 to 2 feet in undrained areas. The rooting depth of most plants is limited by the seasonal high water table during wet periods of the growing season or by the sandy substratum.

Most areas are used as cropland. Some areas are used as pasture or woodland. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Dikes and diversions help to prevent flooding. Land smoothing, diversions, and interception drains help to remove excess water. Applying a system of conservation tillage and returning crop residue or other organic material to the soil help to maintain fertility and good tilth, increase the rate of water infiltration, and reduce the hazard of water erosion and scouring during flooding.

This soil is suited to pasture. The surface layer is subject to crusting, which restricts the emergence of plants. Alfalfa is generally short lived unless the soil is adequately drained. Red clover is generally grown. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Pasture rotation, proper stocking rates, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

This soil is not naturally forested and is not generally managed for woodland. There are some forested areas, mainly along the Black River, where competing grass vegetation has not totally interfered with the natural growth of trees.

This soil generally is not suitable as a site for

septic tank absorption fields, dwellings, or local roads and streets, mainly because of the flooding and the wetness. Overcoming these limitations is difficult. A better suited site should be selected.

The land capability classification is IIw. No woodland ordination symbol or forest habitat type is assigned.

SoA—Sooner silt loam, 0 to 3 percent slopes

This very deep, nearly level and gently sloping, somewhat poorly drained soil is on toe slopes and in slight depressions. Individual areas are irregular in shape and generally range from 5 to 80 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsoil is about 22 inches thick. It is friable. The upper part is dark yellowish brown, mottled silt loam. The next part is dark yellowish brown and yellowish brown, mottled loam. The lower part is yellowish brown, mottled sandy loam. The substratum to a depth of about 60 inches is yellowish brown, mottled sand. In places the surface layer is sandy loam or loam.

Included with this soil in mapping are small areas of the moderately well drained Bilmod and Merimod soils and the somewhat poorly drained Hoop soils. Bilmod and Merimod soils are in the slightly higher positions on the landscape. Bilmod soils have more sand and less silt and clay in the surface layer and subsoil than the Sooner soil. Hoop soils are in landscape positions similar to those of the Sooner soil. They have less silt and clay and more sand in the surface layer and subsoil than the Sooner soil. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate in the silty and loamy alluvium in the Sooner soil and rapid or very rapid in the sandy alluvium. The available water capacity is moderate. The content of organic matter is moderate or high in the surface layer. The surface layer is friable and can be easily tilled throughout a wide range in moisture content. An apparent seasonal high water table is at a depth of 1 to 2 feet in undrained areas. The rooting depth for most crops is limited by the seasonal high water table during wet periods of the growing season or by the sandy substratum.

Most areas are used as cropland. Very few areas are wooded. A few areas are used as pasture. If drained, this soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Excess water can be removed by diversions, grassed waterways, surface drains, and interceptor subsurface drains. If tile drains are installed, the finer sand enters the tile lines unless a suitable filter covers the tile. Applying a system of conservation tillage and returning crop residue to the soil or adding other organic material can help to maintain fertility and good tilth and increase the rate of water infiltration.

This soil is suited to pasture. Alfalfa is short lived unless the soil is adequately drained. Red clover is generally grown. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

This soil is suited to trees. Equipment use is restricted by the wetness and by low soil strength on log landings and haul roads. These limitations can be overcome by using the equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

Because of the wetness and a poor filtering capacity, this soil is poorly suited to septic tank absorption fields. These limitations can result in the pollution of ground water. Mounding the site with suitable filtering material helps to overcome the limitations. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas.

Because of the wetness, this soil is poorly suited to dwellings. This limitation can be overcome by installing tile drains around foundations and providing gravity outlets or other dependable outlets and by constructing the foundations on coarse textured fill material above the level of wetness.

Because of the potential for frost action, this soil is poorly suited to local roads and streets. Installing a subsurface drainage system and replacing the upper part of the soil with coarse textured base material, such as sand or gravel, helps to prevent the damage caused by frost action.

The land capability classification is IIw. The woodland ordination symbol is 2A (Silver maple). The forest habitat type commonly is ArDe-V.

SpA—Sparta sand, 0 to 3 percent slopes

This very deep, nearly level and gently sloping, excessively drained soil is on low stream terraces. Individual areas are irregular in shape and generally range from 5 to 80 acres in size.

Typically, the surface layer and the subsurface layer are very dark brown and dark brown sand about 16 inches thick. The subsoil is about 26 inches thick. It is dark brown, very friable sand in the upper part and dark yellowish brown, loose sand in the lower part. The substratum to a depth of about 60 inches is light yellowish brown sand. In places the surface layer is loamy sand or fine sand. In some areas the surface layer is thinner and lighter colored. In other areas the substratum contains thin strata of loamy fine sand or fine sandy loam.

Included with this soil in mapping are small areas of the well drained Dunnville soils and small areas that have a seasonal high water table at a depth of 3.5 to 6.0 feet. Dunnville soils are in the higher positions on the landscape. They formed in loamy deposits. Included soils make up 5 to 10 percent of the unit.

Permeability is rapid in the Sparta soil. The available water capacity is low. The content of organic matter is moderately low in the surface layer. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content.

Most areas are used as cropland. A few areas are wooded. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. In most years crop yields are limited by the low available water capacity. If irrigated, this soil is suited to the commonly grown farm crops and to vegetables, such as sweet corn and peas. If cultivated crops are grown, the soil is subject to soil blowing. Winter cover crops, conservation tillage, wind stripcropping, and field windbreaks help to prevent excessive soil loss. Returning crop residue to the soil or adding other organic material reduces the hazard of soil blowing and the amount of water lost through evaporation, increases the rate of water infiltration, and helps to maintain fertility and good tilth.

A cover of pasture plants is effective in controlling soil blowing. Forage yields are generally low unless fertilizer is applied and the supply of moisture is adequate. Planting early in the spring, before the soil has a chance to dry, helps to overcome the droughtiness. Later plantings are likely to have a poor survival rate. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Measures that improve fertility, proper stocking rates, and pasture rotation help to keep the pasture in good condition.

This soil is suited to pine trees. Hardwoods grow slowly and are poorly shaped. The equipment limitation and seedling mortality are management concerns. Equipment use is restricted by the loose sand. This restriction can be reduced by using equipment only when the surface is frozen. Equipment with flotation tires or with tracks has better traction in loose sand than standard wheeled equipment. Sandy areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be stabilized with gravel or crushed rock. Seedling mortality caused by droughtiness can be reduced by careful planting of vigorous nursery stock or containerized seedlings and by planting when the soil is moist.

This soil is suited to dwellings and to local roads and streets. It readily absorbs the effluent in septic tank absorption fields. It does not adequately filter the effluent, however, because of the rapid permeability. The poor filtering capacity can result in the pollution of ground water.

The land capability classification is IVs. The woodland ordination symbol is 6S (Jack pine). The primary forest habitat type commonly is PVGy, and the secondary forest habitat type commonly is PVCr.

TrB—Tarr sand, 0 to 6 percent slopes

This very deep, nearly level and gently sloping, excessively drained soil is on foot slopes and toe slopes. Individual areas are irregular in shape and generally range from 4 to 300 acres in size.

Typically, the surface layer is very dark grayish brown sand about 8 inches thick. The subsoil is dark brown and strong brown, loose sand about 28 inches thick. The substratum to a depth of about 60 inches is yellow sand. In places the surface layer is loamy sand or fine sand. In some areas the surface layer is thinner or thicker. In other areas the substratum has loamy sand and reddish strata. In some places the slope is more than 6 percent.

Included with this soil in mapping are small areas of the well drained Bilson soils, the excessively drained Boone and Impact soils, and the moderately well drained Tint soils. Bilson and Impact soils are in positions on the landscape similar to those of the Tarr soil. Bilson soils have more silt and clay in the surface layer and subsoil than the Tarr soil, and Impact soils have a thicker, darker surface layer. Boone soils are in the slightly higher positions on the

landscape. They are underlain by sandstone. Tint soils are in the lower positions. They have a mottled substratum. Included soils make up 5 to 15 percent of the unit.

Permeability is rapid in the Tarr soil. The available water capacity is low. The content of organic matter is low or moderately low in the surface layer. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content.

Most areas are wooded. Some areas are used as cropland or have been planted to pine trees. This soil is poorly suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. In most years crop yields are limited by the low available water capacity. If irrigated, however, the soil is suited to the commonly grown farm crops and to vegetables, such as snap beans and sweet corn. If cultivated crops are grown, water erosion is a slight hazard. Also, the soil is subject to soil blowing. Winter cover crops, conservation tillage, wind stripcropping, and field windbreaks help to prevent excessive soil loss. Returning crop residue to the soil or adding other organic material reduces the hazard of soil blowing and the amount of water lost through evaporation, increases the rate of water infiltration, and helps to maintain fertility and tilth.

A cover of pasture plants is effective in controlling soil blowing and water erosion. Forage yields are generally low unless fertilizer is applied and the supply of moisture is adequate. Planting early in spring, before the soil has a chance to dry, helps to overcome the droughtiness. Later plantings are likely to have a poor survival rate. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Measures that improve fertility, proper stocking rates, and pasture rotation help to keep the pasture in good condition.

This soil is suited to pine trees. Hardwood trees grow slowly and are poorly shaped. The equipment limitation and seedling mortality are management concerns. Equipment use is restricted by the loose sand. This restriction can be reduced by using equipment only when the surface is frozen. Equipment with flotation tires or with tracks has better traction in loose sand than standard wheeled equipment. Sandy areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be stabilized with gravel or crushed rock. Seedling mortality caused by droughtiness can be reduced by careful planting of vigorous nursery stock or containerized seedlings and by planting when the soil is moist.

This soil is suited to dwellings and to local roads and streets. The soil readily absorbs the effluent in septic tank absorption fields, but it does not adequately filter the effluent because of the rapid permeability. The poor filtering capacity can result in the pollution of ground water.

The land capability classification is IVs. The woodland ordination symbol is 6S (Red pine). The primary forest habitat type commonly is PVGy, and the secondary forest habitat type is PVCr.

TrC—Tarr sand, 6 to 15 percent slopes

This very deep, sloping and moderately steep, excessively drained soil is on foot slopes, back slopes, and head slopes. Individual areas are irregular in shape and generally range from 4 to 100 acres in size.

Typically, the surface layer is very dark grayish brown sand about 2 inches thick. It is covered by about 1 inch of partially decomposed leaf and grass litter. The subsoil is very friable sand about 28 inches thick. It is dark yellowish brown in the upper part and strong brown in the lower part. The substratum to a depth of about 60 inches is yellow sand. In places the surface layer is loamy sand or fine sand or is thicker. In some areas the substratum has strata of loamy sand or reddish sand. In other areas the slope is less than 6 percent or more than 15 percent.

Included with this soil in mapping are small areas of the excessively drained Boone, somewhat excessively drained Gosil, and moderately well drained Tint soils. Boone soils are in the higher positions on the landscape. They are underlain by sandstone. Gosil soils are in positions similar to those of the Tarr soil. They have slightly more clay and silt in the subsoil than the Tarr soil. Tint soils are in the lower, less sloping positions. They have a mottled substratum. Included soils make up 5 to 15 percent of the unit.

Permeability is rapid in the Tarr soil. The available water capacity is low. The content of organic matter is low or moderately low in the surface layer. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content.

Most areas are wooded. Some areas are used as cropland or have been planted to pine. This soil is poorly suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. In most years crop yields are limited by the low available water capacity. The soil is not suited to irrigation because of the slope. If cultivated crops are grown, erosion is a slight hazard. Also, the soil is subject to soil blowing. Winter cover crops, contour

stripcropping, conservation tillage, wind stripcropping, and field windbreaks help to prevent excessive soil loss. Returning crop residue to the soil or adding other organic material reduces the amount of water lost through evaporation, increases the rate of water infiltration, helps to maintain fertility and good tilth, and helps to control water erosion and soil blowing.

A cover of pasture plants is effective in controlling soil blowing and water erosion. Forage yields are generally low unless fertilizer is applied and the supply of moisture is adequate. Planting early in spring, before the soil has a chance to dry, helps to overcome the droughtiness. Later plantings are likely to have a poor survival rate. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Measures that improve fertility, proper stocking rates, and pasture rotation help to keep the pasture in good condition.

This soil is suited to pine trees. Hardwood trees grow slowly and are poorly shaped. The equipment limitation and seedling mortality are management concerns. Equipment use is restricted by the loose sand and by the slope at log landings. Equipment with flotation tires or with tracks has better traction in loose sand than standard wheeled equipment. Sandy areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be stabilized with gravel or crushed rock. Log landings can also be established in nearly level or gently sloping included or adjacent areas. Seedling mortality caused by droughtiness can be reduced by careful planting of vigorous nursery stock or containerized seedlings and by planting when the soil is moist.

This soil readily absorbs the effluent in septic tank absorption fields. It does not adequately filter the effluent, however, because of the rapid permeability. The poor filtering capacity can result in the pollution of ground water.

Because of the slope, this soil is only moderately suited to dwellings. This limitation can be overcome by cutting and filling, installing retaining walls, or designing the dwellings so that one side of the basement fronts on the lower part of the slope. Also, the dwellings can be constructed in the less sloping included areas.

Because of the slope, this soil is only moderately suited to local roads and streets. This limitation can be overcome by cutting and filling or by building the road in the less sloping areas.

The land capability classification is VIs. The woodland ordination symbol is 6S (Red pine). The primary forest habitat type commonly is PVGy, and the secondary forest habitat type is PVCr.

TrF—Tarr sand, 15 to 45 percent slopes

This very deep, moderately steep to very steep, excessively drained soil is on the upper foot slopes, on back slopes, and on head slopes. Individual areas are long and narrow and generally range from 10 to 100 acres in size.

Typically, the surface layer is black sand about 2 inches thick. It is covered by about 2 inches of partially decomposed leaf and grass litter. The subsurface layer is brown sand about 6 inches thick. The subsoil is yellowish brown, loose sand about 22 inches thick. The substratum to a depth of about 60 inches is brownish yellow sand. In places the surface layer is loamy sand or fine sand. In some areas the substratum has layers of reddish sand or loamy sand. In other areas the slope is less than 15 percent.

Included with this soil in mapping are small areas of the excessively drained Boone soils. These soils are in the higher positions on the landscape. They are underlain by sandstone. They make up 10 to 15 percent of the unit.

Permeability is rapid in the Tarr soil. The available water capacity is low. The content of organic matter is low or moderately low in the surface layer.

Most areas are wooded. A few areas are used as pasture. Because of droughtiness, water erosion, and soil blowing, this soil is generally not suited to cultivated crops and pasture. Using machinery is difficult in the sloping areas. In some of the less sloping areas, the pasture can be renovated and improved. The native vegetation generally is of poor quality for forage.

This soil is suited to pine trees. Hardwood trees grow slowly and are poorly shaped. The erosion hazard, the equipment limitation, and seedling mortality are management concerns. Erosion is accelerated where runoff is concentrated on skid trails, log landings, and haul roads. Removing water with water bars, establishing out-sloping road surfaces, crowning the road surfaces, providing culverts and ditches, and establishing skid trails and haul roads on the contour help to control erosion. Erosion also can be controlled by seeding areas where logging has exposed the surface.

Equipment use is restricted by the slope. Skid trails and haul roads can be designed so that they conform to the topography and so that grades are

kept as low as possible. In very steep areas, it may be necessary to yard the logs by cable. Log landings can be established in nearly level or gently sloping included or adjacent areas. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Seedling mortality caused by droughtiness can be reduced by careful planting of vigorous nursery stock or containerized seedlings. It can also be reduced by planting mostly on north- or east-facing slopes and by planting when the soil is moist.

This soil generally is not suited to use as a site for septic tank absorption fields or for dwellings or local roads and streets, mainly because of the slope. Overcoming this limitation is difficult. It may be possible to use the small, less sloping included areas for these uses, but in general a better suited site should be considered.

The land capability classification is VIIs. The woodland ordination symbol is 6R (Red pine). The primary forest habitat type commonly is PVGy, and the secondary forest habitat type is PVCr.

TtA—Tint sand, 0 to 3 percent slopes

This very deep, nearly level and gently sloping, moderately well drained soil is in slight depressions. Individual areas are irregular in shape and generally range from 5 to 80 acres in size.

Typically, the surface layer is very dark grayish brown sand about 9 inches thick. The subsoil is sand about 25 inches thick. It is dark yellowish brown and very friable in the upper part and yellowish brown and loose in the lower part. The substratum to a depth of about 60 inches is very pale brown and brownish yellow, mottled sand. In places the surface layer is loamy sand or fine sand. In some areas the surface layer is thicker and darker. In other areas the substratum has loamy strata or reddish sand. In some places the slope is more than 3 percent.

Included with this soil in mapping are small areas of the somewhat poorly drained Majik, excessively drained Tarr, and moderately well drained Tintson soils. Majik soils are in the lower positions on the landscape. Tarr and Tintson soils are in the higher positions. Tintson soils have more silt and clay in the substratum than the Tint soil. Included soils make up 5 to 15 percent of the unit.

Permeability is rapid in the Tint soil. The available water capacity is low. The content of organic matter is low or moderately low in the surface layer. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content. An apparent seasonal high water table is at a depth of 3.5 to 6.0 feet.

Most areas are used as cropland. A few areas are wooded. Some areas have been planted to pine. This soil is poorly suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. In most years crop yields are limited by the low available water capacity. If irrigated, however, the soil is suited to the commonly grown farm crops and to vegetables, such as sweet corn and peas. If cultivated crops are grown, the soil is subject to soil blowing. Winter cover crops, contour stripcropping, conservation tillage, wind stripcropping, and field windbreaks help to prevent excessive soil loss. Returning crop residue to the soil or adding other organic material reduces the hazard of soil blowing and the amount of water lost through evaporation, increases the rate of water infiltration, and helps to maintain fertility and good tilth.

A cover of pasture plants is effective in controlling soil blowing. Forage yields are generally low unless fertilizer is applied and the soil receives an adequate amount of moisture. Planting early in spring, before the soil has a chance to dry, helps to overcome the droughtiness. Later plantings are likely to have a poor survival rate. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Measures that improve fertility, proper stocking rates, and pasture rotation help to keep the pasture in good condition.

This soil is suited to pine trees. Hardwood trees grow slowly and are poorly shaped. The equipment limitation and seedling mortality are management concerns. Equipment use is restricted by the loose sand. This restriction can be reduced by using the equipment only when the surface is frozen. Equipment with flotation tires or with tracks has better traction in loose sand than standard wheeled equipment. Sandy areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be stabilized with gravel or crushed rock. Seedling mortality caused by droughtiness can be reduced by careful planting of vigorous nursery stock or by using containerized seedlings. It can also be reduced by planting when the soil is moist.

This soil readily absorbs the effluent in septic tank absorption fields. It does not adequately filter the effluent, however, because of the rapid permeability. The poor filtering capacity can result in the pollution of ground water. The wetness also is a limitation. Mounding the site with suitable filtering material helps to overcome the wetness and the poor filtering capacity. Also, the effluent can be pumped to an

absorption field on a better suited soil in nearby areas.

This soil is suited to local roads and streets and to dwellings without basements. Because of the wetness, however, it is only moderately suited to dwellings with basements. This limitation can be overcome by installing tile drains around foundations and providing gravity outlets or other dependable outlets and by constructing the foundations on coarse textured fill material above the level of wetness.

The land capability classification is IVs. The woodland ordination symbol is 6S (Red pine). The primary forest habitat type commonly is PVGy, and the secondary forest habitat type is PVCr.

TuB—Tintson sand, 0 to 6 percent slopes

This very deep, nearly level and gently sloping, moderately well drained soil is on broad knolls, toe slopes, and foot slopes. Individual areas are irregular in shape and generally range from 8 to 100 acres in size.

Typically, the surface layer is dark brown sand about 8 inches thick. The subsoil is dark yellowish brown and yellowish brown, very friable and loose sand about 20 inches thick. The upper part of the substratum is mottled yellow sand about 18 inches thick. The lower part to a depth of about 60 inches is mottled yellowish brown loam. In places the surface layer is loamy sand or fine sand. In some areas the surface layer is thicker and darker. In other areas the slope is more than 6 percent.

Included with this soil in mapping are small areas of the moderately well drained Bilmod and Tint soils, the somewhat poorly drained Majik soils, and the excessively drained Tarr soils. Bilmod and Tint soils are in positions on the landscape similar to those of the Tintson soil. Bilmod soils have more silt and clay in the surface layer and subsoil than the Tintson soil, and Tint soils have more sand in the substratum. Majik soils are in the lower positions on the landscape, and Tarr soils are in the higher positions. Tarr soils have more sand in the substratum than the Tintson soil. Included soils make up 5 to 15 percent of the unit.

Permeability is rapid in the sandy mantle in the Tintson soil and moderate in the loamy substratum. The available water capacity is moderate. The content of organic matter is low or moderately low in the surface layer. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content. The seasonal high water table is perched at a depth of 2.5 to 3.5 feet. The rooting depth of most crops is limited by the seasonal high water table during wet periods of the growing season.

Most areas are used as cropland. A few areas are wooded. Some areas have been planted to pine. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. In most years crop yields are limited by the low available water capacity. If irrigated, however, the soil is suited to the commonly grown farm crops and to vegetables, such as sweet corn and peas. If cultivated crops are grown, water erosion is a slight hazard. Also, the soil is subject to soil blowing. Winter cover crops, contour stripcropping, conservation tillage, wind stripcropping, and field windbreaks help to prevent excessive soil loss. Returning crop residue to the soil or adding other organic material reduces the hazard of soil blowing and the amount of water lost through evaporation, increases the rate of water infiltration, and helps to maintain fertility and good tilth.

A cover of pasture plants is effective in controlling soil blowing. Forage yields are generally low unless fertilizer is applied and the supply of moisture is adequate. Planting early in spring, before the soil has a chance to dry, helps to overcome the droughtiness. Later plantings are likely to have a poor survival rate. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Measures that improve fertility, proper stocking rates, and pasture rotation help to keep the pasture in good condition.

This soil is suited to trees, especially pines. The equipment limitation and seedling mortality are management concerns. Equipment use is restricted by the loose sand. This restriction can be reduced by using the equipment only when the surface is frozen. Equipment with flotation tires or with tracks has better traction in loose sand than standard wheeled equipment. Sandy areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be stabilized with gravel or crushed rock. Seedling mortality caused by droughtiness can be reduced by careful planting of vigorous nursery stock or by using containerized seedlings. It can also be reduced by planting when the soil is moist.

Because of the wetness and a poor filtering capacity, this soil is poorly suited to septic tank absorption fields. The upper part of the soil readily absorbs the effluent in septic tank absorption fields. It does not adequately filter the effluent, however, because of the rapid permeability. Mounding the site with suitable filtering material helps to overcome the

wetness and the poor filtering capacity. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas.

This soil is suited to local roads and streets and to dwellings without basements. Because of the wetness, however, it is only moderately suited to dwellings with basements. This limitation can be overcome by installing tile drains around foundations and providing gravity outlets or other dependable outlets and by constructing the foundations on coarse textured fill material above the level of wetness.

The land capability classification is IIIs. The woodland ordination symbol is 6S (Red pine). The primary forest habitat type commonly is PVCr, and the secondary forest habitat type is ArDe-V.

TwA—Toddville silt loam, 0 to 3 percent slopes

This very deep, nearly level and gently sloping, moderately well drained soil is on stream terraces. Individual areas are oblong or irregularly shaped and generally range from 5 to 120 acres in size.

Typically, the surface layer is very dark brown silt loam about 8 inches thick. The subsurface layer is very dark brown and dark brown silt loam about 9 inches thick. The subsoil is about 38 inches thick. The upper part is dark yellowish brown, friable silt loam. The next part is brown, mottled, friable silt loam. The lower part is yellowish brown and brown, mottled, friable, stratified silt loam, loam, sandy loam, and sand. The substratum to a depth of about 60 inches is brownish yellow, mottled sand that has thin strata of sandy loam. In places the substratum is mostly silt loam.

Included with this soil in mapping are small areas of the well drained Bertrand, moderately well drained Jackson, and somewhat poorly drained Rowley soils. Bertrand and Jackson soils have a thinner, lighter colored surface layer than the Toddville soil. Bertrand soils are in the slightly higher positions on the landscape. Jackson soils are in landscape positions similar to those of the Toddville soil. Rowley soils are in the slightly lower positions. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate in the subsoil of the Toddville soil and rapid in the sandy substratum. The available water capacity is very high. The content of organic matter is moderate or high in the surface layer. The surface layer is friable and can be easily tilled, but it tends to crust and puddle after hard rains or forms clods if it is tilled when too wet. An apparent seasonal high water table is at a depth of 3.5 to 6.0 feet.

This soil is not naturally forested and is not generally managed for woodland. Most areas are used as cropland. The soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Applying a system of conservation tillage and returning crop residue to the soil or adding other organic material can help to maintain fertility and good tilth and increase the rate of water infiltration.

This soil is suited to pasture. The surface layer is subject to crusting, which restricts the emergence of plants. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

Because of the wetness, this soil is poorly suited to septic tank absorption fields. This limitation can be overcome by constructing a filtering mound of suitable material. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas.

Because of the shrink-swell potential, this soil is only moderately suited to dwellings. This limitation can be overcome by excavating the soil and replacing it with coarse textured material, such as sand or gravel; by strengthening the basement walls; and by installing a subsurface drainage system around the dwellings at or below the basement elevation. The wetness is a limitation on sites for dwellings with basements. It can be overcome by constructing the foundations on coarse textured fill material above the level of wetness or by installing tile drains around foundations and providing gravity outlets or other dependable outlets.

Because of low strength and the potential for frost action, this soil is poorly suited to local roads and streets. Low strength can be overcome by replacing the upper part of the soil with coarse textured base material, such as sand or gravel, and by increasing the thickness of the pavement or base material. Installing a subsurface drainage system and replacing part of the soil with coarse base material help to prevent the damage caused by frost action.

The land capability classification is I. No woodland ordination symbol or forest habitat type is assigned.

UdF—Udorthents, loamy, very steep

These steep and very steep, severely eroded soils are on back slopes and foot slopes of gullies that have been eroded in stream terraces. Perennial or

intermittent streams have removed most of the topsoil and subsoil, resulting in a network of gullies ranging in depth from 10 to 100 feet. Individual areas of this unit are long and narrow and generally range from 5 to 400 acres in size.

The soil texture and colors and the thickness of the individual soil layers vary greatly. Typically, the texture is silt loam, loam, or sandy loam. In places the soils have strata of loamy sand or sand.

Permeability is generally moderate or moderately rapid. The available water capacity is high. The content of organic matter is low or very low in the surface layer.

Most areas are wooded. These soils are not suited to crops or pasture because of the very severe hazard of water erosion. Installing diversions, fencing livestock out of the area, and constructing toe walls and dams help to control water erosion.

These soils are suited to trees. The hazard of erosion and the equipment limitation are management concerns. Erosion is severely accelerated where runoff is concentrated on skid trails, log landings, and haul roads. Establishing log landings and haul roads in adjacent areas and constructing skid trails on the contour help to control erosion. Erosion also can be controlled by seeding areas where logging has exposed the surface.

Equipment use is restricted by the slope. Skid trails can be designed so that they conform to the topography and so that grades are kept as low as possible. In very steep areas, it may be necessary to yard the logs by cable. Most areas of this soil are long and narrow, so log landings and haul roads can easily be established in areas of better suited adjacent soils. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or mechanical removal.

These soils generally are not suitable as sites for septic tank absorption fields, dwellings, or local roads and streets, mainly because of the slope. Overcoming this hazard is difficult. A better suited site should be selected.

The land capability classification is VIIe. No woodland ordination symbol or forest habitat type is assigned.

UfC2—Urne fine sandy loam, 6 to 12 percent slopes, eroded

This moderately deep, sloping, well drained soil is on shoulders and back slopes of knolls, ridges, and hills. Individual areas are long and narrow or irregularly shaped and generally range from 5 to 80 acres in size.

In most cultivated areas, erosion has removed much of the original surface layer. Typically, the remaining surface layer is dark brown fine sandy loam about 7 inches thick. It is mixed with some brown subsoil material. The subsoil is about 21 inches thick. The upper part is dark brown, friable fine sandy loam, and the lower part is dark brown, very friable channery fine sandy loam. The upper part of the substratum is grayish green loamy fine sand about 8 inches thick. The lower part to a depth of about 60 inches is weakly cemented, fine grained glauconitic sandstone. In places the surface layer is channery sandy loam, loam, or silt loam. In some areas the slope is less than 6 percent or more than 12 percent.

Included with this soil in mapping are small areas of the somewhat excessively drained Elevasil and well drained La Farge soils. Elevasil soils are in the lower positions on the landscape. They are underlain by sand and nonglauconitic sandstone. La Farge soils are in landscape positions similar to those of the Urne soil. They have more silt and clay in the surface layer and subsoil than the Urne soil. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate or moderately rapid in the subsoil of the Urne soil and slow to moderate in the underlying fine grained glauconitic sandstone. The available water capacity is low. The content of organic matter is low in the surface layer. The surface layer is friable and can be easily tilled throughout a wide range in moisture content. The rooting depth of most crops is limited by the underlying sandstone.

Most areas are used as cropland or pasture. A few areas are wooded. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. In most years crop yields are limited by the low available water capacity. The soil is poorly suited to irrigation because of the slope. If cultivated crops are grown, water erosion is a moderate hazard. Also, the soil is subject to soil blowing. Contour farming, contour stripcropping, winter cover crops, and conservation tillage help to prevent excessive soil loss. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and helps to control water erosion and soil blowing.

A cover of pasture plants is effective in controlling water erosion and soil blowing. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture

rotation, measures that improve fertility, and timely deferment of grazing help to keep the pasture in good condition.

This soil is suited to trees. Equipment use at log landings is restricted by the slope. Log landings can be established in the nearly level or gently sloping included or adjacent areas. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or mechanical removal.

Because of seepage and a thin layer over bedrock, this soil is poorly suited to septic tank absorption fields. These limitations can result in the pollution of ground water. Mounding the site with suitable filtering material helps to overcome the limitations. Also, the effluent can be pumped to an absorption field on a better suited soil in a nearby area.

Because of the slope, this soil is only moderately suited to dwellings. This limitation can be overcome by cutting and filling, by installing retaining walls, or by designing the dwellings so that one side of the basement fronts on the lower part of the slope. Also, the dwellings can be constructed in the less sloping included areas.

Because of the slope and the potential for frost action, this soil is only moderately suited to local roads and streets. The slope can be overcome by shaping the roadway through cutting and filling. Also, the roads can be built in the less sloping areas. Replacing the upper part of the soil with coarse textured base material, such as sand or gravel, helps to prevent the damage caused by frost action.

The land capability classification is IIIe. The woodland ordination symbol is 4A (Northern red oak). The forest habitat type commonly is ArDe-V.

UfD2—Urne fine sandy loam, 12 to 25 percent slopes, eroded

This moderately deep, moderately steep and steep, well drained soil is on shoulders and back slopes of knolls, ridges, and hills. Individual areas are long and narrow or irregularly shaped and generally range from 10 to 100 acres in size.

In most cultivated areas, erosion has removed much of the original surface layer. Typically, the remaining surface layer is dark brown fine sandy loam about 9 inches thick. It is mixed with some dark yellowish brown subsoil material. The subsoil is dark yellowish brown, very friable fine sandy loam about 14 inches thick. The upper part of the substratum is light olive brown loamy fine sand about 8 inches thick. The lower part to a depth of about 60 inches is weakly cemented, fine grained glauconitic sandstone. In places the surface layer is channery sandy loam, loam, or silt loam. In some areas the slope is less than 12 percent or more than 25 percent.

Included with this soil in mapping are small areas of the somewhat excessively drained Elevasil and well drained La Farge soils. Elevasil soils are in the lower positions on the landscape. They are underlain by sand and glauconitic sandstone. La Farge soils are in landscape positions similar to those of the Urne soil. They have more silt and clay in the surface layer and subsoil than the Urne soil. Included soils make up 10 to 15 percent of the unit.

Permeability is moderate or moderately rapid in the subsoil of the Urne soil and slow to moderate in the underlying fine grained glauconitic sandstone. The available water capacity is low. The content of organic matter is low in the surface layer. The surface layer is friable and can be easily tilled throughout a wide range in moisture content. The rooting depth of most crops is limited by the underlying sandstone.

Most areas are wooded. A few areas are used as cropland or pasture. This soil is suited to corn and small grain and to grasses and legumes for hay and pasture. In most years crop yields are limited by the low available water capacity. The soil is not suited to irrigation because of the slope. If cultivated crops are grown, erosion is a severe hazard. Also, the soil is subject to soil blowing. Contour farming, contour stripcropping, crop rotations that include grasses and legumes, and conservation tillage help to prevent excessive soil loss. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and helps to control water erosion and soil blowing.

A cover of pasture plants is effective in controlling water erosion and soil blowing. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, measures that improve fertility, and timely deferment of grazing help to keep the pasture in good condition.

This soil is suited to trees. The erosion hazard and the equipment limitation are management concerns. Erosion is accelerated where runoff is concentrated on skid trails, log landings, and haul roads. Removing water with water bars, establishing out-sloping road surfaces, crowning the road surfaces, providing ditches and culverts, and establishing skid trails and haul roads on the contour help to control erosion. Erosion also can be controlled by seeding areas where logging has exposed the surface.

Equipment use is restricted by the slope. Skid trails and haul roads can be designed so that they conform to the topography and so that grades are kept as low as possible. Log landings can be established in nearly level or gently sloping included or adjacent areas. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or mechanical removal.

Because of seepage, a thin layer over bedrock, and the slope, this soil is poorly suited to septic tank absorption fields. The thin layer and seepage can be overcome by mounding the site with suitable filtering material. The slope can be overcome by cutting and filling or by installing a trench absorption system on the contour or in the less sloping included areas.

Because of the slope, this soil is poorly suited to dwellings. This limitation can be overcome by cutting and filling, by installing retaining walls, or by designing the dwellings so that one side of the basement fronts on the lower part of the slope. Also, the dwellings can be constructed in the less sloping included areas.

Because of the slope, this soil is poorly suited to local roads and streets. This limitation can be overcome by shaping the roadway through cutting and filling. Also, the roads can be built in the less sloping included areas.

The land capability classification is IVe. The woodland ordination symbol is 4R (Northern red oak). The forest habitat type commonly is ArDe-V.

UrF—Urne-Council complex, 25 to 50 percent slopes

These soils are steep and very steep. The well drained, moderately deep Urne soil is on shoulders and the steeper back slopes of knolls, ridges, and hills. The well drained, very deep Council soil is on back slopes, foot slopes, and head slopes. The Urne and Council soils occur as areas so intricately mixed or so small that it was not practical to map them separately. Individual areas are long and narrow or irregularly shaped and generally range from 10 to 1,000 acres in size. They are 45 to 55 percent Urne soil and 25 to 35 percent Council soil.

Typically, the surface layer of the Urne soil is black fine sandy loam about 2 inches thick. It is covered by about 1 inch of very dark grayish brown mucky peat, which is a mat of partially decomposed forest litter. The subsoil is olive brown and light olive brown, friable fine sandy loam about 34 inches thick. The substratum to a depth of about 60 inches is weakly cemented, fine grained glauconitic sandstone. In places the surface layer is sandy loam, silt loam, or channery sandy loam.

Typically, the surface layer of the Council soil is very dark grayish brown loam about 4 inches thick. It is covered by about 1 inch of very dark grayish brown mucky peat, which is a mat of partially decomposed forest litter. The subsurface layer is dark yellowish brown loam about 8 inches thick. The subsoil is about 24 inches thick. It is dark yellowish brown and friable and is mottled in the lower part. The upper part is loam, and the lower part is stratified loam and silt loam. The substratum to a depth of about 60 inches is yellowish brown, mottled silt loam. The mottles in the lower part of the subsoil and in the substratum are relict and are not associated with a seasonal high water table. In places the surface layer is sandy loam or fine sandy loam.

Included with these soils in mapping are small areas of the well drained Elevasil, La Farge, and Seaton soils. Elevasil soils are in landscape positions similar to those of the Urne soil but are at slightly lower elevations. They are underlain by sand and nonglauconitic sandstone. La Farge and Seaton soils are in landscape positions similar to those of the Council soil. La Farge soils have more silt and clay in the surface layer and subsoil than the Council soil and have sandstone at a depth of 20 to 40 inches. Seaton soils are silty throughout. Included soils make up 10 to 20 percent of the unit.

Permeability is moderate or moderately rapid in the subsoil of the Urne soil and slow to moderate in the underlying fine grained glauconitic sandstone. It is moderate in the Council soil. The available water capacity is low in the Urne soil and high in the Council soil. The content of organic matter is low or moderately low in the surface layer of the Urne soil and moderately low in the surface layer of the Council soil. The rooting depth for most plants is limited by the sandstone bedrock in the Urne soil.

Most areas are wooded. These soils are not suited to cultivated crops or pasture because of the slope and a very severe hazard of water erosion. The soils are suited to trees. The erosion hazard and equipment limitations are management concerns. Erosion is accelerated where runoff is concentrated on skid trails, log landings, and haul roads. Removing water with water bars, establishing out-sloping road surfaces, crowning the road surfaces, providing culverts and ditches, and establishing skid trails and haul roads on the contour help to control erosion. Erosion can also be controlled by seeding areas where logging has exposed the surface.

Equipment use is severely restricted by the slope. Skid trails and haul roads can be designed so that they conform to the topography and so that grades are kept as low as possible. In very steep areas, it may be necessary to yard the logs by cable. Log landings can be established in the nearly level or gently sloping included or adjacent areas. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal. Skidding can also destroy competing vegetation and expose enough mineral soil to allow rapid natural regeneration.

These soils generally are not suitable as sites for septic tank absorption fields, dwellings, or local roads and streets, mainly because of the slope. Overcoming this limitation is difficult. It may be possible to use the small, less sloping included areas for these uses, but in general a better suited site should be considered.

The land capability classification is VIIe. The woodland ordination symbol is 4R (Northern red oak). The forest habitat type commonly is ArDe-V for the Urne soil and ArCi for the Council soil.

Vs—Veedum-Elm Lake mucks, 0 to 2 percent slopes

These moderately deep, nearly level, poorly drained soils are in drainageways and depressions. The Veedum and Elm Lake soils occur as areas so intricately mixed or so small that it was not practical to map them separately. Individual areas are long and narrow or irregularly shaped and generally range from 10 to 60 acres in size. They are about 45 to 55 percent Veedum soil and 30 to 40 percent Elm Lake soil.

Typically, the surface layer of the Veedum soil is black muck about 7 inches thick. The subsurface layer is dark grayish brown, mottled silt loam about 4 inches thick. The subsoil is about 20 inches thick. It is mottled. It is stratified dark grayish brown, friable loam and light brownish gray, firm silty clay loam. The substratum to a depth of about 60 inches is weakly cemented interbedded sandstone and shale. In places the surface layer is mucky silt loam, silt loam, or loam.

Typically, the surface layer of the Elm Lake soil is dark reddish brown muck about 6 inches thick. The substratum is about 32 inches thick. It is grayish brown and very pale brown sand in the upper part and dark gray, mottled loam in the lower part. The substratum to a depth of about 60 inches is weakly cemented interbedded sandstone and shale. In places the surface layer is mucky sand, mucky loamy sand, or loamy sand.

Included with these soils in mapping are small areas of the very poorly drained Citypoint and poorly drained Ponycreek soils. Citypoint soils are in the slightly lower positions on the landscape. They formed in 16 to 51 inches of organic material. Ponycreek soils are in landscape positions similar to those of the Veedum and Elm Lake soils. They are sandy throughout. Included soils make up 5 to 20 percent of the unit.

Permeability is moderate in the upper part of the subsoil in the Veedum soil, moderately slow or moderate in the lower part of the subsoil, and extremely slow to moderately slow in the underlying interbedded sandstone and shale. It is rapid in the sandy upper part of the substratum in the Elm Lake soil, moderately slow or moderate in the loamy lower part of the substratum, and extremely slow to moderately slow in the underlying interbedded sandstone and shale. The available water capacity is moderate in the Veedum soil and low in the Elm Lake soil. The content of organic matter is very high in the surface layer of both soils. The rooting depth of most plants is limited by the perched seasonal high water table, which is near or above the surface, and by the interbedded sandstone and shale.

Most areas support native wetland vegetation. A few areas are wooded. These soils are suited to some conifers but are poorly suited to most other trees. Most trees grow slowly and are poorly shaped. The equipment limitation, seedling mortality, and the windthrow hazard are management concerns.

Equipment use is restricted by wetness and by low soil strength. These restrictions can be reduced by using equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock or can be established in better suited included or adjacent areas. Culverts and ditches can be used to maintain natural drainage systems along haul roads. Seedling mortality caused by wetness can be reduced by careful machine planting on prepared ridges or by hand planting on cradle knolls and in the drier included areas. Selecting vigorous nursery stock for

planting also reduces the seedling mortality rate. Harvesting by clearcut or area-selection methods helps to prevent windthrow of the remaining trees. Maintaining permanent all-season haul roads allows quick salvage of downed trees after periodic storms. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

These soils generally are not suitable as sites for septic tank absorption fields, dwellings, or local roads and streets, mainly because of the ponding. Overcoming the ponding is difficult. A better suited site should be considered.

The land capability classification is Vlw. The woodland ordination symbol is 1W (Black ash) for the Veedum soil and 3W (Red maple) for the Elm Lake soil. No forest habitat type is assigned.

WmA—Whitehall silt loam, 0 to 3 percent slopes

This very deep, nearly level and gently sloping, moderately well drained soil is in drainageways and depressions. It is subject to rare flooding. Individual areas are irregular in shape and generally range from 4 to 60 acres in size.

Typically, the surface layer and the subsurface layer are dark brown silt loam about 12 inches thick. The subsoil is about 20 inches thick. It is dark brown and reddish brown, friable silt loam in the upper part and reddish brown, friable loam in the lower part. The substratum to a depth of about 60 inches is reddish yellow, mottled sand. In places the surface layer is thinner. In some areas the surface layer and the upper part of the subsoil are loam.

Included with this soil in mapping are small areas of the well drained Dunnville soils in the higher positions on the landscape. These soils have more sand in the surface layer and subsoil than the Whitehall soil. They make up 5 to 15 percent of the unit.

Permeability is moderate in the silty and loamy subsoil of the Whitehall soil and rapid or very rapid in the sandy substratum. The available water capacity is moderate. The content of organic matter is moderate in the surface layer. The surface layer is friable and can be easily tilled, but it tends to crust and puddle after hard rains or forms clods if it is tilled when too wet. An apparent seasonal high water table is at a depth of 3.5 to 6.0 feet. The rooting depth of most crops is limited by the sandy substratum.

This soil is not naturally forested and is generally not managed for trees. Most areas are used as cropland. The soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Droughtiness is a slight hazard. Applying a system of conservation tillage and returning crop residue to the soil or adding other organic material can help to maintain fertility and good tilth and increase the rate of water infiltration.

This soil is suited to pasture. The surface layer is subject to crusting, which restricts the emergence of plants. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

Because of wetness and a poor filtering capacity, this soil is poorly suited to septic tank absorption fields. It readily absorbs the effluent in septic tank absorption fields, but it does not adequately filter the effluent because of the rapid permeability. The poor filtering capacity can result in the pollution of ground water. Mounding the site with suitable filtering material helps to overcome the wetness and the poor filtering capacity. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas.

Because of the flooding, this soil is poorly suited to dwellings. Overcoming this limitation is difficult. It may be possible to use included areas for this use, but a better suited site should be considered.

Because of low strength and the potential for frost action, this soil is poorly suited to local roads and streets. Low strength can be overcome by replacing the upper part of the soil with coarse textured base material, such as sand or gravel, and by increasing the thickness of the pavement or base material. Installing a subsurface drainage system and replacing part of the soil with a coarse textured base material help to prevent the damage caused by frost action.

The land capability classification is IIs. No woodland ordination symbol or forest habitat type is assigned.

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