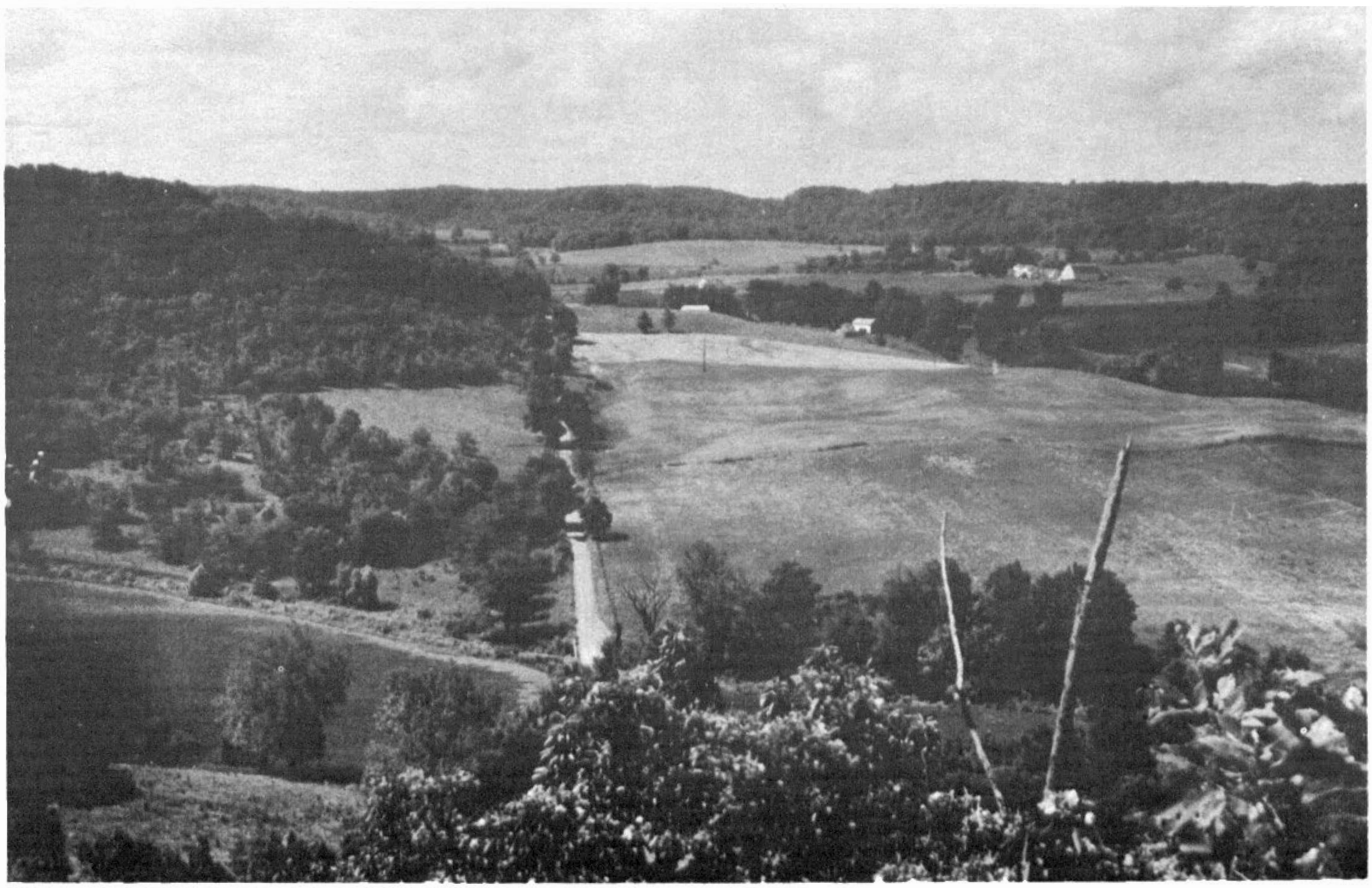
SOIL SURVEY

Fairfield County, Ohio



UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
in Cooperation with
OHIO AGRICULTURAL EXPERIMENT STATION

Series 1951, No. 7

Issued March 1960

HOW TO USE THE SOIL SURVEY REPORT

THIS SOIL SURVEY of Fairfield County will serve several groups of readers. It will help farmers in planning the kind of management that will protect their soils and provide good yields; assist engineers in selecting sites for roads, buildings, ponds, and other structures; and add to the soil scientists' fund of knowledge.

In making this survey, soil scientists walked over the fields and woodlands. They dug holes and examined surface soils and subsoils; measured slopes with a hand level; noticed differences in growth of crops, weeds, and brush; and, in fact, recorded all the things about the soils that they believed might affect their suitability for farming, engineering, forestry, and related uses.

The scientists plotted the boundaries of the soils on aerial photographs. Then cartographers prepared from the photographs the detailed soil map in the back of this report. Fields, woods, roads, and many other landmarks can be seen on the map.

Locating the soils

Use the index to map sheets to locate areas on the large map. The index is a small map of the county on which numbered rectangles have been drawn to show where each sheet of the large map is located. When the correct sheet of the large map is found, it will be seen that boundaries of the soils are outlined and that there is a special symbol for each kind of soil. All areas marked with the same symbol are the same kind of soil, wherever they appear on the map. Suppose, for example, an area located on the map has a symbol AaB2. The legend for the detailed map shows that this symbol identifies Alexandria silt loam, 2 to 6 percent slopes, moderately eroded. The Aa part of the symbol stands for the Alexandria silt loam soil type. The B part of the symbol is given to all the soils in the 2 to 6 percent slope range. The 2 indicates moderate erosion. This soil and all the others mapped in the county are described in the section, Descriptions of Soils.

Finding information

Few readers will be interested in all sections of the soil report, because it has special sections for different groups. The introductory part, which describes the climate and physiography and gives some statistics on agriculture, will be of interest mainly to those not familiar with the county.

Farmers and those who work with farmers can learn about the soils from the sections, Descriptions of Soils, Use and Management of Soils, and Estimated Yields. From these they can first identify the soils on their farms and then learn how these soils can be managed and what yields can be expected. The soils are grouped by capability units; that is, groups of soils that need similar management and respond in about the same way. For example, Alexandria silt loam, 2 to 6 percent slopes, moderately eroded, is in capability unit IIe-1. The management this soil needs will be described under the heading, Capability unit IIe-1, in the section, Capability Groups.

Engineers will want to refer to the section, Engineering Properties of Soils. Tables in that section show the depth to bedrock, the texture of soil layers, drainage, and other characteristics of the soils that affect engineering.

Soil scientists will find information about how the soils were formed and how they were classified in the section, Formation and Classification of Soils. Detailed information on samples of a few soils is given in this section.

Students, teachers, and other users will find information about soils and their management in various parts of the report, depending on their particular interest.

Fieldwork for this survey was started in 1944 and completed in 1951. Unless otherwise indicated, all statements in the report refer to conditions in the county at that time. The soil survey was made as part of the technical assistance furnished by the Soil Conservation Service to the Fairfield Soil Conservation District.

Cover picture.—A landscape near Lancaster. On the left are Muskingum soils on the wooded hills of the Allegheny Plateau; on the right are Alexandria and Cardington soils on the gentler slopes of the ground moraine in the glaciated Central Lowland.

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General Nature of the County

Fairfield County is a little southeast of the center of Ohio (fig. 1). It occupies 505 square miles, or 323,200 acres. It is bounded on the north by Licking County, on the east by Perry County, on the south by Hocking County, on the southwest by Pickaway County, and on the northwest by Franklin County.

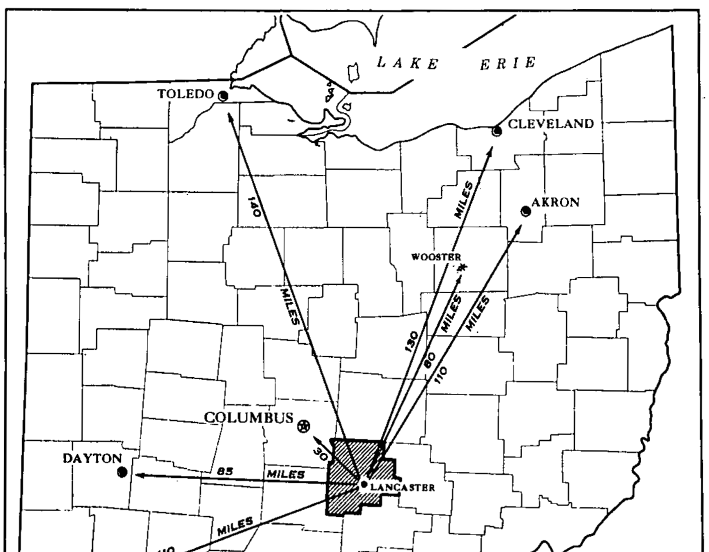

Figure 1.—**Location of Fairfield County in Ohio.**

[1] Fieldwork was done while the Soil Survey Division was part of the Bureau of Plant Industry, Soils, and Agricultural Engineering. Soil Survey was transferred to the Soil Conservation Service on November 15, 1952.

The population of the county in 1950 was 52,130. The county seat and largest town, Lancaster, located near the center of the county, had a population of 24,180. Other towns and their populations in 1950 were—Baltimore, 1,843; Bremen, 1,187; Pleasantville, 618; Millersport, 605; Amanda, 587; Thurston, 454; Sugar Grove, 434; Pickerington, 433; Carroll, 416; Lithopolis, 350; Rushville, 252; and West Rushville, 152.

Agriculture

Livestock raising is the most important type of farming in Fairfield County. More than half of the 2,514 farms in the county are livestock farms. In 1954, according to the census of agriculture, two-thirds of the farm income was from livestock and livestock products. The numbers of livestock reported in that census were as follows: Cattle and calves, 45,082 (including 12,034 milk cows); horses and mules, 715; hogs and pigs, 59,105; and sheep and lambs, 19,702. In the same census the following numbers of poultry were reported: Chickens over 4 months old, 162,566; turkeys raised, 8,421; and ducks raised, 946.

Corn is the chief field crop. It was grown on 60,292 acres in 1954. Most of this was harvested for grain. Wheat is next most important, with 34,814 acres used for this crop. Oats (6,905 acres in 1954), barley (2,669 acres), and rye (1,000 acres) are the only other grains commonly planted. Soybeans were grown on 3,225 acres. The acreage used for hay—44,697 acres—was second only to that used for corn. Three-fourths of this acreage was in clover or timothy, or a mixture of the two. Most of the rest was in alfalfa. A few hundred acres were planted to vegetables and other crops. Some tree fruits, mostly apples and peaches, were grown.

Land in farms in 1954 was 279,696 acres, or 86.5 percent of the total area of the county. The average farm was 111 acres in size. Most of the farmland—about 202,997 acres—was cropland, but 40,864 acres of this was pastured in 1954. Woodland covered 29,153 acres, of which 13,370 acres was also used for pasture. Other pastures totaled 26,490 acres. Farmland in roads, buildings, and miscellaneous uses totaled 21,056 acres.

In 1954, 82.8 percent of the farms were operated by their owners. Tenants operated 17.1 percent of the farms, and managers only 0.1 percent. About 60 percent of farm operators worked off their farms during 1954, but only about half of these received more from their outside jobs than from their farms.

Most of the 2,514 farms in the county have modern conveniences. In 1954, 2,488 farms had electricity; 2,053 had piped running water; and 2,127 had telephones. In that year, 3,690 tractors were in use, 1,165 motortrucks, and 3,069 automobiles. On 50 farms only horses or mules were used for power, and on 645 farms neither work animals nor tractors were used.

Climate

The climate of Fairfield County is of the continental type characteristic of the north-central part of the United States. Summers are hot and humid, and winters are cold. The frost-free season averages 170 days, from April 26 to October 13. Normally, it is long enough for the common crops to mature. In some years a late wet spring delays planting on poorly drained soils enough so that corn and soybeans cannot mature before early fall frosts. The latest frost recorded in spring was on May 27, and the earliest in fall was on September 14.

Normally there is enough rainfall to supply moisture for the common crops, but dry periods long enough to affect crop growth occur nearly every year.

Table 1 shows data on temperature, precipitation, and snowfall from the U.S. Weather Bureau station at Lancaster.

TABLE 1.—*Temperature and precipitation at Lancaster Station, Fairfield County, Ohio*

[Elevation, 840 feet]

Month	Temperature [1]			Precipitation [2]			
	Average	Absolute maximum	Absolute minimum	Average	Driest year (1930)	Wettest year (1935)	Average snowfall
	° F.	° F.	° F.	Inches	Inches	Inches	Inches
December	32. 9	71	−18	3. 09	1. 37	3. 10	4. 6
January	30. 7	77	−23	3. 34	4. 36	1. 98	5. 8
February	31. 3	76	−23	2. 62	2. 67	2. 96	5. 3
Winter	31. 6	77	−23	9. 05	8. 40	8. 04	15. 7
March	41. 5	86	−3	4. 22	3. 43	3. 80	2. 4
April	51. 2	92	9	3. 54	1. 62	2. 85	. 9
May	61. 5	96	23	4. 03	. 72	8. 44	(3)
Spring	51. 4	96	−3	11. 79	5. 77	15. 09	3. 3
June	69. 7	101	34	4. 34	. 91	5. 75	(3)
July	73. 8	106	41	4. 16	1. 19	10. 67	0
August	71. 9	102	38	3. 83	2. 04	7. 89	0
Summer	71. 8	106	34	12. 33	4. 14	24. 31	0
September	67. 4	102	26	2. 95	2. 48	4. 24	0
October	54. 4	92	13	2. 43	. 81	2. 16	. 1
November	42. 8	81	−1	2. 74	2. 05	3. 61	1. 8
Fall	54. 8	102	−1	8. 12	5. 34	10. 01	1. 9
Year	52. 4	106	−23	41. 29	23. 65	57. 45	20. 9

[1] Average temperature based on a 59-year record, through 1955; highest and lowest temperatures on a 55-year record, through 1952.
[2] Average precipitation based on a 60-year record, through 1955; wettest and driest years based on a 59-year record, in the period 1896–1955; snowfall based on a 56-year record, through 1952.
[3] Trace.

Vegetation [2]

Fairfield County was originally covered by a dense forest, interspersed with small areas of treeless prairie. In the glaciated part of the county, almost all of the trees were hardwoods. In some areas in the unglaciated part, conifers were mixed with the hardwoods.

Most of the original forests were cleared so the land could be used for crops. The areas now wooded have never been cleared and cultivated, but most of them have been pastured and have been cut over at least once. Woodlands generally occupy soils that are poorly suited to other types of farming. A few areas that were formerly cultivated and then abandoned are now reforesting naturally.

The trees most common in the county are identified by common and scientific names in the following list.

Acer negundo	Boxelder.
A. rubrum	Red maple.
A. saccharinum	Silver maple.
A. saccharum	Sugar maple.
Aesculus glabra	Ohio buckeye.
Betula nigra	River birch.
Carya spp.	Hickory.
C. ovata	Shagbark hickory.
Castanea dentata	Chestnut.
Celtis occidentalis	Hackberry.
Fagus grandifolia	Beech.
Fraxinus americana	White ash.
F. nigra	Black ash.
Gleditsia triacanthos	Honeylocust.
Juglans cinerea	Butternut.
J. nigra	Black walnut.
Liriodendron tulipifera	Tulip-poplar.
Nyssa sylvatica	Blackgum.
Ostrya virginiana	Eastern hophornbeam.
Pinus rigida	Pitch pine.
P. virginiana	Virginia pine.
Platanus occidentalis	Sycamore.
Populus heterophylla	Cottonwood.
Prunus serotina	Wild cherry.
P. virginiana	Chokecherry.
Quercus alba	White oak.
Q. bicolor	Swamp white oak.
Q. rubra	Red oak.
Q. coccinea	Scarlet oak.
Q. imbricaria	Shingle oak.
Q. macrocarpa	Bur oak.
Q. prinus	Chestnut oak.
Q. palustris	Pin oak.
Q. velutina	Black oak.
Salix spp.	Willow.
Sassafras albidum	Sassafras.
Tilia americana	Basswood.
Tsuga canadensis	Eastern hemlock.
Ulmus americana	American elm.

[2] Information on vegetation associations was obtained from "Vegetation Survey of an Area in Central Ohio at the Edge of the Allegheny Plateau" by G. A. Heffner, Master's Thesis, Ohio State University, 1939; and from John N. Wolfe, Professor of Botany, Ohio State University.

The original tree species occurred in rather definite forest associations, each of which was suited to the environment in the particular area where it grew. Clearing, selective cutting, grazing, and other disturbances have changed the composition of the forests.

The native vegetation of the county has been classified into eight associations of forest or prairie vegetation.

Beech-maple association.—The dominant trees in this forest association were beech and sugar maple. Other important trees were white ash, black walnut, shagbark hickory, white oak, eastern hophornbeam, and chokecherry.

In the northern half of the county, this association occurred on uplands and terraces. It probably grew best on the imperfectly drained Bennington, Crosby, McGary, Fitchville, and Sebring soils. It also grew on the moderately well drained Cardington, Celina, Markland, Glenford, and Thackery soils and the well drained Alexandria, Miami, Fox, and Mentor soils.

In the southern half of the county, this association occurred chiefly in the stream valleys. It occupied the well drained to imperfectly drained Fox, Thackery, and Sleeth soils on glacial terraces and the moist but well drained to moderately well drained Alexandria, Cardington, and Hanover soils on lower valley slopes.

Swamp-forest association.—Willow, cottonwood, sycamore, and, in some places, river birch grew on the inner flood plains; honeylocust, black walnut, and hackberry grew on the outer flood plains. The soils on the flood plains are of the Genesee, Ross, Eel, Shoals, Sloan, Chagrin, Lobdell, Orrville, and Algiers series.

Swamp forests on uplands consisted of elm, white ash, black ash, honeylocust, pin oak, swamp white oak, bur oak, black walnut, silver maple, red maple, and beech. They occurred on the poorly and very poorly drained, nearly level or depressed, upland soils of the Marengo, Brookston, and Condit series.

The forests on the imperfectly drained to poorly drained glacial lacustrine deposits were mostly elm, honeylocust, red maple, silver maple, wild cherry, black walnut, beech, boxelder, ash, and willow. The soils on these low-lying, nearly level deposits of Wisconsin age are of the McGary, Fitchville, and Montgomery series.

Butternut, shagbark hickory, and sugar maple also grew in the swamp forests.

Oak-maple association.—Forests of this type occurred mainly in the central, southern, and southeastern parts of the county on the moderately well drained, rather deep, rolling to hilly soils of the Alexandria, Cardington, Hanover, Kendallville, Parke, and Fox series. The dominant trees were white oak, black oak, red oak, sugar maple, and hickory. Other species included were white ash, blackgum, sassafras, chestnut, and chestnut oak. Since these forests were logged, the proportion of hickory trees has increased.

Oak-chestnut association.—This type of forest generally occurred on relatively shallow unglaciated soils on ridges and hilltops. The soils are well-drained to excessively drained members of the Muskingum and Loudonville series. The dominant trees were chestnut, chestnut oak, scarlet oak, and black oak. White ash, white oak, shagbark hickory, and sassafras were included. In a few places, especially along the edges of cliffs, Virginia pine and pitch pine were scattered among the oaks. Hickory has become a dominant tree since the original forest was cut over.

Mixed mesophytic forest association.—This association occurs in the unglaciated southeastern part of the county or on ridges where glacial till is very thin or lacking. This kind of forest grew mostly in the coves and on north-facing slopes in the narrow valleys or hollows. These sites are more moist and more shaded than south-facing slopes. The soils are mostly the steeper phases of Muskingum sandy loam, rocky sandy loam, and silt loam. The trees were tulip-poplar, eastern hemlock, Ohio buckeye, white oak, white ash, shagbark hickory, red maple, butternut, basswood, American elm, chestnut, red oak, black oak, sugar maple, blackgum, and chokecherry. After the original forests were cut over, hickory invaded these areas and now dominates the association.

Mixed oak association.—On the drier, south-facing slopes of the unglaciated or very thinly glaciated areas, the trees were mostly white oak, black oak, chestnut oak, and scarlet oak. Some red oak, shingle oak, shagbark hickory, and chestnut were included. The amount of hickory has increased since this forest has been cut over, and hickory is now an important part of the association. The soils are the steeper phases of Muskingum sandy loam, rocky sandy loam, and silt loam.

Prairie association.—This association consists principally of wet-prairie vegetation. It occurs in open areas of the swamp forests in glacial outwash valleys and lacustrine deposits. These nearly level or depressed, poorly drained areas are occupied by Westland, Algiers, and Montgomery soils. Marsh grasses, sedges, and wet-prairie grasses grew here. Near the edges of these areas, where the land was higher and better drained, the soils were of the Warsaw series and the vegetation was dry-prairie grass.

This association consists of marsh grasses, sedges, and wet-prairie grasses. It occurs in nearly level or basinlike spots of bog, most of which are in the lowest parts of the prairies between the headwaters of drainage basins. The soils are Carlisle muck and Willette muck. The largest areas are between Lancaster and Carroll, near Amanda, and near Buckeye Lake.

Physiography

The escarpment that marks the western edge of the Allegheny Plateau crosses Fairfield County in an irregular line from the northeastern corner to near the southwestern corner. The Central Lowland physiographic province lies to the northwest of the escarpment, and the Allegheny Plateau physiographic province lies to the southeast.

All of the Central Lowland and most of the Allegheny Plateau in this county have been glaciated and covered with varying thicknesses of glacial drift. The glaciation occurred in two separate stages. The first deposit of drift material took place when the Illinoian continental ice sheet invaded the county, and the second deposit of drift occurred when the Late Wisconsin ice sheet covered part of this area.

Figure 2 shows the physiographic divisions of Fairfield County. The broad general areas covered by the Illinoian and the Wisconsin glacial drift in this county are shown, but small areas of glacial outwash that extend into other physiographic divisions and small areas where glacial drift is lacking are not shown.

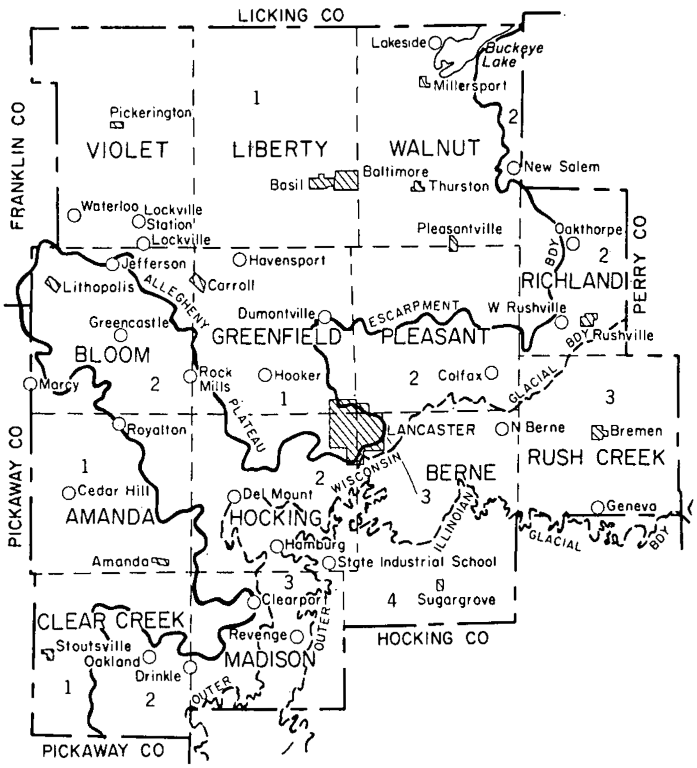

Figure 2.—**Physiographic divisions of Fairfield County, Ohio. 1. Till plain of the Central Lowland—glaciated in Late Wisconsin stage; 2. Allegheny Plateau—glaciated in Late Wisconsin stage; 3. Allegheny Plateau—glaciated in Illinoian stage; 4. Allegheny Plateau—unglaciated.**

The relief in the Central Lowland is mostly undulating. Extensive areas are nearly level. Small areas bordering the major streams are rolling or steeper.

The Allegheny Plateau is higher, more rugged, and more dissected than the Central Lowland. Part of the Allegheny Plateau was glaciated during the Late Wisconsin glacial stage. A strongly undulating to rolling relief is characteristic of this region. Steep-sided ridges and knobs protrude above the general land level. Another part of the Allegheny Plateau, glaciated during the Illinoian stage, is more rugged and has fairly numerous outcrops of sandstone.

The unglaciated part of the Allegheny Plateau west of the Hocking River, in the south-central part of the county, contains steep, narrow, flat-topped ridges and sheer cliffs of sandstone. The unglaciated part of the Allegheny Plateau that is east of the Hocking River is also rugged and strongly dissected, but the hills are more uniformly convex and less steep than those west of the Hocking River. There are no cliffs in the area east of the river, and very few outcrops of sandstone, except in the Hocking River valley.

Bedrock geology

All of the bedrock of the county is acid sandstone or shale, except for minor outcrops of limestone. Figure 3 shows the general distribution of the major geological formations in the county.

Nearly all of the bedrock dates from the Mississippian Period. A little Bedford shale is located in the northwestern corner of the county and near Waterloo. Berea sandstone underlies a larger area in the northwestern part of the county. Most of the northern and central parts of the county and the valley of the Hocking River overlie fine-grained Cuyahoga sandstone and interbedded shale. All of the Bedford and Berea formations and most of the Cuyahoga formation are in the Central Lowland physiographic province.

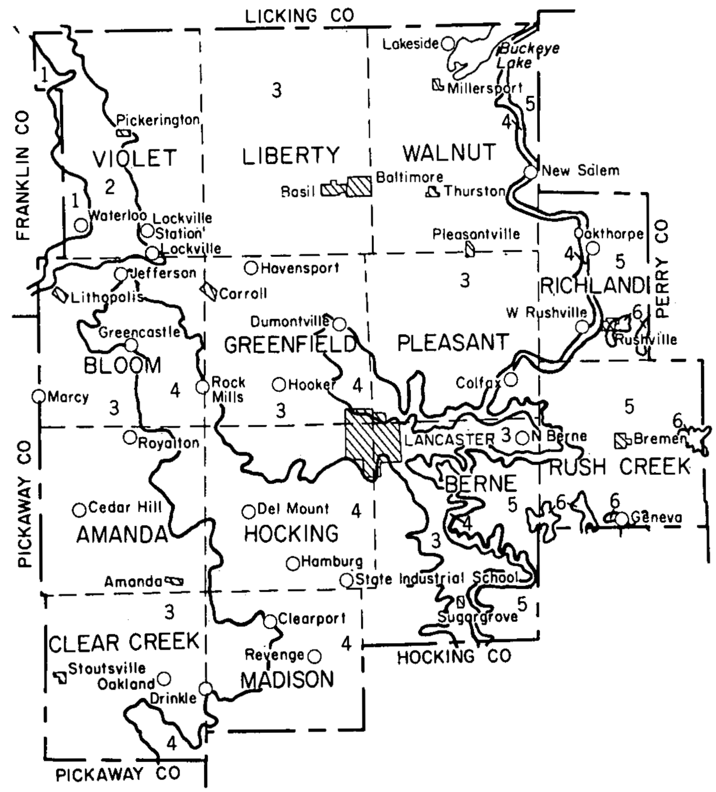

Figure 3.—**Major bedrock areas in Fairfield County, Ohio.**

Mississippian Period: (1) Bedford shale; (2) Berea sandstone; (3) Cuyahoga fine-grained sandstone and interbedded shale; (4) Black Hand coarse sandstone and conglomerate of the Cuyahoga formation, with the Logan fine-grained sandstone on ridgetops in the unglaciated part of the area; and (5) Logan fine-grained sandstone.

Pennsylvanian Period: (6) Pottsville clay shales and thin-bedded sandstones.

The part of the Allegheny Plateau west of the Hocking River is underlain by the coarse-grained Black Hand sandstone and conglomerate of the Cuyahoga formation. This area also has some fine-grained sandstone of the Logan formation on the ridgetops.

The Allegheny Plateau east of the Hocking River consists principally of the fine-grained Logan sandstone. Small areas in Rush Creek and Richland Townships are underlain by Pottsville clay shales and thin-bedded sandstones of the Pennsylvanian Period. A few small outcrops of Maxville limestone occur in the eastern part of Rush Creek Township.

Glacial geology

During the Pleistocene epoch, Fairfield County was invaded from the northwest by at least two of the continental ice sheets that spread over much of the northern United States.

The earlier glaciation, called the Illinoian, covered all of the county except the southern part of Berne Township and the eastern part of Madison Township. The later glaciation, called the Wisconsin, did not penetrate so far southward. It is estimated that the Illinoian glaciation occurred about 250,000 to 300,000 years ago, and the Wisconsin glaciation, about 10,000 to 20,000 years ago.

Huge loads of debris were carried in the glacial ice. This debris, which consisted of boulders, pebbles, sand, silt, and clay, was deposited as glacial drift when the ice melted. Figure 11, page 68, shows the general distribution of the various kinds of glacial drift in the county and the places where glacial drift is lacking. The depth of the mantle of drift in the glaciated part of the county varies from more than 100 feet to a few inches. Drift is lacking in spots, either because none was deposited or because the deposits have been removed by erosion.

Glaciation and deposition of drift tended to reduce the contrast between the Central Lowland and the Allegheny Plateau physiographic provinces. Uneven deposits of drift gave the till plain of the Central Lowland a billowy topography, while the Allegheny Plateau was smoothed out somewhat as the glaciers scraped the hills and partly filled in the valleys. Nevertheless, the escarpment that marks the edge of the Allegheny Plateau remains a prominent feature of the landscape.

The drift deposited by the ice was derived from the bedrock over which the glaciers passed. Many rocks and other materials were carried hundreds of miles by the ice. The drift in this county originated from the local sandstone and shale; from the limestone, dolomite, and shale of central and northwestern Ohio; and from the granite, quartzite, and other crystalline rocks of the Canadian highlands. The proportions of these different rocks varied, but all of the drift contained enough limestone, dolomite, and their weathered products to be calcareous in reaction. The boulders and other erratics in the county are nearly all of granite, quartzite, or other rock that is resistant to weathering.

MORAINES

Much of the glacial drift was deposited as ground moraine. This was formed when the ice was melting more rapidly than it was advancing. The debris was dropped as the ice retreated. The ground moraine is fairly uniform in thickness, and its surface relief coincides generally with the relief of the bedrock. Thus, the ground moraine of the Central Lowland is smooth, with little topographic expression. Most of the glacial drift on the Allegheny Plateau tends to follow the topography of the underlying bedrock surface.

Recessional moraines were formed where the rate of melting of the ice was about equal to its rate of advance. Debris was carried forward to the edge and deposited along the ice front. These moraines are hummocky, rolling, and rather elongated. Most of them are continuous along the former ice front, but in some places they are broken or isolated as a result of stream dissection. Recessional moraines are rather conspicuous on the Central Lowland because they rise in hummocky relief above the general level of the plain. Some of the recessional moraines on the Allegheny Plateau cannot be distinguished from the thinner deposits of glacial drift that overlie bedrock ridges. Some parts of recessional moraines consist entirely of unassorted glacial till. Others contain layers of silt, sand, clay, or gravel sorted and deposited by streams and lakes that flowed from the melting ice. Most of the recessional moraines vary unpredictably in arrangement of these layers.

The ground moraine and parts of the recessional moraines consist of a very compact, mixed mass of sand, silt, clay, pebbles, and boulders, known as glacial till. The unweathered till is bluish gray because so little air circulates in it that the minerals are unoxidized. When it is weathered and oxidized, the till is a yellowish-brown heavy loam. The pebbles and boulders in the till vary in size, but most of them are rounded.

Three principal types of till are common in this county. They are (1) strongly calcareous Wisconsin till, (2) moderately calcareous Wisconsin till, and (3) Illinoian till.

A vast area of the strongly calcareous Wisconsin till is in western Ohio, but only a little of this material is located in Fairfield County. One small area is near Waterloo, another is near Cedar Hill, and a third is near Stoutsville. Carbonates have been leached from this till to depths of 18 to 28 inches. Although the strongly calcareous till is underlain by acid sandstone and shale and is some distance east of the areas of limestone bedrock, it contains a large proportion of limestone and dolomite and their weathered derivatives. It contains less material derived from acid sandstone and shale than the other kinds of till in the county. This is probably because, before glaciation, these areas were alluvium-filled valleys, and, consequently, the glaciers did not pick up material from the deeply buried sandstone and shale bedrock. The limestone debris carried in by the glaciers became the major part of the deposits.

The moderately calcareous Wisconsin till contains more of the acid sandstone and shale and less of the limestone and dolomite than does the strongly calcareous Wisconsin till. It covers about two-thirds of the county. The layer of till is very thin on many of the prominent hills, and in some places there is no till and the soil has been formed from weathered bedrock. The carbonates have been leached to depths of 36 to 42 inches. The till varies somewhat in composition. In the eastern part of the county, on the Allegheny Plateau, it contains more sandstone and the depth to carbonates is greater than typical. Where this till overlies bedrock of Black Hand sandstone, it is more sandy than in other places.

In contrast to the fairly complete coverage of the glaciated landscape by the Wisconsin till, the Illinoian till is characterized by its thinner and extremely patchy distribution. It is thickest in the valleys and on the lower parts of slopes, moderately thick on the hilltops, and usually very thin or entirely missing on the steep, intervening slopes.

The composition of the Illinoian till was probably about the same as that of the Wisconsin glacial till, because the two glaciers passed over the same territory before reaching Fairfield County. This would mean that this material was calcareous when it was laid down. However, the Illinoian till is so deeply leached and so thin over bedrock in most places that no carbonates have been observed in it in the county. The till that overlies the coarse Black Hand sandstone, west of the Hocking River, is sandier than the silty till that overlies the fine-grained Logan sandstone, east of the river.

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OUTWASH

While the glaciers covered this area, periods of warm weather caused water from the rapidly melting, debris-filled ice to flow away in great sheets. This created a system of streams and rivers and formed temporary lakes where the flow was hindered. The melt water carried large quantities of rock materials. The cobblestones, pebbles, and coarser sands were deposited by swift water, the finer sands by the more slowly moving water, and the silts and clays by the quiet waters of temporary lakes or ponded areas. These deposits are known as glacial outwash. Deposits of material laid down by streams flowing from the glaciers are known as glaciofluvial deposits. Deposits laid down in quiet water or temporary lakes are known as lacustrine deposits.

Outwash gravel and sand have been deposited in the major valleys through which the melt water from both the Illinoian and Wisconsin glaciers flowed. Where the Wisconsin glacier overran the earlier Illinoian deposits, the Illinoian formations were destroyed or covered. Where the two kinds of outwash are found in the same valley, the Illinoian deposits lie at higher elevations than the Wisconsin deposits. Both kinds of outwash are predominantly limestone and sandstone, with lesser amounts of crystalline pebbles. The Illinoian outwash is weathered and leached to considerably greater depths because it is older.

The main deposit of Wisconsin outwash is in the large valley that extends from Lockville to Hooker and southward along the Hocking River. Another large area is along Clear Creek. The Wisconsin outwash material in the eastern and southern parts of the county contains more sandstone and shale and less limestone than that elsewhere.

Illinoian outwash is found on the high terraces along the Hocking River between Lancaster and Horn's Mill (Clark Crossing), along Clear Creek, and along the valley between Lancaster and Bremen.

Many lacustrine deposits are scattered in nearly level, basinlike places throughout the area of Wisconsin drift. They consist of stratified calcareous clay, silt, or fine sand deposited in lakes or ponded water. The fine sand has been leached of carbonates to greater depths than the silt and clay. The largest area of calcareous lacustrine deposits of Wisconsin age lies between Basil and Pleasantville. Other areas occur on the valley floor along the Hocking River and Rush Creek.

Disconnected remnants of the Illinoian lacustrine deposits lie on the lower valley slopes along the Hocking River and Rush Creek. These deposits are at higher elevations than the Wisconsin lacustrine deposits in the same valleys. Most of them are relatively shallow over sandstone bedrock. They consist mainly of stratified silts and thin lenses of clay and very fine sand. These deposits probably were originally calcareous, but the carbonates have been leached out.

KAMES AND ESKERS

Other glacial deposits in the county are kames and eskers. Most of these are in the Wisconsin glacial region. Kames are rather low but prominent, moundlike, steep-sided hills formed from sediments deposited in crevasses in the ice or on the surface of stagnant ice. Some of the kames in this county consist entirely of clean gravel and sand, others, of a thin veneer of such material over till. The gravel hills south of Cedar Hill are kames.

Eskers are elongated, winding ridges of stratified gravel and sand deposited by streams that flowed in ice tunnels within the base of the glacier. The Pickerington esker lies between Pickerington and Basil—Ridge Road runs along it. Another esker extends from a point north of Basil toward the northwest. Both terminate near Basil in a lacustrine deposit.

DRIFTLESS AREAS

Some small areas on prominent steep ridges were beneath the glacial ice but do not have a covering of glacial drift. These driftless areas are common in the Illinoian glacial area, but less so in the Wisconsin glacial area. If any drift was deposited in these places, it was later removed by erosion. Some spots may have been covered by clean ice that carried little debris.

Drainage

Major changes in the drainage pattern took place during the Illinoian glaciation. The preglacial topography of the Allegheny Plateau section was that of a well-dissected upland with deeply cut stream valleys. The Central Lowland area, below the escarpment, was a smooth plain. Streams flowed generally westward.

The Illinoian glacier, which covered almost all of the county, buried and blocked the west-flowing streams. At Horn's Mill (Clark Crossing), the southern edge of the ice dammed the north-flowing Hocking River and formed a large lake. Eventually, the stream cut through a divide to the south and reversed its direction of flow. All except a few remnants of the extensive lacustrine deposits in this lake were removed by subsequent erosion and by outwash from the later Wisconsin glacier.

The pattern of drainage that developed after the recession of the Illinoian ice sheet was not changed much by the Wisconsin glaciation and is generally the same today. The present streams are much smaller than the glacial streams. Their flood plains occupy a very small part of the outwash-filled glacial valleys. An abandoned and drift-filled valley of a preglacial stream lies between Hooker and Lockville; another extends westward from a point near Amanda, and another goes eastward from Lancaster through Bremen.

At present, all of the water in the county drains into the Hocking, Scioto, and Muskingum River systems. Buckeye Lake, in the extreme northeastern corner, drains into the Muskingum River system. The northern half of the county is drained by Walnut Creek, which is part of the Scioto River system. Salt Creek, which drains small areas in the extreme west-central and southwestern parts of the county, also empties into the Scioto River system. The central and southeastern parts of the county are drained by the Hocking River.

Soils of the County

The soils of Fairfield County are listed in table 2, and the approximate acreage and proportion of the land area of the county covered by each soil are shown.

The section Soil Survey Methods and Definitions contains a general description of how the soils are surveyed and classified into the various mapping units and defines some of the terms used. Some general information about the soil series and detailed information about each of the mapping units are given under Descriptions of Soils.

TABLE 2.—*Approximate acreage and proportionate extent of soils mapped*

Map symbol	Soil	Acres	Percent	Map symbol	Soil	Acres	Percent
AaA1	Alexandria silt loam, 0 to 2 percent slopes	163	0.1	EbAO	Eel silt loam	4,615	1.4
AaB1	Alexandria silt loam, 2 to 6 percent slopes, slightly eroded	12,249	4.0	EaAO	Eel loam	199	.1
AaB2	Alexandria silt loam, 2 to 6 percent slopes, moderately eroded	6,120	2.0	FeA1	Fox silt loam, 0 to 2 percent slopes	1,214	.4
AaC1	Alexandria silt loam, 6 to 12 percent slopes, slightly eroded	499	.2	FeB1	Fox silt loam, 2 to 6 percent slopes, slightly eroded	5,081	1.6
AaC2	Alexandria silt loam, 6 to 12 percent slopes, moderately eroded	21,709	7.0	FeB2	Fox silt loam, 2 to 6 percent slopes, moderately eroded	570	.2
AaD1	Alexandria silt loam, 12 to 18 percent slopes, slightly eroded	183	.1	FeC1	Fox silt loam, 6 to 12 percent slopes, slightly eroded	256	.1
AaD2	Alexandria silt loam, 12 to 18 percent slopes, moderately eroded	5,017	1.6	FeC2	Fox silt loam, 6 to 12 percent slopes, moderately eroded	3,045	1.0
AaE1	Alexandria silt loam, 18 to 25 percent slopes, slightly eroded	148	(1)	FgC3	Fox silty clay loam, 6 to 12 percent slopes, severely eroded	239	.1
AaE2	Alexandria silt loam, 18 to 25 percent slopes, moderately eroded	1,349	.4	FdA1	Fox loam, 0 to 2 percent slopes	315	.1
AaF2	Alexandria silt loam, 25 to 50 percent slopes, moderately eroded	631	.2	FdB1	Fox loam, 2 to 6 percent slopes, slightly eroded	613	.2
AbC3	Alexandria silty clay loam, 6 to 12 percent slopes, severely eroded	1,918	.6	FdB2	Fox loam, 2 to 6 percent slopes, moderately eroded	60	(1)
AbD3	Alexandria silty clay loam, 12 to 18 percent slopes, severely eroded	1,152	.4	FdC2	Fox loam, 6 to 12 percent slopes, moderately eroded	279	.1
AbE3	Alexandria silty clay loam, 18 to 25 percent slopes, severely eroded	276	.1	FdD2	Fox loam, 12 to 18 percent slopes, moderately eroded	1,148	.4
AcAO	Algiers silt loam	6,781	2.1	FaD3	Fox clay loam, 12 to 18 percent slopes, severely eroded	282	.1
AdAO	Algiers silty clay loam	503	.2	FcA1	Fox gravelly loam, 0 to 2 percent slopes	230	.1
BaAO	Bennington silt loam, 0 to 2 percent slopes	25,204	8.0	FcB1	Fox gravelly loam, 2 to 6 percent slopes, slightly eroded	356	.1
BaB1	Bennington silt loam, 2 to 6 percent slopes, slightly eroded	11,828	4.0	FcB2	Fox gravelly loam, 2 to 6 percent slopes, moderately eroded	65	(1)
BaB2	Bennington silt loam, 2 to 6 percent slopes, moderately eroded	100	(1)	FcC2	Fox gravelly loam, 6 to 12 percent slopes, moderately eroded	201	.1
BbAO	Brookston clay loam	4,472	1.4	FbC3	Fox gravelly clay loam, 6 to 12 percent slopes, severely eroded	42	(1)
CaA1	Cardington silt loam, 0 to 2 percent slopes	385	.1	GbAO	Genesee silt loam	5,182	.2
CaB1	Cardington silt loam, 2 to 6 percent slopes, slightly eroded	43,609	13.5	GaAO	Genesee loam	425	.1
CaB2	Cardington silt loam, 2 to 6 percent slopes, moderately eroded	3,869	1.2	Gc	Gravel and sand pits	149	(1)
CaC1	Cardington silt loam, 6 to 12 percent slopes, slightly eroded	253	.1	HaB1	Hanover silt loam, 2 to 6 percent slopes, slightly eroded	2,980	1.0
CaC2	Cardington silt loam, 6 to 12 percent slopes, moderately eroded	2,871	1.0	HaB2	Hanover silt loam, 2 to 6 percent slopes, moderately eroded	596	.2
CaD2	Cardington silt loam, 12 to 18 percent slopes, moderately eroded	123	(1)	HaC1	Hanover silt loam, 6 to 12 percent slopes, slightly eroded	388	.1
CbAO	Carlisle muck	509	.2	HaC2	Hanover silt loam, 6 to 12 percent slopes, moderately eroded	6,888	2.1
CeE2	Casco loam, 18 to 25 percent slopes, moderately eroded	190	.1	HaD1	Hanover silt loam, 12 to 18 percent slopes, slightly eroded	123	(1)
CcE3	Casco clay loam, 18 to 25 percent slopes, severely eroded	94	(1)	HaD2	Hanover silt loam, 12 to 18 percent slopes, moderately eroded	1,761	.5
CdD2	Casco gravelly loam, 12 to 18 percent slopes, moderately eroded	198	.1	HaD3	Hanover silt loam, 12 to 18 percent slopes, severely eroded	270	.1
CgF2	Casco and Rodman loams, 25 to 40 percent slopes, moderately eroded	112	(1)	KaC2	Keene silt loam, shallow, 2 to 12 percent slopes, slightly to moderately eroded	54	(1)
ChA1	Celina silt loam, 0 to 2 percent slopes	58	(1)	KbD3	Keene silty clay loam, shallow, 12 to 18 percent slopes, severely eroded	52	(1)
ChB1	Celina silt loam, 2 to 6 percent slopes, slightly eroded	2,681	1.0	KcA1	Kendallville silt loam, 0 to 2 percent slopes	57	(1)
ChB2	Celina silt loam, 2 to 6 percent slopes, moderately eroded	176	.1	KcB1	Kendallville silt loam, 2 to 6 percent slopes, slightly eroded	1,013	.3
CmAO	Chagrin silt loam	598	.2	KcB2	Kendallville silt loam, 2 to 6 percent slopes, moderately eroded	79	(1)
CkAO	Chagrin fine sandy loam	63	(1)	KcC2	Kendallville silt loam, 6 to 12 percent slopes, moderately eroded	278	.1
CnAO	Condit silt loam	424	.1	KcD2	Kendallville silt loam, 12 to 18 percent slopes, moderately to severely eroded	82	(1)
CoAO	Crosby silt loam, 0 to 2 percent slopes	1,696	.5				
CoB1	Crosby silt loam, 2 to 6 percent slopes, slightly eroded	633	.2				

See footnote at end of table.

TABLE 2.—*Approximate acreage and proportionate extent of soils mapped*—Continued

Map symbol	Soil	Acres	Percent
LbAO	Lobdell silt loam	1,490	0.5
LaAO	Lobdell fine sandy loam	102	(1)
LcB1	Loudonville silt loam, 2 to 6 percent slopes, slightly eroded	212	.1
LcB2	Loudonville silt loam, 2 to 6 percent slopes, moderately eroded	91	(1)
LcC1	Loudonville silt loam, 6 to 12 percent slopes, slightly eroded	50	(1)
LcC2	Loudonville silt loam, 6 to 12 percent slopes, moderately eroded	1,597	.5
LcC3	Loudonville silt loam, 6 to 12 percent slopes, severely eroded	157	(1)
LcD1	Loudonville silt loam, 12 to 18 percent slopes, slightly eroded	54	(1)
LcD2	Loudonville silt loam, 12 to 18 percent slopes, moderately eroded	2,380	.8
LcD3	Loudonville silt loam, 12 to 18 percent slopes, severely eroded	747	.2
LcE1	Loudonville silt loam, 18 to 25 percent slopes, slightly eroded	144	(1)
LcE2	Loudonville silt loam, 18 to 25 percent slopes, moderately eroded	933	.3
LcE3	Loudonville silt loam, 18 to 25 percent slopes, severely eroded	236	.1
LcF2	Loudonville silt loam, 25 to 50 percent slopes, moderately eroded	119	(1)
Ma	Made land	218	.1
McAO	Marengo silty clay loam	23,270	7.2
MbAO	Marengo silt loam	994	.3
MdA1	Markland and Glenford silt loams, 0 to 2 percent slopes	417	.1
MdB1	Markland and Glenford silt loams, 2 to 6 percent slopes, slightly eroded	2,129	.7
MdB2	Markland and Glenford silt loams, 2 to 6 percent slopes, moderately eroded	195	.1
MgA1	McGary and Fitchville silt loams, 0 to 2 percent slopes	4,339	1.3
MgB1	McGary and Fitchville silt loams, 2 to 6 percent slopes, slightly eroded	977	.3
MeAO	McGary and Fitchville loams, 0 to 2 percent slopes	336	.1
MhAO	McGary and Sebring silt loams, 0 to 2 percent slopes	795	.2
MkAO	Mentor silt loam, 0 to 2 percent slopes	138	(1)
MkB1	Mentor silt loam, 2 to 6 percent slopes, slightly eroded	746	.2
MkB2	Mentor silt loam, 2 to 6 percent slopes, moderately eroded	115	(1)
MkC1	Mentor silt loam, 6 to 12 percent slopes, slightly eroded	88	(1)
MkC2	Mentor silt loam, 6 to 12 percent slopes, moderately eroded	391	.1
MkD2	Mentor silt loam, 12 to 18 percent slopes, moderately eroded	95	(1)
MmB1	Miami silt loam, 2 to 6 percent slopes, slightly eroded	2,116	.7
MmB2	Miami silt loam, 2 to 6 percent slopes, moderately eroded	823	.3
MmC2	Miami silt loam, 6 to 12 percent slopes, moderately eroded	874	.3
MmD2	Miami silt loam, 12 to 18 percent slopes, moderately eroded	65	(1)
MnC3	Miami silty clay loam, 6 to 12 percent slopes, severely eroded	289	.1
MnD3	Miami silty clay loam, 12 to 18 percent slopes, severely eroded	89	(1)
MpAO	Montgomery silty clay loam	13,026	4.0
MoAO	Montgomery silt loam	896	.3
MuB1	Muskingum silt loam, 2 to 6 percent slopes, slightly to moderately eroded	48	(1)
MuC1	Muskingum silt loam, 6 to 12 percent slopes, slightly eroded	141	(1)
MuC2	Muskingum silt loam, 6 to 12 percent slopes, moderately eroded	617	0.2
MuC3	Muskingum silt loam, 6 to 12 percent slopes, severely eroded	84	(1)
MuD1	Muskingum silt loam, 12 to 18 percent slopes, slightly eroded	110	(1)
MuD2	Muskingum silt loam, 12 to 18 percent slopes, moderately eroded	2,217	.8
MuD3	Muskingum silt loam, 12 to 18 percent slopes, severely eroded	310	.1
MuE1	Muskingum silt loam, 18 to 25 percent slopes, slightly eroded	467	.1
MuE2	Muskingum silt loam, 18 to 25 percent slopes, moderately eroded	2,710	1.0
MuE3	Muskingum silt loam, 18 to 25 percent slopes, severely eroded	318	.1
MuF1	Muskingum silt loam, 25 to 50 percent slopes, slightly eroded	2,588	1.0
MuF2	Muskingum silt loam, 25 to 50 percent slopes, moderately to severely eroded	3,058	1.0
MrC1	Muskingum fine and very fine sandy loams, 6 to 12 percent slopes, slightly to moderately eroded	93	(1)
MrD2	Muskingum fine and very fine sandy loams, 12 to 18 percent slopes, slightly to moderately eroded	231	.1
MrE2	Muskingum fine and very fine sandy loams, 18 to 25 percent slopes, slightly to moderately eroded	396	.1
MtB1	Muskingum sandy loam, 2 to 6 percent slopes, slightly to moderately eroded	74	(1)
MtC1	Muskingum sandy loam, 6 to 12 percent slopes, slightly eroded	114	(1)
MtC2	Muskingum sandy loam, 6 to 12 percent slopes, moderately eroded	769	.2
MtD1	Muskingum sandy loam, 12 to 18 percent slopes	174	.1
MtD2	Muskingum sandy loam, 12 to 18 percent slopes, moderately eroded	2,016	.6
MtD3	Muskingum sandy loam, 12 to 18 percent slopes, severely eroded	71	(1)
MtE1	Muskingum sandy loam, 18 to 25 percent slopes, slightly eroded	666	.2
MtE2	Muskingum sandy loam, 18 to 25 percent slopes, moderately eroded	2,558	1.0
MtE3	Muskingum sandy loam, 18 to 25 percent slopes, severely eroded	277	.1
MtF1	Muskingum sandy loam, 25 to 50 percent slopes, slightly eroded	2,039	.6
MtF2	Muskingum sandy loam, 25 to 50 percent slopes, moderately eroded	2,092	.6
MsD2	Muskingum rocky sandy loam, 6 to 18 percent slopes, slightly to moderately eroded	233	.1
MsE1	Muskingum rocky sandy loam, 18 to 25 percent slopes, slightly to moderately eroded	686	.2
MsG1	Muskingum rocky sandy loam, 25 to 50 percent slopes, slightly to moderately eroded	7,547	2.3
NaC2	Negley gravelly and sandy loams, 6 to 12 percent slopes, moderately eroded	83	(1)
NaD2	Negley gravelly and sandy loams, 12 to 18 percent slopes, moderately eroded	130	(1)

See footnote at end of table.

TABLE 2.—*Approximate acreage and proportionate extent of soils mapped*—Continued

Map symbol	Soil	Acres	Percent	Map symbol	Soil	Acres	Percent
NaD3	Negley gravelly and sandy loams, 12 to 18 percent slopes, severely eroded	34	(1)	PaD1	Parke silt loam, 12 to 18 percent slopes, slightly eroded	35	(1)
NaE1	Negley gravelly and sandy loams, 18 to 25 percent slopes, slightly eroded	371	0. 1	PaD2	Parke silt loam, 12 to 18 percent slopes, moderately eroded	964	0. 3
NaE2	Negley gravelly and sandy loams, 18 to 25 percent slopes, moderately eroded	31	(1)	PaE1	Parke silt loam, 18 to 25 percent slopes, slightly eroded	82	(1)
NaE3	Negley gravelly and sandy loams, 18 to 25 percent slopes, severely eroded	85	(1)	PaE2	Parke silt loam, 18 to 25 percent slopes, moderately eroded	831	. 3
NaF1	Negley gravelly and sandy loams, 25 to 50 percent slopes, slightly eroded	154	(1)	PbD3	Parke silty clay loam, 12 to 18 percent slopes, severely eroded	224	. 1
NaF2	Negley gravelly and sandy loams, 25 to 50 percent slopes, moderately eroded	504	. 2	PbE3	Parke silty clay loam, 18 to 25 percent slopes, severely eroded	120	(1)
NaF3	Negley gravelly and sandy loams, 25 to 50 percent slopes, severely eroded	53	(1)	PcA1	Pike silt loam, 0 to 2 percent slopes	63	(1)
ObA1	Ockley silt loam, 0 to 2 percent slopes	2, 011	. 6	PcB1	Pike silt loam, 2 to 6 percent slopes	373	. 1
ObB1	Ockley silt loam, 2 to 6 percent slopes, slightly eroded	1, 882	. 6	PcB2	Pike silt loam, 2 to 6 percent slopes, moderately eroded	144	(1)
ObB2	Ockley silt loam, 2 to 6 percent slopes, moderately eroded	193	. 1	PcC2	Pike silt loam, 6 to 12 percent slopes, moderately eroded	523	. 2
ObC1	Ockley silt loam, 6 to 12 percent slopes, slightly eroded	99	(1)	Ra	Riverwash	139	(1)
ObC2	Ockley silt loam, 6 to 12 percent slopes, moderately eroded	131	(1)	RbAO	Ross silt loam	679	. 2
OaA1	Ockley loam, 0 to 2 percent slopes	81	(1)	SaAO	Shoals silt loam	1, 076	. 3
OaB1	Ockley loam, 2 to 6 percent slopes, slightly eroded	412	. 1	SbA1	Sleeth silt loam, 0 to 2 percent slopes	971	. 3
OaB2	Ockley loam, 2 to 6 percent slopes, moderately eroded	44	(1)	SbB1	Sleeth silt loam, 2 to 6 percent slopes, slightly eroded	101	(1)
OdAO	Orrville silt loam	1, 415	. 4	SdAO	Sloan silty clay loam	3, 000	1. 0
OcAO	Orrville fine sandy loam	292	. 1	ScAO	Sloan silt loam	660	. 2
OeB2	Otwell silt loam, 2 to 6 percent slopes, slightly to moderately eroded	50	(1)		Stone quarries	13	(1)
OeC1	Otwell silt loam, 6 to 12 percent slopes, slightly eroded	63	(1)	TaA1	Thackery silt loam, 0 to 2 percent slopes	508	. 2
OeC2	Otwell silt loam, 6 to 12 percent slopes, moderately eroded	318	. 1	TaB1	Thackery silt loam, 2 to 6 percent slopes, slightly eroded	485	. 2
OeD2	Otwell silt loam, 12 to 18 percent slopes, moderately eroded	273	. 1	TbA1	Tippecanoe silt loam	237	. 1
OeE2	Otwell silt loam, 18 to 25 percent slopes, moderately eroded	85	(1)	WaAO	Wallkill silt loam	412	. 1
PaB1	Parke silt loam, 2 to 6 percent slopes, slightly eroded	154	(1)	WbAO	Wallkill silty clay loam	242	. 1
PaB2	Parke silt loam, 2 to 6 percent slopes, moderately eroded	82	(1)	WcAO	Warsaw silt loam, 0 to 2 percent slopes	53	(1)
PaC1	Parke silt loam, 6 to 12 percent slopes, slightly eroded	38	(1)	WcB1	Warsaw silt loam, 2 to 6 percent slopes, slightly eroded	80	(1)
PaC2	Parke silt loam, 6 to 12 percent slopes, moderately eroded	648	. 2	WdA1	Wea silt loam, 0 to 2 percent slopes	475	. 1
				WdB1	Wea silt loam, 2 to 6 percent slopes, slightly eroded	406	. 1
				WeB1	Wellston silt loam, 2 to 6 percent slopes, slightly eroded	146	(1)
				WeC1	Wellston silt loam, 6 to 12 percent slopes, slightly eroded	318	. 1
				WeC2	Wellston silt loam, 6 to 12 percent slopes, moderately eroded	1, 390	. 4
				WeD2	Wellston silt loam, 12 to 18 percent slopes, slightly to moderately eroded	39	(1)
				WhAO	Westland silty clay loam	4, 792	1. 5
				WgAO	Westland silt loam	1, 179	. 4
				WkAO	Willette muck	256	. 1
					Total	323, 200	100. 0

[1] Less than 0.1 percent.

Soil Survey Methods and Definitions

The scientist who makes a soil survey examines soils in the field, classifies the soils in accordance with facts that he observes, and maps their boundaries on an aerial photograph or other map.

FIELD STUDY.—The soil surveyor bores or digs many holes to see what the soils are like. The holes are not spaced in a regular pattern but are located according to the lay of the land. Usually they are not more than a quarter of a mile apart and sometimes they are much less. In most soils, such a boring or hole reveals several distinct layers, called horizons, which collectively are known as the soil profile. Each layer is studied to see how it differs from others in the profile and to learn the things about this soil that influence its capacity to support plant growth.

Color is generally related to the amount of organic matter. The darker the surface soil, as a rule, the more organic matter it contains. Streaks and spots of gray, yellow, and brown in the lower layers generally indicate poor drainage and poor aeration.

Texture, or the amount of sand, silt, and clay, is determined by the way the soil feels when rubbed between the fingers. Samples of the more important soils are later checked by laboratory analysis. Texture determines how well the soil retains moisture, plant nutrients, and fertilizer, and whether it is easy or difficult to cultivate.

Structure, which is the way the individual soil particles are arranged in larger grains or aggregates and the amount of pore space between grains, gives us clues to the ease or difficulty with which the soil can be penetrated by plant roots and by moisture.

Consistence, or the tendency of the soil to crumble or to stick together, indicates whether it is easy or difficult to keep the soil open and porous under cultivation.

Reaction, or the acidity or alkalinity of a soil, determines whether the soil needs lime. The reaction usually is expressed as the pH value. The terms that correspond to ranges in pH are as follows:

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

Strict neutrality is pH 7.0, but in fieldwork anything between pH 6.6 and pH 7.3 is neutral for all practical purposes.

Other characteristics observed in the course of the field study and considered in classifying the soil include the following: The depth of the soil over bedrock or compact layers, the presence of gravel or stones in amounts that will interfere with cultivation, the steepness and pattern of slopes, the degree of erosion, and the nature of the underlying rocks or other parent material from which the soil has developed.

CLASSIFICATION.—On the basis of the characteristics observed by the survey team or determined by laboratory tests, soils are classified into phases, types, and series. The soil type is the basic classification unit. A soil type may consist of several phases. Types that resemble each other in most of their characteristics are grouped into soil series.

Soil type.—Soils similar in kind, thickness, and arrangement of soil layers are classified as one soil type.

Soil phase.—Because of differences other than those of kind, thickness, and arrangement of layers, some soil types are divided into two or more phases. Slope variations, degree of erosion, or depth of soil over the substratum are examples of characteristics that suggest dividing a soil type into phases.

The soil phase (or the soil type if it has not been subdivided) is the unit shown on the soil map. It is the unit that has the narrowest range of characteristics. Use and management practices, therefore, can be specified more easily than for soil series or yet broader groups that contain more variation.

Soil series.—Two or more soil types that differ in surface texture but are otherwise similar in kind, thickness, and arrangement of soil layers are normally designated as a soil series. In a given survey area, some of the soil series may be represented by only one soil type each. Each series is named for a place near which the soils were first mapped.

Miscellaneous land types.—Fresh stream deposits and gravelly stony material that have little true soil are not classified by type and series but are identified by descriptive names, such as Riverwash and Stone quarries.

Soil complex.—When two or more soils are so intricately associated in small areas that it is not practical to show them separately on the soil map, they are mapped together and called a soil complex. This is true of the Markland and Glenford soils in this county, and also of the McGary soils, which are in some places in a complex with the Fitchville soils and in other places in a complex with the Sebring soils.

Descriptions of Soils

This section describes the soil series and mapping units of Fairfield County.

The soil series is described first and in detail. The information in this part applies generally to each of the soils in that series.

Each of the mapping units, or individual soils, is described under its series. A soil profile is part of the description of one or more of the soils of each series. The soil profile is a record of the soil layers and their characteristics as they are in the field. Each profile was studied at some location within the mapping unit. Profiles taken at other locations on the same kind of soil will vary only slightly from the one given. Profiles from other mapping units in the same soil series will be similar in many respects to the one given. They are likely to differ in texture of surface soil, degree of erosion, slope, or depth. Usually the differences are evident from the names of the mapping units and are not otherwise indicated in these descriptions.

Many areas mapped and described as one kind of soil include small spots or streaks of a different kind of soil. It is not possible to mark all of these separately on the soil map. Where these inclusions are numerous, they are mentioned in the soil descriptions; elsewhere they are not important to soil management.

Following the name of each mapping unit is the symbol that identifies the soil on the map. The first two letters of the map symbol identify the soil series and type.

The third letter of the symbol identifies the dominant slope of the soil, as follows: A—nearly level, 0 to 2 percent slopes; B—undulating, 2 to 6 percent slopes; C—sloping, 6 to 12 percent slopes; D—hilly, 12 to 18 percent slopes; E—steep, 18 to 25 percent slopes; F—very steep, 25 to 35 percent slopes; and G—slopes steeper than 35 percent. A slope of 2 to 6 percent means a fall of 2 to 6 feet in 100 feet of horizontal distance. A few spots in a unit may be steeper or more nearly level than the name or symbol indicates, but the range given is that most common.

A mapping unit is not likely to be uniformly eroded. The number at the end of the mapping symbol identifies the degree of erosion that is most common, as follows: 0—Little or no erosion; 1—slight erosion; 2—moderate erosion; and 3—severe erosion.

The number of the capability unit in which the soil is included follows the map symbol. This is a clue to the management and responses of that soil. In the section Use and Management of Soils, suggestions for the management of the soils in each unit are made.

Alexandria series

These are well-drained Gray-Brown Podzolic soils. They are extensive on the upland slopes that are covered with moderately calcareous glacial till of Wisconsin age. Associated soils are those of the moderately well drained Cardington series, the somewhat poorly drained Bennington series, and the dark-colored, very poorly drained Marengo series.

The native vegetation was a deciduous forest of maple, oak, ash, and elm. Most areas of these soils are now used for crops. The steeper slopes are in pasture and forest.

The root zone is moderately deep or deep, and the subsoil is moderately permeable to water. Lime and fertilizer are needed for most crops, but with proper management good yields can be obtained.

Alexandria silt loam, 0 to 2 percent slopes (AaA1, Capability unit I-1).—This is a well-drained, moderately deep to deep soil. The subsoil is moderately permeable to water. The surface soil contains a medium amount of organic matter. Most areas of this soil show little or no erosion, but several areas have been slightly eroded. A typical profile of Alexandria silt loam, 0 to 2 percent slopes, follows.

Surface soil—
- 0 to 7 inches, dark grayish-brown or brown friable silt loam; moderate medium granular structure; medium content of organic matter; slightly acid.
- 7 to 10 inches, yellowish-brown friable silt loam; moderate medium to fine granular structure; medium acid to strongly acid.

Subsoil—
- 10 to 14 inches, yellowish-brown to brown friable silt loam to silty clay loam; moderate medium to fine subangular blocky structure; medium acid to strongly acid in upper part, grading to slightly acid in lower part.
- 14 to 42 inches, yellowish-brown to dark yellowish-brown friable to firm clay loam; moderate medium subangular blocky structure; slightly acid.

Substratum—
- 42 inches+, light yellowish-brown firm loam glacial till; massive in place; calcareous.

Alexandria silt loam, 2 to 6 percent slopes, slightly eroded (AaB1, Capability unit IIe-1).—The profile of this soil is like that of Alexandria silt loam, 0 to 2 percent slopes. Several small gravelly areas are shown on the map by gravel symbols. Included are a few areas that have a darker colored surface soil like that of prairie soils.

Alexandria silt loam, 2 to 6 percent slopes, moderately eroded (AaB2, Capability unit IIe-1).—The profile of this soil is like that of Alexandria silt loam, 0 to 2 percent slopes. Erosion has removed part of the surface soil, and the present plow layer is a mixture of original surface soil and upper subsoil.

Alexandria silt loam, 6 to 12 percent slopes, slightly eroded (AaC1, Capability unit IIIe-1).—This sloping soil is similar to Alexandria silt loam, 0 to 2 percent slopes, except that the combined depth of surface soil and subsoil is 2 to 4 inches less than that described in the typical profile, and part of the original surface soil has been removed by erosion.

Alexandria silt loam, 6 to 12 percent slopes, moderately eroded (AaC2, Capability unit IIIe-1).—Because of erosion, the present plow layer of this soil is a mixture of the original surface soil and upper subsoil. The total depth of the original surface soil and subsoil was 2 to 4 inches less than the depth of those layers in Alexandria silt loam, 0 to 2 percent slopes. Some areas have irregular slopes (fig. 4).

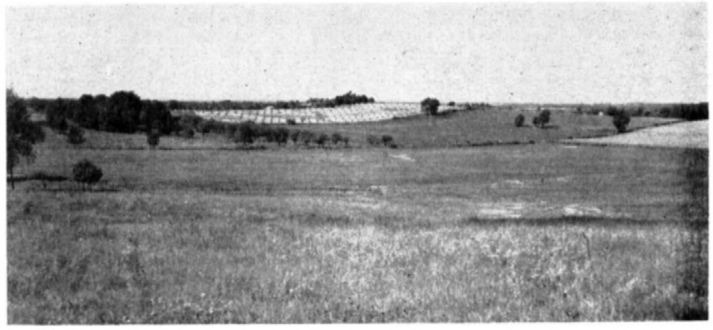

***Figure 4.*—Alexandria silt loam, 6 to 12 percent slopes, moderately eroded. The rolling topography is typical of much of the glacial ground moraine. Soils on the ground moraine are used chiefly for crops.**

Alexandria silt loam, 12 to 18 percent slopes, slightly eroded (AaD1, Capability unit IVe-1).—The depth of the surface soil and the subsoil combined is about 2 to 4 inches less than in Alexandria silt loam, 0 to 2 percent slopes.

Alexandria silt loam, 12 to 18 percent slopes, moderately eroded (AaD2, Capability unit IVe-1).—This moderately steep soil has a profile similar to that of Alexandria silt loam, 0 to 2 percent slopes. The depth of the surface soil and subsoil layers combined is 2 to 4 inches less than in Alexandria silt loam, 0 to 2 percent slopes. As a result of erosion, the present plow layer is a mixture of original surface soil and subsoil.

Alexandria silt loam, 18 to 25 percent slopes, slightly eroded (AaE1, Capability unit VIe-1).—The profile of this steep soil is about 30 inches deep over the calcareous substratum. Otherwise it is similar to that of Alexandria silt loam, 0 to 2 percent slopes.

Alexandria silt loam, 18 to 25 percent slopes, moderately eroded (AaE2, Capability unit VIe-1).—This soil is similar to Alexandria silt loam, 0 to 2 percent slopes, but as a result of erosion the present surface soil is a mixture of original surface soil and subsoil. The total depth of surface soil and subsoil is about 30 inches.

Alexandria silt loam, 25 to 50 percent slopes, moderately eroded (AaF2, Capability unit VIIe-1).—This soil is similar to Alexandria silt loam, 0 to 2 percent slopes, but it is only about 30 inches deep over the substratum. The surface soil is a mixture of the original surface soil and subsoil. Several severely eroded areas have been included in this mapping unit.

Alexandria silty clay loam, 6 to 12 percent slopes, severely eroded (AbC3, Capability unit IVe-1).—This soil is the result of severe erosion of Alexandria silt loams. All of the original surface soil has been removed from most of the area. The plow layer is predominantly silty clay loam, but some small areas that are less severely eroded still have a silt loam plow layer. This soil is usually low in organic matter. Tilth is very poor. When this soil is wet, the surface puddles and becomes plastic. Lime and heavy applications of fertilizer are needed to restore these soils to usefulness for hay and pasture. A typical profile follows.

Plow layer—
- 0 to 7 inches, yellowish-brown firm silty clay loam; somewhat massive in place; breaks to medium granular structure; low content of organic matter; slightly acid to medium acid.

Subsoil—
7 to 32 inches, yellowish-brown to dark yellowish-brown firm clay loam; medium angular blocky to subangular blocky structure; slightly acid.
Substratum—
32 inches+, light yellowish-brown firm loam glacial till; calcareous.

Alexandria silty clay loam, 12 to 18 percent slopes, severely eroded (AbD3, Capability unit VIe–1).—This soil is similar to Alexandria silty clay loam, 6 to 12 percent slopes, severely eroded, except that the profile is 2 to 4 inches shallower. Management needs are the same. This soil is also suitable for forest.

Alexandria silty clay loam, 18 to 25 percent slopes, severely eroded (AbE3, Capability unit VIIe–1).—This soil is similar to Alexandria silty clay loam, 6 to 12 percent slopes, severely eroded, but is about 3 to 6 inches less in depth to the substratum. Most areas of this soil were used for crops or pasture but have been abandoned. They should be reforested.

Algiers series

These are somewhat poorly drained to poorly drained Alluvial soils. The surface layer is 1 to 2 feet thick. It developed from light-colored alluvium washed predominantly from soils that overlie calcareous Wisconsin glacial till. The lower layer developed from older, darker colored, finer textured, neutral alluvium. These bottom-land soils are associated with the well drained Genesee soils, the moderately well drained Eel soils, and the dark-colored, very poorly drained Sloan soils of the bottom lands, and with the dark-colored, very poorly drained Westland and Montgomery soils of the low terraces.

The surface soil is normally medium textured to moderately fine textured. Both surface soil and subsoil are medium to high in organic matter. The surface layer is moderately permeable, but the lower layer is only slowly permeable. Runoff is slow. These soils are normally flooded every year.

The native vegetation was a water-tolerant deciduous forest of elm, soft maple, and sycamore. Areas drained by tile have a deep root zone. Liming is not usually necessary. These soils do not respond well to heavy fertilization, but starter fertilizers are useful. Yields are high when the crops are not damaged by floods.

Algiers silt loam (AcAO, Capability unit IIw–1).—Most of this soil is on slopes of 0 to 2 percent. There has been little or no erosion. A typical profile of this soil follows.

Surface soil—
0 to 12 inches, grayish-brown to dark grayish-brown friable silt loam; medium to fine granular structure; medium content of organic matter; neutral to slightly acid.
Subsoil—
12 to 42 inches, black to very dark gray firm silty clay loam; moderate medium subangular blocky to angular blocky structure; medium to high content of organic matter; neutral.
Substratum—
42 inches+, olive-gray very firm silty clay mottled with yellowish brown; massive in place; neutral.

Slopes range up to 6 percent. The depth of the surface layer ranges from 12 to 42 inches. The depth to the substratum is more than 42 inches in some places.

Algiers silty clay loam (AdAO, Capability unit IIw–1).—This soil differs from Algiers silt loam only in surface texture. All of it occurs on slopes of less than 2 percent. It has had little or no erosion.

Bennington series

The Bennington soils are somewhat poorly drained Gray-Brown Podzolic soils. They are extensive in the uplands in the northern part of the county. They developed over moderately calcareous Wisconsin glacial till. In some areas between Pleasantville and Baltimore they developed from a shallow layer of till overlying lacustrine silts and clays or from till interbedded with lacustrine silts and clays. The associated soils are the well drained Alexandria soils, the moderately well drained Cardington soils, the poorly drained Condit soils, and the dark-colored very poorly drained Marengo soils.

The surface soil is typically medium textured. The subsoil contains more clay and is more gray in color. The subsoil is slowly permeable to water, and during wet weather the soil above this tight layer is likely to be waterlogged. Runoff ranges from very slow to medium, depending on the slope and the plant cover. The root zone is normally shallow to moderately deep. The surface soil is medium to low in organic matter. These soils puddle or clod if worked when too wet.

The native vegetation was a deciduous forest of beech, elm, maple, and oak. The undrained areas of these soils are still in forest or, if cleared, are used for pasture. Most of the acreage is drained and used for crops.

These soils are not suitable for crops unless they are drained. Tiling provides moderately good drainage. Surface drainage also is used. Sloping areas need to be protected from erosion. Lime and fertilizer are needed. Green-manure crops should be grown to maintain and improve tilth and to supply organic matter.

Bennington silt loam, 0 to 2 percent slopes (BaAO, Capability unit IIw–2).—About three-fourths of this soil is practically uneroded. The remainder is slightly eroded. A typical profile follows.

Surface soil—
0 to 7 inches, grayish-brown to dark grayish-brown very friable silt loam; moderate medium granular structure; medium to low content of organic matter; medium acid.
7 to 11 inches, grayish-brown friable silt loam with faint, fine, yellowish-brown mottles; moderate medium to fine granular structure; medium acid.
Subsoil—
11 to 15 inches, yellowish-brown firm to friable silt loam, with distinct, medium, grayish-brown mottles; moderate medium to fine subangular blocky structure; strongly acid.
15 to 35 inches, dark yellowish-brown firm clay loam with many, distinct, coarse, grayish-brown and dark-gray mottles; moderate medium to coarse subangular blocky structure; strongly acid to slightly acid, grading to neutral in the lower part of the layer; lowest 10 or 12 inches is coarser textured and more gravelly and gritty.
Substratum—
35 inches+, yellowish-brown firm loam to coarse clay loam glacial till; contains many fragments of shale and sandstone and a few fragments of limestone; calcareous.

Bennington silt loam, 2 to 6 percent slopes, slightly eroded (BaB1, Capability unit IIw–2).—This soil needs both surface and subsurface drainage to make it suitable for crops. It is difficult to remove excess surface water without causing erosion.

Bennington silt loam, 2 to 6 percent slopes, moderately eroded (BaB2, Capability unit IIw–2).—This soil is like Bennington silt loam, 0 to 2 percent slopes, but the plow layer is a mixture of the original surface soil and upper subsoil.

This soil needs both surface and subsurface drainage to make it suitable for crops. It is difficult to remove excess surface water without causing erosion.

Brookston series

These are dark-colored very poorly drained Humic Gley soils. They occur at the extreme western edge of the county and are not extensive. They developed in level spots or depressions. In many places they form dendritic patterns along upland drainageways. They overlie highly calcareous glacial till of Wisconsin age. They are associated with the well drained Miami soils, the moderately well drained Celina soils, and the somewhat poorly drained Crosby soils.

The surface soil is moderately fine textured. It will puddle and clod if it is worked while it is too wet. It is medium to high in organic matter. The grayish clayey subsoil has slow to medium permeability. Surface water ponds or runs slowly off the very gentle slopes. During wet weather a perched water table may develop. If a good drainage system is installed, these soils generally have a moderately deep root zone.

A deciduous forest of maple, beech, elm, and oak was the native vegetation. A small acreage is still in forest; some is in pasture; but the largest acreage is used for corn, wheat, soybeans, and hay.

These soils need to be drained for crops or pasture. Tiling or surface drainage, or both, may be used. Lime and fertilizer are also needed. Enough meadow crops should be grown in each rotation to maintain tilth and restore organic matter.

Brookston clay loam (BbAO, Capability unit IIw–3).—Most of this soil is on 0 to 2 percent slopes. A typical profile follows.

Surface soil—
- 0 to 7 inches, very dark gray to black friable to firm clay loam; moderate medium to fine granular structure; medium to high content of organic matter; neutral to slightly acid.
- 7 to 17 inches, very dark gray friable to firm clay loam; moderate medium to fine subangular blocky structure; moderately high content of organic matter; neutral.

Subsoil—
- 17 to 32 inches, distinctly mottled brownish-yellow, dark-gray, and light brownish-gray firm to very firm clay loam; moderate to strong, medium to coarse, subangular blocky structure; neutral.
- 32 to 55 inches, yellowish-brown firm clay loam with distinct, grayish-brown mottles; massive in place but breaks to irregular subangular and angular blocky structure; upper part of layer is neutral, grading to calcareous in lower part.

Substratum—
- 55 inches+, olive-brown firm clay loam glacial till; massive in place; contains limestone pebbles and stones; calcareous.

Slopes range up to 6 percent in some places. Small areas have a lighter colored surface layer. In some places, the depth to the calcareous glacial till is less than 55 inches.

Cardington series

These are moderately well drained Gray-Brown Podzolic soils that developed over moderately calcareous Wisconsin glacial till. They are extensive in the northern part of the county. They are associated with the well-drained Alexandria soils, the somewhat poorly drained Bennington soils, and the dark-colored, very poorly drained Marengo soils.

The typical surface soil is medium textured. The content of organic matter is medium. Runoff ranges from slow to rapid, depending on slope and vegetation. Permeability is medium to slow. The subsoil is mottled. When wet, it is plastic. The root zone is moderately deep to deep.

These soils originally supported deciduous forests of maple, oak, ash, and elm. Except for a few small areas in pasture or forest, they are now used for cropland. The main crops are corn, wheat, soybeans, and hay.

These soils need lime and fertilizer. Meadow crops should be grown often enough to keep the soils in good tilth and maintain the supply of organic matter. There are wet spots that need to be drained.

Cardington silt loam, 0 to 2 percent slopes (CaA1, Capability unit I–1).—Most of this soil is slightly eroded. A typical profile follows.

Surface soil—
- 0 to 8 inches, dark grayish-brown friable silt loam; moderate fine to medium granular structure; medium content of organic matter; slightly acid.

Subsoil—
- 8 to 13 inches, yellowish-brown friable to firm silty clay loam to clay loam; moderate medium subangular blocky structure; medium acid.
- 13 to 26 inches, yellowish-brown firm clay loam with faint to distinct, light brownish-gray mottles; moderate medium to coarse subangular blocky structure; medium acid in upper part, grading to neutral in lower part.

Substratum—
- 26 inches+, yellowish-brown firm loam glacial till; massive in place; contains many fragments of shale and sandstone and a few fragments of igneous rock and limestone; calcareous.

Cardington silt loam, 2 to 6 percent slopes, slightly eroded (CaB1, Capability unit IIe–1).—The profile of this soil is similar to that of Cardington silt loam, 0 to 2 percent slopes. Some small areas have a dark-colored surface soil like that of prairie soils.

Cardington silt loam, 2 to 6 percent slopes, moderately eroded (CaB2, Capability unit IIe–1).—Before this soil was eroded, its profile was similar to that of Cardington silt loam, 0 to 2 percent slopes. Erosion has removed so much of the surface soil that the plow layer is now a mixture of original surface soil and subsoil.

Cardington silt loam, 6 to 12 percent slopes, slightly eroded (CaC1, Capability unit IIIe–3).—The profile of this soil differs from that of Cardington silt loam, 0 to 2 percent slopes, in that the combined depth of the surface soil and subsoil is about 3 to 6 inches less.

Cardington silt loam, 6 to 12 percent slopes, moderately eroded (CaC2, Capability unit IIIe–3).—The combined depth of the surface soil and the subsoil of this soil is about 3 to 6 inches less than the depth of the same layers of Cardington silt loam, 0 to 2 percent slopes. Part of the surface soil has been removed by erosion, and the present plow layer is a mixture of surface soil and subsoil.

Cardington silt loam, 12 to 18 percent slopes, moderately eroded (CaD2, Capability unit IVe–1).—The combined depth of the surface soil and subsoil is 3 to 6 inches less in this soil than in Cardington silt loam, 0 to 2 percent slopes. Part of the surface soil has been removed by erosion. The plow layer is a mixture of surface soil and subsoil.

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Carlisle series

These very poorly drained black organic soils were derived from grasses, sedges, trees, and other vegetation that accumulated in ponds, marshes, and potholes after the Wisconsin glacial age. These soils lie in low spots and are not extensive in this county. They are associated with the black, very poorly drained Willette muck soils and, in a few places, with the dark-colored, very poorly drained Sloan and Algiers soils.

The surface layer is typically a soft friable muck. At depths of 3 feet or more, it is underlain by impermeable, calcareous, clayey material. Around the edges of the areas, at the base of slopes, a silty overwash has been deposited. The surface soil in these places is a silty muck.

The muck is moderately permeable, but it is kept saturated by a naturally high water table. Marsh grasses and sedges are the native plants.

Carlisle muck (CbAO, Capability unit IIIw–1).—This soil is on slopes of 0 to 2 percent. There has been little or no erosion. A typical profile of Carlisle muck follows.

Surface soil—
- 0 to 20 inches, black granular muck; soft when moist, firm when dry; contains many fragments of partly decayed woody materials of various sizes; slightly acid to neutral.

Subsoil—
- 20 to 36 inches, black and dark reddish-brown very friable soft muck; granular; grades into peat in which woody materials are distinguishable; slightly acid to neutral.

Substratum—
- 36 inches+, dark olive-gray firm silty clay; calcareous; underlain by gravel at varying depths.

The combined depth of the mucky surface soil and subsoil is normally between 36 and 48 inches, but in some places it is more.

These soils can be used for crops if drained by tiles and fertilized. Vegetables for market are grown successfully. Undrained areas are used for pasture or woodland. Areas that have only surface drainage usually provide good pasture in dry seasons.

Using heavy machinery is hazardous because these soils will not support much weight when they are saturated. These soils provide very poor foundation support for construction work. It may be difficult to keep drainage tiles aligned at the proper grade in muck. The surface of the muck may subside several inches after the soil is dried and compacted in cultivation. Plank supports may be used, or tile in longer lengths with a diameter of 5 to 6 inches may be laid.

Casco series

These are well-drained Gray-Brown Podzolic soils that developed over stratified calcareous gravel and sand of Late Wisconsin age. They occur on terrace escarpments in outwash areas. Slopes are 12 percent or steeper. In the less strongly sloping areas the associated soils are the well-drained Ockley and Fox soils and, in the steep areas, the well-drained Rodman soils.

The surface layer is medium textured to moderately coarse textured. The organic-matter content is low. Both internal drainage and runoff are rapid. The root zone is shallow.

The native vegetation is a deciduous forest of oak and hickory. Most of the acreage is in forest or pasture.

Casco loam, 18 to 25 percent slopes, moderately eroded (CeE2, Capability unit VIe–1).—A typical profile of this soil follows.

Surface soil—
- 0 to 7 inches, grayish-brown friable loam; weak fine to medium granular structure; soft when dry; low in organic matter; slightly acid.
- 7 to 12 inches, brown to grayish-brown friable loam; weak fine granular structure; soft when dry; slightly acid.

Subsoil—
- 12 to 17 inches, brown to dark-brown very friable to firm gravelly clay loam; the clay loam material is sticky when wet; weak granular to fine subangular blocky structure; slightly acid in upper part, grading to alkaline in lower part.

Substratum—
- 17 inches+, pale-brown, stratified, loose gravel and sand; calcareous.

Some areas are only slightly eroded, and some have a very irregular surface.

Casco clay loam, 18 to 25 percent slopes, severely eroded (CcE3, Capability unit VIIe–1).—This soil is the result of severe erosion of Casco loam, 18 to 25 percent slopes. It is low in organic matter. Tilth is very poor. When wet, the surface seals into a plastic clayey mass. A typical profile follows.

Surface soil—
- 0 to 12 inches, brown to dark-brown firm clay loam; sticky when wet; weak granular structure; contains gravel; slightly acid in upper part, grading to alkaline in lower part.

Substratum—
- 12 inches+, pale-brown stratified loose gravel and sand; calcareous.

The texture of the surface soil varies from clay loam to loam.

Casco gravelly loam, 12 to 18 percent slopes, moderately eroded (CdD2, Capability unit IVe–2).—The surface layer of this soil contains more gravel than that of Casco loam, 18 to 25 percent slopes, moderately eroded. The surface soil and subsoil combined are several inches thicker than the corresponding layers of the Casco loam.

Casco and Rodman loams, 25 to 40 percent slopes, moderately eroded (CgF2, Capability unit VIIe–1).—In some areas, Casco and Rodman soils are so closely associated that they cannot be separated on the soil map. The Casco soil in this unit is like the profile described under Casco loam, 18 to 25 percent slopes, moderately eroded. The Rodman soil is mostly gravel and cobblestones. It is described below.

Surface soil—
- 0 to 4 inches, grayish-brown, very friable to loose, coarse gravelly loam; very low in organic matter; calcareous.

Subsoil—
- 4 to 12 inches, brown to grayish-brown, very friable to loose, coarse gravelly loam; calcareous.

Substratum—
- 12 inches+, gray, loose, stratified gravel, cobblestones, and sand.

Some of this mapping unit is severely eroded. In a few areas the slopes are very irregular. Most of the acreage is used for forest or pasture.

Celina series

These are moderately well drained Gray-Brown Podzolic soils. They developed on the uplands over highly calcareous Wisconsin glacial till. They occur inextensively at the extreme western edge of the county and are associated with the well-drained Miami soils, the somewhat poorly drained Crosby soils, and the very poorly drained Brookston soils.

The surface soil is typically medium textured. It has a medium content of organic matter and is easy to work at the proper moisture content. Runoff ranges from slow to rapid, depending on slope and the vegetation. The subsoil is moderately permeable to slowly permeable. During wet seasons, a temporarily perched water table may develop. The root zone of these soils is moderately deep to deep.

The native vegetation was a deciduous forest of oak, hickory, and maple. Most of the acreage is now used for corn, wheat, soybeans, and hay. Smaller acreages are in pasture or forest. Lime and fertilizer are needed. Erosion control practices should be used on the sloping areas. Enough meadow crops should be included in the crop rotations to keep the soil in good tilth and maintain its supply of organic matter.

Celina silt loam, 0 to 2 percent slopes (ChA1, Capability unit I–1).—Some areas of this soil have little or no erosion. Other areas are slightly eroded. A typical profile follows.

Surface soil—
- 0 to 7 inches, brown friable silt loam; moderate medium to coarse granular structure; medium content of organic matter; slightly acid to medium acid.
- 7 to 11 inches, yellowish-brown friable to firm silty clay loam; moderate fine subangular blocky structure; medium acid.

Subsoil—
- 11 to 24 inches, dark-brown firm to friable clay loam with many, distinct, light yellowish-brown and grayish-brown mottles; below 16 inches the grayish-brown mottles increase in number; plastic when wet; medium acid to slightly acid in upper part, grading to neutral in lower part.

Substratum—
- 24 inches+, yellowish-brown firm loam glacial till; calcareous.

Celina silt loam, 2 to 6 percent slopes, slightly eroded (ChB1, Capability unit IIe–1).—The profile of this soil is similar to that of Celina silt loam, 0 to 2 percent slopes. A few areas that have a dark-colored surface soil, like that of prairie soils, have been included in this mapping unit.

Celina silt loam, 2 to 6 percent slopes, moderately eroded (ChB2, Capability unit IIe–1).—The profile of this soil is like that of Celina silt loam, 0 to 2 percent slopes, except that part of the surface soil has been removed by erosion. The present plow layer is a mixture of surface soil and the upper part of the subsoil.

Chagrin series

These are well-drained Alluvial soils that occur in long strips along stream bottoms. The alluvium from which they developed was washed from noncalcareous glacial material or from sandstone and shale, or from both. They are associated with the moderately well drained Lobdell soils and the somewhat poorly drained Orrville soils.

The surface layer is typically medium textured to moderately coarse textured. It has a medium content of organic matter. Runoff is slow. Permeability is moderate. The root zone is deep. A deciduous forest of oak, ash, walnut, and tulip-poplar was the native vegetation.

These soils are now used mostly for crops. Along small streams and in irregular areas, they are used for woodland or pasture. These soils are productive but are likely to be flooded. They should be fertilized and should be limed where it is needed. Meadows should be included in the rotations to keep the soil in good tilth and to supply organic matter.

Chagrin silt loam (CmAO, Capability unit I–2).—All of this soil occurs on slopes of 0 to 2 percent. There has been little or no erosion. A typical profile follows.

Surface soil—
- 0 to 7 inches, grayish-brown to dark grayish-brown friable silt loam; medium granular structure; medium content of organic matter; medium acid to slightly acid.

Subsoil—
- 7 to 36 inches, yellowish-brown to brown friable silt loam; weak medium to coarse angular blocky structure; medium acid to slightly acid.

Chagrin fine sandy loam (CkAO, Capability unit I–2).—This soil has more sand in the surface soil and subsoil than Chagrin silt loam. There has been little or no erosion. Slopes range from 0 to 2 percent.

Condit series

These poorly drained Planosols are characterized by a claypan. They developed over moderately calcareous glacial till of Wisconsin age. A few areas northeast of Baltimore are underlain by stratified till and calcareous lacustrine clay, clay loam, and silty clay loam.

Condit soils occur in small depressed areas or basins in the uplands. They are generally surrounded by the somewhat poorly drained Bennington soils. Other soils associated with this series are the well drained Alexandria soils, the moderately well drained Cardington soils, and the very poorly drained Marengo soils.

The surface soil is light gray when dry. It is typically medium textured. It is low in organic matter. If the soil is worked when too wet, the surface will puddle and clod.

The clayey subsoil is grayish. It is slowly to very slowly permeable. Surface water ponds or runs off very slowly. In wet seasons, these soils have a perched water table. The root zone is shallow because of the firm layer in the subsoil. A deciduous forest of oak, maple, beech, and elm grew on these soils.

If drained, these soils are used for grain or hay. They are not suitable for crops unless drained. Surface drainage is more practical than tiling. Undrained areas are in woodland or pasture. Cropped areas need lime and fertilizer. The rotations should include meadow crops, which will help to improve tilth and to maintain the supply of organic matter.

Condit silt loam (CnAO, Capability unit IIIw–2).—Most of this soil is on slopes of 0 to 2 percent. A few areas are slightly eroded, but the rest of the soil is uneroded or practically uneroded. A typical profile follows.

Surface soil—
- 0 to 8 inches, light brownish-gray, very friable, smooth silt loam; moderate fine granular structure; low in organic matter; medium acid.
- 8 to 14 inches, light-gray friable silt loam with many, distinct, light yellowish-brown and pale-brown mottles, weak fine granular structure; strongly acid.

Subsoil—
- 14 to 18 inches, gray friable silty clay loam with few to many yellow and brown mottles; moderate medium subangular blocky structure; contains some very dark brown to black soft concretions of iron or manganese; strongly acid.
- 18 to 36 inches, mottled gray, yellow, and brown firm clay loam to silty clay loam; moderate coarse to very coarse angular blocky structure; varies in content of partly decomposed rock fragments; strongly acid in upper part, grading to slightly acid in lower part.

Substratum—
36 inches+, gray and yellow massive clay loam and silty clay loam glacial till; contains fragments of sandstone, shale, and limestone; calcareous.

In a few areas slopes range from 2 to 6 percent.

Crosby series

These are somewhat poorly drained Gray-Brown Podzolic soils that developed on uplands over highly calcareous Wisconsin glacial till. They occur inextensively at the extreme western edge of the county. They are associated with the well drained Miami soils, the moderately well drained Celina soils, and the dark-colored, very poorly drained Brookston soils.

The typical surface soil is medium textured. It is medium to low in organic matter. Runoff ranges from very slow to medium, depending on slope and surface cover. A perched water table develops in wet seasons.

The grayish clayey subsoil of this series is slowly permeable. The root zone is shallow to moderately deep. The native vegetation was a deciduous forest of beech, maple, oak, and elm.

These soils are used mostly for corn, wheat, soybeans, and hay. A few areas are in pasture or forest.

These soils are not suitable for crops unless drained. If the soils are worked when too wet, the surface will puddle and clod. Lime and fertilizer are needed. The rotation should include meadow crops, which will help to keep the soil in good tilth and increase the supply of organic matter.

Crosby silt loam, 0 to 2 percent slopes (CoAO, Capability unit IIw–2).—About two-thirds of the area of this soil is practically uneroded. The rest is slightly eroded. A typical profile follows.

Surface soil—
0 to 7 inches, grayish-brown friable silt loam; low to medium in organic matter; slightly acid to medium acid.
7 to 10 inches, brown friable fine silt loam with faint, grayish-brown mottles; slightly acid to strongly acid.
Subsoil—
10 to 14 inches, friable silty clay loam with distinct, yellowish-brown and light brownish-gray mottles; medium acid to strongly acid.
14 to 22 inches, yellowish-brown, dark yellowish-brown, and grayish-brown friable fine clay loam; medium acid to strongly acid in upper part, grading to slightly acid in lower part.
Substratum—
22 inches+, light yellowish-brown firm loam to coarse clay loam glacial till; massive in place; calcareous.

Crosby silt loam, 2 to 6 percent slopes, slightly eroded (CoB1, Capability unit IIw–2).—The profile of this soil is similar to that of Crosby silt loam, 0 to 2 percent slopes. Some small areas have a dark-colored surface soil like that of prairie soils.

This soil needs both surface and subsurface drainage to make it suitable for crops. It is difficult to remove excess surface water without causing erosion.

Eel series

These are moderately well drained Alluvial soils that occur in long strips along stream bottoms, mostly in the northern and western parts of the county. The alluvium from which they developed was washed from calcareous glacial till of Wisconsin age. The associated soils are the well-drained Genesee soils, the somewhat poorly drained Shoals soils, and the dark-colored, very poorly drained Sloan soils.

Both the surface soil and subsoil are medium to high in organic matter. The typical surface soil is medium textured. Runoff is slow and permeability is moderate. The root zone is deep.

A deciduous forest of elm, oak, and maple was the native vegetation. Most of the acreage is now used for corn, wheat, soybeans, and hay. Areas that are irregular or situated along small streams are mostly in pasture or forest.

Seasonal flooding is normal on these soils. They are productive when floods do not damage the crops. Low areas should be tiled to remove excess water quickly. Some fertilizer is needed.

Eel silt loam (EbAO, Capability unit I–2).—This soil occurs on slopes of less than 2 percent. It has had little or no erosion. A typical profile follows.

Surface soil—
0 to 12 inches, dark-brown to grayish-brown very friable silt loam; moderate medium to fine granular structure; medium to high in organic matter; neutral to mildly alkaline.
Subsoil—
12 to 42 inches, dark grayish-brown friable silt loam with distinct gray and grayish-brown mottles; size and number of mottles increases with depth; neutral to alkaline.
Substratum—
42 inches+, calcareous sand and gravel.

About one-tenth of the area has a fine sandy loam texture. The subsoil may extend much deeper than 42 inches below the surface.

Eel loam (EaAO, Capability unit I–2).—Both the surface soil and the subsoil are coarser textured, but otherwise the profile of this soil is like that of Eel silt loam. Several small areas have a sandy loam surface texture. All of this soil occurs on slopes of 0 to 2 percent. It has had little or no erosion.

Fitchville series

These are somewhat poorly drained soils that intergrade between the Gray-Brown Podzolic and the Red-Yellow Podzolic great soil groups. They developed on terraces, over stratified, lacustrine, noncalcareous silty and clayey materials of Wisconsin age. The native vegetation was a forest of beech, maple, and elm. These soils are associated with the well drained Markland soils, the moderately well drained Glenford soils, the somewhat poorly drained McGary soils, the poorly drained Sebring soils, and the very poorly drained Montgomery soils.

The surface soil in this series is typically medium textured, and the subsoil is grayish and clayey. Some variation in texture is due to differences in parent materials. The surface soil is medium to low in organic matter. Runoff ranges from very slow to medium, depending on slope and vegetation. During wet weather, a perched water table stands above the slowly permeable subsoil. The root zone is shallow to moderately deep.

Fitchville soils are not mapped separately in Fairfield County. They occur in small areas intermingled with small areas of McGary soils, with which they are mapped. The combined mapping units are described under the McGary series. The description of McGary and Fitchville silt loams, 0 to 2 percent slopes, includes a typical profile of Fitchville silt loam.

Fox series

These are well-drained Gray-Brown Podzolic soils that developed over stratified gravel and sand of Late Wisconsin age. They occur on glacial outwash terraces in the valleys and on kames and moraines in the uplands.

The texture of the surface soil, if it is not eroded, ranges from medium to moderately coarse. In some places the surface soil is smooth and silty, probably because of an alluvial deposit or a capping of loess.

These soils have a moderately deep root zone. They tend to be droughty in dry seasons. Normally they can be worked over a wide moisture range. The rate of runoff varies from medium to very rapid, depending on the slope and the vegetation. The surface soil and subsoil are moderately permeable, and the substratum is rapidly permeable. The native vegetation was a deciduous forest of oak, hickory, and maple.

Soils of this series are used for crops, pasture, or forest.

The Fox soils on the glacial outwash terraces in the valleys generally have uniform slopes. Large gently sloping areas are well suited to irrigation and can be used to grow special crops. These soils are well drained, and they dry out and warm up early in the spring. They are associated with the well drained Ockley, Warsaw, and Wea soils, the moderately well drained Thackery and Tippecanoe soils, and the somewhat poorly drained Sleeth soils.

On kames and moraines the slopes are generally knobby and irregular and the soils are less definitely stratified than the Fox soils in the outwash valleys. The depth to the gravelly substratum varies from about 24 inches to 42 inches. These mapping units include small areas underlain at depths of 3 to 4 feet by calcareous nonstratified glacial till. These areas are Kendallville soils, but they are too small or too irregular to be separated on the map. Upland soils associated with the Fox soils are the well-drained Miami, Alexandria, and Kendallville soils, and the moderately well drained Celina and Cardington.

Fox silt loam, 0 to 2 percent slopes (FeA1, Capability unit IIs–1).—Most areas of this soil are slightly eroded. The rest is uneroded or practically uneroded. A typical profile follows.

Surface soil—
- 0 to 7 inches, brown to dark-brown, smooth, friable silt loam; moderate medium granular structure; medium content of organic matter; slightly acid to medium acid.
- 7 to 15 inches, dark yellowish-brown friable loam; moderate fine to medium subangular blocky structure; slightly acid to medium acid.

Subsoil—
- 15 to 27 inches, dark-brown or reddish-brown firm clay loam; moderate medium subangular blocky structure; sticky and plastic when wet; contains many gravelly fragments; slightly acid to medium acid.
- 27 to 36 inches, dark-brown and dark reddish-brown firm gravelly clay loam; moderate to strong medium to coarse angular blocky structure; sticky and plastic when wet; contains many gravelly fragments; slightly acid to medium acid in upper part, grading to neutral in lower part; lower boundary of layer is distinct but irregular, and tonguelike extensions reach as much as 5 feet into substratum.

Substratum—
- 36 inches+, gray and light-yellow, loose, stratified gravel and sand; contains many glacial erratics and gravelly fragments of sandstone, shale, and dolomitic limestone; calcareous.

The lower subsoil varies in thickness.

Fox silt loam, 2 to 6 percent slopes, slightly eroded (FeB1, Capability unit IIe–1).—The profile of this soil is similar to that of Fox silt loam, 0 to 2 percent slopes. If cultivated, this soil needs to be protected against erosion. Hay should be included in the rotation to improve tilth and add organic matter. Lime and fertilizer are needed.

Fox silt loam, 2 to 6 percent slopes, moderately eroded (FeB2, Capability unit IIe–1).—About 20 percent of this soil is on irregular slopes. Erosion has removed part of the surface soil, and the upper subsoil is mixed into the plow layer. This soil can be cultivated but should be protected against further erosion.

Fox silt loam, 6 to 12 percent slopes, slightly eroded (FeC1, Capability unit IIIe–2).—The combined depth of the surface soil and subsoil is 2 to 4 inches less; otherwise, the profile of this soil is like that of Fox silt loam, 0 to 2 percent slopes. This soil can be used for crops, but it should be protected from further erosion. Hay should be included in the rotation to improve tilth and add organic matter.

This soil is 2 to 4 inches less in depth to the substratum than Fox silt loam, 0 to 2 percent slopes. Part of the surface soil has been removed by erosion, and the plow layer is a mixture of surface soil and subsoil. About one-fifth of the acreage is on irregular slopes. This soil can be cultivated if it is protected against further erosion.

Fox silt loam, 6 to 12 percent slopes, moderately eroded (FeC2, Capability unit IIIe–2).—This soil is similar to Fox silt loam, 0 to 2 percent slopes, except that a considerable amount of the surface soil has been removed by erosion and the upper subsoil has been mixed with the remainder. The present surface soil is only 4 to 8 inches thick and has a dark yellowish-brown color. It contains somewhat less organic matter than the original. In some severely eroded spots the original surface soil has been entirely removed and the color is a reddish brown. When this soil is cultivated, it needs protection against erosion.

Fox silty clay loam, 6 to 12 percent slopes, severely eroded (FgC3, Capability unit IVe–1).—This soil is the result of severe erosion of Fox silt loam, 6 to 12 percent slopes, slightly eroded. The plow layer has a spotty pattern of silt loam and silty clay loam textures. This soil is low in organic matter. The tilth is very poor. When the soil is wet, the surface seals into a sticky plastic mass. About one-third of this soil occurs on irregular slopes. A typical profile follows.

Plow layer—
- 0 to 7 inches, dark-brown and reddish-brown firm silty clay loam; sticky and plastic when wet, hard when dry; low in organic matter; contains many gravel fragments; slightly acid to medium acid.

Subsoil—
- 7 to 12 inches, dark-brown or reddish-brown firm clay loam; sticky and plastic when wet, hard when dry; slightly acid to medium acid.
- 12 to 24 inches, dark-brown and dark reddish-brown firm gravelly clay loam; moderate to strong medium to coarse angular blocky structure; sticky and plastic when wet; slightly acid to medium acid in upper part, grading to neutral in lower part; lower boundary of layer is distinct but irregular, and tonguelike extensions reach as much as 5 feet into substratum.

Substratum—
- 24 inches+, gray and light-yellow loose stratified gravel and sand; contains many glacial erratics and gravelly fragments of sandstone, shale, and dolomitic limestone; calcareous.

This soil can be used for hay or pasture if fertilizer and lime are applied. It is also suitable for forest. It should not be used for row crops.

Fox loam, 0 to 2 percent slopes (FdA1, Capability unit IIs-1).—All of this soil is slightly eroded. A typical profile follows.

Surface soil—
- 0 to 7 inches, brown to dark-brown friable loam; moderate to weak medium and fine granular structure; medium in organic matter; slightly acid to medium acid.
- 7 to 11 inches, strong-brown friable loam; moderate fine to medium subangular blocky structure; slightly acid to medium acid.

Subsoil—
- 11 to 23 inches, reddish-brown firm gravelly clay loam; moderate medium subangular blocky structure; sticky and plastic when wet; slightly acid to medium acid.
- 23 to 30 inches, dark-brown and dark reddish-brown firm gravelly clay loam; moderate to strong medium to coarse angular blocky structure; sticky and plastic when wet; slightly acid to medium acid in upper part, grading to neutral in lower part; lower boundary of layer is distinct but irregular; tongues extend as much as 5 feet into substratum.

Substratum—
- 30 inches+, gray and light-yellow loose stratified gravel and sand; contains many glacial erratics and gravelly fragments of sandstone, shale, and dolomitic limestone; calcareous.

Fox loam, 2 to 6 percent slopes, slightly eroded (FdB1, Capability unit IIe-1).—This soil is similar to Fox loam, 0 to 2 percent slopes, but is more likely to erode. If cultivated it needs to be protected against further erosion. Crops should be well fertilized and limed, and the rotation should include hay.

Fox loam, 2 to 6 percent slopes, moderately eroded (FdB2, Capability unit IIe-1).—Part of the surface layer of this soil has been removed by erosion. The plow layer is a mixture of surface soil and upper subsoil. Otherwise, the profile resembles that of Fox loam, 0 to 2 percent slopes. About half of the area occurs on irregular slopes. The uniform slopes are suitable for irrigation. If cultivated this soil needs to be protected against further erosion.

Fox loam, 6 to 12 percent slopes, moderately eroded (FdC2, Capability unit IIIe-2).—The depth of the surface soil and subsoil of this soil is 2 to 4 inches less than the depth of the corresponding layers of Fox loam, 0 to 2 percent slopes. Part of the surface soil has been removed by erosion, and the rest is mixed with subsoil material in the plow layer. About one-fifth of this soil occurs on irregular slopes.

Fox loam, 12 to 18 percent slopes, moderately eroded (FdD2, Capability unit IVe-1).—The profile of this soil is like that of Fox loam, 0 to 2 percent slopes, but is 3 to 6 inches shallower over the substratum. Surface soil and subsoil are mixed in the plow layer. Part of the original surface soil has been lost through erosion. One-tenth of this soil occurs on irregular slopes.

Fox clay loam, 12 to 18 percent slopes, severely eroded (FaD3, Capability unit VIe-1).—This soil is the result of severe erosion of Fox loam on 12 to 18 percent slopes. The plow layer consists of loam and clay loam arranged in a spotty land pattern. About one-fifth of this soil is on irregular slopes. A typical profile follows.

Plow layer—
- 0 to 9 inches, reddish-brown firm clay loam; weak medium granular structure; sticky and plastic when wet, hard when dry; contains gravel fragments; contains little or no organic matter; slightly acid to medium acid.

Subsoil—
- 9 to 24 inches, dark-brown and dark reddish-brown firm gravelly clay loam; moderate to strong medium to coarse angular blocky structure; sticky and plastic when wet; slightly acid to medium acid in upper part, grading to neutral in lower part; lower boundary of layer is distinct but irregular; tongues extend as much as 5 feet into substratum.

Substratum—
- 24 inches+, gray and light-yellow loose stratified gravel and sand; contains many glacial erratics and gravelly fragments of sandstone, shale, and dolomitic limestone; calcareous.

This soil contains little organic matter. Tilth is very poor. When wet, the surface soil becomes sticky, plastic, and massive.

This soil could well be reforested. It should not be cultivated. Fertilizer and lime are needed to make it suitable for hay or pasture.

Fox gravelly loam, 0 to 2 percent slopes (FcA1, Capability unit IIs-1).—All of this soil is slightly eroded. It contains more gravel than fine material (fig. 5). A typical profile follows.

Surface soil—
- 0 to 7 inches, brown to dark-brown very friable gravelly loam; gravel makes up half of the volume; medium in organic matter; slightly acid.
- 7 to 10 inches, strong-brown friable to firm gravelly loam; gravel makes up half of the volume; slightly acid.

Subsoil—
- 10 to 34 inches, dark reddish-brown firm gravelly clay loam; gravel makes up one-half to two-thirds of the volume; sticky and plastic when wet, hard when dry; slightly acid in upper part, grading to neutral in lower part; lower boundary of layer is distinct but irregular; tongues extend as much as 5 feet into substratum.

Substratum—
- 34 inches+, gray and light-yellow loose stratified gravel and sand; contains many glacial erratics and gravelly fragments of sandstone, shale, and dolomitic limestone; calcareous.

Figure 5.—**A profile of Fox gravelly loam, showing irregularity of lower boundary of subsoil.**

Fox gravelly loam, 2 to 6 percent slopes, slightly eroded (FcB1, Capability unit IIs-1).—The profile of this soil is similar to that of Fox gravelly loam, 0 to 2 percent slopes. If used for crops, it should be protected against further erosion.

Fox gravelly loam, 2 to 6 percent slopes, moderately eroded (FcB2, Capability unit IIs-1).—The profile of this soil is like that of Fox gravelly loam, 0 to 2 percent slopes, except that part of the surface soil has been removed by erosion. The plow layer is now a mixture of surface soil and subsoil. If this soil is used for crops it should be protected against further erosion.

Fox gravelly loam, 6 to 12 percent slopes, moderately eroded (FcC2, Capability unit IIIe-2).—The profile of this soil is 2 to 4 inches less in depth over the substratum than the profile of Fox gravelly loam, 0 to 2 percent slopes. Part of the original surface soil has been removed by erosion. Some subsoil has been mixed with the remaining surface soil in the plow layer.

Fox gravelly clay loam, 6 to 12 percent slopes, severely eroded (FbC3, Capability unit IVe-2).—This soil resulted from severe erosion of Fox gravelly loam on 6 to 12 percent slopes. The present surface soil consists of gravelly loam and gravelly clay loam, which occur in a spotty pattern. Tilth is generally poor. The surface soil becomes sticky, plastic, and massive when it is wet. The content of organic matter is low. A typical profile follows.

Plow layer—
0 to 7 inches, dark reddish-brown, firm, coarse gravelly clay loam; gravel makes up one-half to two-thirds of the volume; sticky and plastic when wet, hard when dry; contains little or no organic matter; slightly acid to medium acid.

Subsoil—
7 to 24 inches, dark reddish-brown, firm, coarse gravelly clay loam; gravel makes up one-half to two-thirds of the volume; sticky and plastic when wet, hard when dry; slightly acid in upper part, grading to neutral in lower part; lower boundary of layer is distinct but irregular; tongues extend as much as 5 feet into substratum.

Substratum—
24 inches+, gray and light-yellow loose stratified gravel and sand; contains many glacial erratics and gravelly fragments of sandstone, shale, and dolomitic limestone; calcareous.

This soil should not be used for row crops, but it can be used for hay and pasture if fertilized and limed adequately. It is also suitable for forest.

Genesee series

These are well-drained Alluvial soils. They occur in strips on the bottom lands along the streams. They developed from neutral alluvium, most of which was washed from areas underlain by calcareous Wisconsin till. The associated soils are the moderately well drained Eel soils, the somewhat poorly drained Shoals soils, and the dark, very poorly drained Sloan soils.

The surface soil in this series is typically medium textured. The content of organic matter is medium. The root zone is deep. Runoff is slow and internal drainage is moderate.

A deciduous forest of oak, ash, walnut, and sycamore was the native vegetation. Along small streams and in irregularly shaped areas, these soils are used for pasture or for forest. Most of the area is used for corn, soybeans, or hay.

These soils are productive if the crops are not damaged by floods. Hay and cover crops should be grown to keep the soil in good tilth and increase the content of organic matter. Fertilizer is needed.

Genesee silt loam (GbAO, Capability unit I-2).—All of this soil occurs on slopes of less than 2 percent. There has been little or no erosion. A typical profile follows.

Surface soil—
0 to 17 inches, dark grayish-brown friable silt loam; moderate medium granular structure; medium content of organic matter; neutral to mildly alkaline.

Subsoil—
17 to 42 inches, dark grayish-brown friable silt loam to silty clay loam; texture varies but is usually finer than that of surface soil; moderate medium to coarse granular structure; neutral to alkaline.

Substratum—
42 inches+, yellowish-brown to weak-brown sand, gravel, and silty clay loam, roughly stratified in many places; neutral to calcareous.

The depth of the surface soil and subsoil over the substratum varies considerably. The surface layer may be 17 to 24 inches deep. The substratum may begin 42 to 60 inches below the surface.

Genesee loam (GaAO, Capability unit I-2).—This soil has a coarser surface soil than Genesee silt loam, and it has more sand in the subsoil. Otherwise the profiles are similar. This soil occurs on slopes of 0 to 2 percent. Little or no erosion has taken place.

Glenford series

These are moderately well drained soils whose characteristics intergrade between those of the Gray-Brown Podzolic soils and the Red-Yellow Podzolic soils. They developed on terraces over stratified noncalcareous lacustrine silty and clayey materials of Late Wisconsin age. A forest of beech, maple, oak, and hickory was the native vegetation. These soils are associated with the well-drained Markland soils, the somewhat poorly drained McGary and Fitchville, the poorly drained Sebring, and the very poorly drained Montgomery soils.

The surface soil is medium textured and has a medium amount of organic matter. It is easy to work at ordinary moisture content. The root zone is deep to moderately deep.

Runoff ranges from moderate to moderately slow, depending on slope and plant cover. The subsoil is moderately slowly permeable. It is mottled and plastic when wet. In wet weather, a perched water table stands above this subsoil layer.

Glenford soils are not mapped separately in Fairfield County. They are closely related to and intermingled with the Markland soils. Three units of Markland and Glenford silt loams are described under the Markland series. The description of Markland and Glenford silt loams, 0 to 2 percent slopes, includes a profile of Glenford silt loam.

Gravel and sand pits

Gravel and sand pits (Gc).—In these areas, the upper layers of the soil have been removed or pushed aside so the substratum can be excavated for road gravel, concrete materials, molding sand, and other uses. Gravel pits are usually in Negley, Fox, or Parke soils, which have substrata of relatively clean gravel and sand. Sand pits are generally in the Negley and Parke soils, which are a source of high-quality molding sand and plaster sand.

The larger pits are outlined on the soil map. They are operated chiefly by commercial producers. Small pits are indicated only by the symbol for gravel pits. A few that contain water are used for fish ponds.

Hanover series

These are Gray-Brown Podzolic soils that have some characteristics like those of Red-Yellow Podzolic soils. They are well-drained upland soils that developed over very strongly acid loamy till of Illinoian age. The associated series are the Muskingum and Loudonville soils, which are well drained and shallow.

Hanover soils east of the Hocking River valley are underlain by fine-textured sandstone. Those west of the Hocking River valley are underlain by a coarser textured hard black sandstone, their glacial till contains more sand, and their lower subsoil is sandier.

Areas that are not severely eroded have a smooth, medium-textured surface soil. The silty surface soil and upper subsoil of some of the Hanover soils suggest that the till from which they developed may have been covered by a layer of loess.

The root zone is moderately deep to deep. The subsoil is moderately permeable. The rate of runoff depends on the slope and the vegetation; it ranges from medium to rapid. Where it is not severely eroded, the surface soil is friable and easily worked and has a medium content of organic matter.

A deciduous forest of oak, hickory, maple, and yellow-poplar is native to this soil. The steep and severely eroded areas are used for pasture or are left in forest. Most of this soil is used for corn, wheat, or hay.

Hanover silt loam, 2 to 6 percent slopes, slightly eroded (HaB1, Capability unit IIe–1).—A typical profile of this soil follows.

Surface soil—
- 0 to 8 inches, brown to dark-brown friable and smooth silt loam; moderate medium to fine granular structure; medium content of organic matter; medium acid to slightly acid.
- 8 to 13 inches, yellowish-brown friable silt loam; moderate medium to fine granular structure; strongly acid.

Subsoil—
- 13 to 17 inches, yellowish-brown friable silt loam; moderate medium to fine subangular blocky structure; strongly acid.
- 17 to 24 inches, yellowish-brown to strong-brown, firm, fine silty clay loam; strong medium subangular blocky structure; plastic when wet; strongly acid.
- 24 to 37 inches, yellowish-brown friable fine silt loam with a few, faint, light yellowish-brown mottles; moderate coarse subangular blocky structure; strongly acid.

Substratum—
- 37 inches+, pale-yellow to light yellowish-brown firm silt loam, loam, or very fine sandy loam glacial till; massive in place; strongly acid to very strongly acid.

The depth to the substratum ranges up to 65 inches.

This soil needs lime and fertilizer and should be protected against further erosion. Hay should be grown in the rotation to maintain tilth and add organic matter.

Hanover silt loam, 2 to 6 percent slopes, moderately eroded (HaB2, Capability unit IIe–1).—Part of the surface layer of this soil has been removed by erosion; as a result the plow layer is now a mixture of surface soil and subsoil. Otherwise, the profile is like that of Hanover silt loam, 2 to 6 percent slopes, slightly eroded. This soil needs lime and fertilizer and should be protected against further erosion.

Hanover silt loam, 6 to 12 percent slopes, slightly eroded (HaC1, Capability unit IIIe–1).—The combined depth of the surface soil and subsoil is about 3 to 6 inches less than the depth of the same layers of Hanover silt loam, 2 to 6 percent slopes, slightly eroded. Otherwise the two soils are similar.

Hanover silt loam, 6 to 12 percent slopes, moderately eroded (HaC2, Capability unit IIIe–1).—This soil is like Hanover silt loam, 2 to 6 percent slopes, slightly eroded, except that the combined depth of the surface soil and the subsoil is about 3 to 6 inches less. Part of the surface soil has been lost through erosion. In the present plow layer, some of the upper subsoil is mixed with the remaining surface soil. This soil needs lime and fertilizer and should be protected against further erosion.

Hanover silt loam, 12 to 18 percent slopes, slightly eroded (HaD1, Capability unit IVe–1).—This soil is about 5 to 8 inches shallower than Hanover silt loam, 2 to 6 percent slopes, slightly eroded. This soil should not be used for row crops. It should be kept in hay or pasture or should be reforested.

Hanover silt loam, 12 to 18 percent slopes, moderately eroded (HaD2, Capability unit IVe–1).—This soil is about 5 to 8 inches shallower than Hanover silt loam, 2 to 6 percent slopes, slightly eroded. Part of the surface soil has been removed by erosion, and the rest has been mixed into the upper subsoil. This soil is not suitable for rotation cropland. It should be used for hay or pasture or it should be reforested.

Hanover silt loam, 12 to 18 percent slopes, severely eroded (HaD3, Capability unit VIe–1).—This soil is the result of severe erosion of Hanover silt loam on slopes of 12 to 18 percent. It is not uniformly eroded. Some spots of less eroded soil are included in the mapping unit. Before this soil was severely eroded, its profile was probably like that of Hanover silt loam, 2 to 6 percent slopes, slightly eroded, except that it was about 5 to 8 inches shallower. Nearly all of the original surface soil has been removed by erosion, and the present surface layer is mostly subsoil.

When this soil is dry, the surface is hard, cloddy, and crusted. When it is wet, it is sticky, plastic, puddled, and massive. It is low in organic matter. It can be used for hay or pasture if fertilized and limed. It would also be suitable for forest.

Keene series

These soils are moderately well drained to somewhat poorly drained. They are considered Gray-Brown Podzolic soils but have many of the characteristics of the Red-Yellow Podzolic great soil group. They developed on uplands over laminated, jointed, acid, clayey shales and thin-bedded, acid sandstones. They are not extensive in this county. They are associated with the well-drained Wellston and Muskingum soils.

These soils are very easily eroded. A large proportion of the rainwater runs off, because the subsoil is only slowly permeable and very little water can soak in. The rate of runoff varies, depending on the slope and the vegetation. The native vegetation does not protect the soil against erosion. Where it has not been severely eroded, the surface soil is medium textured and has a medium content of organic matter. The root zone is shallow. The native trees were oak, hickory, and some beech.

Most areas of these soils are still in forest or are used for pasture. A few small areas are used for crops.

Keene silt loam, shallow, 2 to 12 percent slopes, slightly to moderately eroded (KaC2, Capability unit IIIe–3).—About one-fourth of the area of this soil is only slightly eroded. A typical profile follows.

Surface soil—
- 0 to 8 inches, yellowish-brown friable fine silt loam; moderate medium granular structure; medium content of organic matter; medium acid to strongly acid.

Subsoil—
8 to 13 inches, yellowish-brown firm silty clay loam; massive in place; sticky and very plastic when wet, very hard when dry; contains many small, soft, flat fragments of shale and sandstone; strongly acid.
Substratum—
13 inches+, mottled light-gray and yellowish-brown clay shale; laminated and massive in place; very sticky and plastic when wet, very hard when dry; strongly acid.

If this soil is used for crops it needs fertilizer and lime and protection against further erosion.

Keene silty clay loam, shallow, 12 to 18 percent slopes, severely eroded (KbD3, Capability unit VIe-1).—This soil is the result of severe erosion of Keene silt loam on 12 to 18 percent slopes. Some areas are severely gullied. In most places the surface layer is silty clay loam, but many spots of silt loam are scattered through the areas.

Tilth is very poor. The plow layer is sticky and plastic when wet and hard when dry. The content of organic matter is low. A typical profile follows.

Surface soil—
0 to 7 inches, yellowish-brown firm silty clay loam; weak medium to fine granular structure; contains many small, soft, flat fragments of shale and sandstone; low in organic matter; strongly acid.
Substratum—
7 inches+, mottled light-gray and yellowish-brown clay shale; laminated and massive in place; very sticky and plastic when wet, very hard when dry; strongly acid

This soil should not be used for rotation cropland. It could be used for hay and pasture if fertilized and limed, or it could be reforested with pines.

Kendallville series

These are well-drained Gray-Brown Podzolic soils that developed on the uplands from Wisconsin glacial material. They are associated with the well-drained Miami, Fox, and Alexandria soils.

The surface soil is typically medium textured and contains a medium amount of organic matter. Patches of gravel and sand are common in some areas. Runoff ranges from slow to rapid, depending on slope and vegetation. The subsoil is moderately permeable. The root zone is moderately deep. The native vegetation was a deciduous forest of oak and hickory.

These soils are used mostly for crops. There is some acreage in pasture, and the steeper slopes are forested.

Kendallville silt loam, 0 to 2 percent slopes (KcA1, Capability unit I-1).—About two-thirds of this soil is slightly eroded. The rest is eroded little or not at all. A typical profile follows.

Surface soil—
0 to 8 inches, brown to dark-brown friable silt loam; moderate medium granular structure; medium content of organic matter; slightly acid to medium acid.
8 to 12 inches, brown friable silt loam to silty clay loam; moderate medium to fine subangular blocky structure; slightly acid to medium acid.
Subsoil—
12 to 24 inches, reddish-brown to brown firm clay loam; moderate medium subangular and angular blocky structure; sticky and plastic when wet; medium acid.
24 to 36 inches, very dark brown firm gravelly clay loam; moderate to strong medium to coarse subangular and angular blocky structure; sticky and plastic when wet; medium acid in upper part, grading to slightly acid in lower part.
Substratum—
36 inches+, yellowish-brown and gray fine loam glacial till; calcareous.

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This soil needs lime and fertilizer if it is used for crops. Hay should be grown in the rotation to keep the soil in good tilth and supply organic matter.

Kendallville silt loam, 2 to 6 percent slopes, slightly eroded (KcB1, Capability unit IIe-1).—This soil is similar to Kendallville silt loam, 0 to 2 percent slopes If cultivated, it should be protected against further erosion.

Kendallville silt loam, 2 to 6 percent slopes, moderately eroded (KcB2, Capability unit IIe-1).—This soil originally was like Kendallville silt loam, 0 to 2 percent slopes. Part of the surface soil has been removed by erosion, and subsoil is now mixed with the remaining surface soil in the plow layer.

If this soil is used for crops, it should be limed and fertilized and protected against further erosion. Meadow crops should be included in the rotation to keep the soil in good tilth and supply organic matter.

Kendallville silt loam, 6 to 12 percent slopes, moderately eroded (KcC2, Capability unit IIIe-1).—This soil has a profile similar to that of Kendallville silt loam, 0 to 2 percent slopes, except that about 6 inches of the surface layer has been eroded away.

Erosion control is needed on this soil. Necessary for good management are lime, fertilizer, and enough meadow in the rotation to maintain tilth and organic matter.

Kendallville silt loam, 12 to 18 percent slopes, moderately to severely eroded (KcD2, Capability unit VIe-1).—The combined depth of the surface soil and subsoil is about 5 to 8 inches less than in Kendallville silt loam, 0 to 2 percent slopes. The moderately eroded areas have lost part of their surface soil through erosion, and the remaining surface soil is now mixed with the upper subsoil. About one-fourth of this soil is severely eroded and has a plow layer similar to that of Fox silty clay loam, 6 to 12 percent slopes, severely eroded. This soil should not be used for rotation cropland. It is better suited to pasture, hay, or forest.

Lobdell series

These moderately well drained Alluvial soils developed from alluvium washed from sandstone and shale, from noncalcareous glacial material, or from both. They occur on long strips along stream bottoms and are associated with the well-drained Chagrin soils and the somewhat poorly drained Orrville soils.

The surface soil is medium textured or moderately coarse textured. It has a medium content of organic matter. Both the surface soil and the subsoil are moderately permeable. The root zone is deep. Surface water runs off slowly from these nearly level soils. Seasonal flooding is usual. The soils are easy to work at normal moisture content. The native vegetation was a deciduous forest of elm, oak, and maple.

Along smaller streams and in irregular areas, the soils are still in forest or are used only for pasture. Other areas are used for corn, wheat, soybeans, and hay. The soils are productive when crops are not damaged by flooding. Low areas should be random tiled to remove the excess water quickly. Some lime may be needed. Crops should be fertilized. Enough hay or cover crops should be included in the rotation to keep the soil in good tilth and supply organic matter.

Lobdell silt loam (LbAO, Capability unit I–2).—All of this soil occurs on slopes of less than 2 percent. It has had little or no erosion. In a few small areas flood-deposited silt lies on top of the normal surface soil. A typical profile follows.

Surface soil—
0 to 14 inches, dark grayish-brown to brown friable silt loam; moderate granular structure; medium content of organic matter; medium acid to slightly acid.
Subsoil—
14 to 36 inches, yellowish-brown friable silt loam or very fine sandy loam with a few, distinct, gray mottles in the lower part; medium acid to slightly acid.
Substratum—
36 inches+, mottled gray, yellowish-brown, and brown friable very fine sandy loam and sandy loam with layers of loam and clay loam; massive in place; medium acid to slightly acid.

Lobdell fine sandy loam (LaAO, Capability unit I–2).—All of this soil occurs on slopes of 2 to 6 percent. Little or no erosion is evident. The profile is similar to that of Lobdell silt loam, except that both the surface soil and the subsoil contain more sand.

Loudonville series

These soils are considered Gray-Brown Podzolic soils, but in many of their characteristics they grade between that great soil group and the Red-Yellow Podzolic soils. They are well-drained upland soils derived from medium-textured, acid, Wisconsin or Illinoian glacial till. This till overlies material weathered from interbedded fine-textured acid sandstone and shale. These soils are associated with the unglaciated well-drained Muskingum and Wellston soils.

The depth to bedrock varies with the slope. On steeper slopes the soil is shallow. In some places the subsoil rests directly on bedrock or on consolidated materials derived from the bedrock. Most of the surface soils are medium textured, but, in spots where the overlying glacial till is very shallow or absent, the coarse-textured sandstone bedrock results in a loam or fine sandy loam surface texture.

These well-drained soils tend to be droughty. The root zone is moderately deep to shallow. The subsoil is moderately permeable. Runoff ranges from moderately rapid to rapid, depending on the slope and the vegetative cover. The content of organic matter is medium if the soil is not severely eroded. At normal moisture content, these soils are easy to work.

These soils were originally in deciduous forest of oak, hickory, and maple. Some areas on slopes of less than 18 percent are used for corn, wheat, and hay. Because of steep slopes, low productivity, and risk of erosion, most of these soils are still in forest or in abandoned pastures.

Loudonville silt loam, 2 to 6 percent slopes, slightly eroded (LcB1, Capability unit IIe–1).—A typical profile of this soil follows.

Surface soil—
0 to 7 inches, brown to dark grayish-brown friable silt loam; moderate to weak medium to fine granular structure; medium content of organic matter; slightly acid to medium acid.
7 to 11 inches, yellowish-brown friable silt loam; weak medium to fine subangular blocky structure; medium acid.
Subsoil—
11 to 15 inches, yellowish-brown firm to friable clay loam; weak to moderate medium subangular blocky structure; contains a few small scattered pieces of glacial gravel; medium acid.
15 to 30 inches, brown to dark yellowish-brown firm clay loam; moderate medium subangular blocky structure; contains a few small flat fragments of sandstone and shale; medium acid.
Substratum—
30 inches+, weathered interbedded sandstone and shale; strongly acid.

The depth to the substratum ranges from 30 to 40 inches.

If this soil is used for crops, it should be fertilized and limed. Growing meadow crops in the rotation will help to control erosion.

Loudonville silt loam, 2 to 6 percent slopes, moderately eroded (LcB2, Capability unit IIe–1).—The profile of this soil is similar to that of Loudonville silt loam, 2 to 6 percent slopes, slightly eroded, except that part of the surface soil has been removed by erosion. The present plow layer is a mixture of surface soil and upper subsoil. This soil can be used for crops if fertilizer and lime are added. Areas now in abandoned pastures should be converted to forests of pine and hardwoods.

Loudonville silt loam, 6 to 12 percent slopes, slightly eroded (LcC1, Capability unit IIIe–2).—The combined depth of the surface soil and the subsoil of this soil is about 6 to 8 inches less than the depth of those layers in Loudonville silt loam, 2 to 6 percent slopes, slightly eroded. Several small areas in this mapping unit have surface textures of loam or sandy loam. This soil is likely to erode if it is cultivated. It needs fertilizer and lime. Hay should be part of the rotation.

Loudonville silt loam, 6 to 12 percent slopes, moderately eroded (LcC2, Capability unit IIIe–2).—This soil has a profile like that of Loudonville silt loam, 2 to 6 percent slopes, slightly eroded, but is about 6 to 8 inches shallower. Part of the surface soil has been removed by erosion, and the rest has been mixed into the upper subsoil.

Loudonville silt loam, 6 to 12 percent slopes, severely eroded (LcC3, Capability unit IVe–1).—This soil resulted from severe erosion of Loudonville silt loam on slopes of 6 to 12 percent. The surface texture of most areas is fine silt loam. In numerous scattered spots, part of the subsoil has been mixed into the surface soil and the surface texture, therefore, is a silty clay loam.

The surface soil is low in organic matter. It has very poor tilth. When it is wet, the surface seals into a sticky, plastic mass. This soil should not be used for rotation crops. It can be used for hay or pasture if it is limed and fertilized, but it is better suited to forest of pine and hardwoods.

A typical profile follows.

Plow layer—
0 to 7 inches, yellowish-brown, firm, fine silt loam; weak very fine, fine, and medium granular and subangular blocky structure; contains a few flat fragments of sandstone and shale; low content of organic matter; medium acid.
Subsoil—
7 to 22 inches, brown to dark yellowish-brown firm clay loam; moderate medium subangular blocky structure; contains a few flat fragments of sandstone and shale; medium acid.
Substratum—
22 inches+, weathered interbedded sandstone and shale; strongly acid.

Loudonville silt loam, 12 to 18 percent slopes, slightly eroded (LcD1, Capability unit IIIe–4).—This soil is similar to Loudonville silt loam, 2 to 6 percent slopes, slightly eroded, except that the combined depth of the surface soil and subsoil is about 7 to 10 inches less.

Loudonville silt loam, 12 to 18 percent slopes, moderately eroded (LcD2, Capability unit IIIe-4).—Several small areas that have a loam or sandy loam surface texture are included in this unit. Most of this soil is similar to Loudonville silt loam, 2 to 6 percent slopes, slightly eroded, except that it is about 7 to 10 inches shallower over the substratum. Part of the surface soil has been removed by erosion, and the rest is mixed with the upper subsoil.

Loudonville silt loam, 12 to 18 percent slopes, severely eroded (LcD3, Capability unit VIe-1).—This soil is the result of severe erosion of Loudonville silt loam on 12 to 18 percent slopes. Some places are badly gullied.

Tilth is very poor. The surface layer contains little organic matter. When the soil is wet, the surface seals into a sticky plastic mass. A typical profile follows.

Plow layer—
- 0 to 7 inches, yellowish-brown, firm, fine silt loam; weak very fine, fine, and medium granular and subangular blocky structure; contains a few flat fragments of sandstone and shale; low content of organic matter; medium acid.

Subsoil—
- 7 to 18 inches, brown to dark yellowish-brown firm clay loam; moderate medium subangular blocky structure; contains a few flat fragments of sandstone and shale; medium acid.

Substratum—
- 18 inches+, weathered interbedded sandstone and shale; strongly acid.

In spots enough subsoil is mixed with the remaining surface soil to give the plow layer a silty clay loam texture.

This soil is not suited to rotation crops. It needs lime and fertilizer to make it suitable for hay or pasture. It is suitable for forest.

Loudonville silt loam, 18 to 25 percent slopes, slightly eroded (LcE1, Capability unit IVe-2).—This soil should not be used for row crops. It needs lime and fertilizer to make it suitable for hay or pasture. Forest of pine and hardwood is the best use for it. A typical profile of this soil follows.

Surface soil—
- 0 to 7 inches, brown to dark grayish-brown friable silt loam; moderate to weak medium to fine granular structure; medium content of organic matter; slightly acid to medium acid.

Subsoil—
- 7 to 18 inches, yellowish-brown to dark yellowish-brown friable fine silt loam to silty clay loam; moderate medium subangular blocky structure; contains many flat fragment of sandstone and shale and, in some places, scattered small pieces of glacial gravel; medium acid.

Substratum—
- 18 inches+, weathered interbedded sandstone and shale; strongly acid.

Loudonville silt loam, 18 to 25 percent slopes, moderately eroded (LcE2, Capability unit IVe-2).—This soil is somewhat similar to Loudonville silt loam, 18 to 25 percent slopes, slightly eroded. Part of the original surface soil has been removed by erosion. The present surface soil is a mixture of surface soil and subsoil. Hay, pasture, and forest are suitable uses for this soil.

Loudonville silt loam, 18 to 25 percent slopes, severely eroded (LcE3, Capability unit VIe-1).—This soil resulted from severe erosion of Loudonville silt loam on slopes of 18 to 25 percent. The profile is generally similar to that of Loudonville silt loam, 12 to 18 percent slopes, severely eroded. Most of the surface soil is fine silt loam. In spots the texture is silty clay loam because so much of the subsoil has been mixed into the surface soil.

The surface soil is low in organic matter. Tilth is poor. This soil can be used for pasture if it is limed and fertilized. It can also be reforested.

Loudonville silt loam, 25 to 50 percent slopes, moderately eroded (LcF2, Capability unit VIIe-1).—This soil is 2 to 6 inches shallower than Loudonville silt loam, 18 to 25 percent slopes, slightly eroded. Otherwise the profiles are similar. The upper subsoil has been mixed with the remaining surface soil. This soil should be used for forest.

Made land

Made land (Ma).—This land type consists of areas that have been filled in with soil material or refuse, leveled off for building sites or athletic fields, or stripped of their upper soil layers to provide fill material for road building. These areas have little or no agricultural value.

Marengo series

These dark-colored, very poorly drained Humic Gley soils developed in level to depressed areas or in strips in drainageways in the uplands. The parent material is moderately calcareous glacial till of late Wisconsin age. These soils are associated with the well drained Alexandria soils, the moderately well drained Cardington soils, and the somewhat poorly drained Bennington soils.

The surface soil is typically medium textured or moderately fine textured. Small bands of Marengo soils that have a shallower and lighter colored surface soil surround areas of the typical Marengo soils. The typical surface soil is medium to high in organic matter. It will puddle or clod if worked when too wet. The grayish clayey subsoil is slowly to moderately permeable. The root zone is moderately deep if a good drainage system is used. Surface water ponds or runs off slowly. During wet weather a perched water table may develop. A deciduous forest of maple, beech, elm, and oak originally grew on this soil.

At present these soils are used mostly for corn, wheat, soybeans, and hay; a few areas are in forest or pasture. Lime and fertilizer should be used on crops. Hay should be grown in the rotation often enough to keep the soil in good tilth and maintain the organic-matter content.

These soils cannot be farmed unless they are drained.

Marengo silty clay loam (McAO, Capability unit IIw-3).—Most of this soil is on slopes of less than 2 percent, but several areas are on slopes of 2 to 6 percent. A few areas of this soil are slightly eroded. A typical profile follows.

Surface soil—
- 0 to 7 inches, very dark gray to black friable to firm silty clay loam; moderate medium to coarse granular structure; sticky and plastic when wet; medium to high content of organic matter; neutral.
- 7 to 15 inches, very dark gray to black firm clay loam; moderate to strong fine to medium angular blocky structure; sticky and plastic when wet; medium content of organic matter; neutral.

Subsoil—
- 15 to 50 inches, distinctly mottled dark yellowish-brown, dark grayish-brown, and gray very firm clay loam and fine clay loam; compound weak to moderate angular blocky structure and weak prismatic structure; medium acid to slightly acid.

50 to 60 inches, dark yellowish-brown firm clay loam prominently mottled with olive gray; weak medium subangular blocky structure; slightly acid in upper part, grading to neutral in lower part.

Substratum—

60 inches+, dark yellowish-brown very firm loam to coarse clay loam glacial till; calcareous.

Marengo silt loam (MbAO, Capability unit IIw–3).—This soil is similar to Marengo silty clay loam except that the surface soil is a fine silt loam and the subsoil has a very slightly coarser texture. Several areas are on slopes of 2 to 6 percent, but most of this soil is on slopes of 0 to 2 percent. A few areas have been slightly eroded.

Markland series

These are well-drained Gray-Brown Podzolic soils on terraces. They developed over stratified calcareous lacustrine silty and clayey materials of Late Wisconsin age. The native vegetation was a forest of beech, maple, oak, and hickory.

These soils are associated with the moderately well drained Glenford soils, the somewhat poorly drained McGary and Fitchville, the poorly drained Sebring, and the very poorly drained Montgomery soils.

The subsoil is moderately permeable, and the root zone is deep to moderately deep. Runoff ranges from moderately slow to moderate, depending on slope and plant cover. The surface soil is medium textured. It contains a medium amount of organic matter and is easy to work at normal moisture content.

In this county the Markland soils are intermingled with the Glenford soils and are mapped in the same units.

Markland and Glenford silt loams, 0 to 2 percent slopes (MdA1, Capability unit I–1).—A typical profile of Markland silt loam, 0 to 2 percent slopes, follows.

Surface soil—

0 to 7 inches, grayish-brown friable silt loam; moderate medium granular structure; medium content of organic matter; medium acid to slightly acid.

Subsoil—

7 to 14 inches, light yellowish-brown to brown friable silty clay loam; moderate fine subangular blocky and angular blocky structure; medium acid.

14 to 32 inches, yellowish-brown to brown firm and smooth silty clay loam; moderate to strong coarse angular blocky structure; medium acid in upper part, grading to neutral in lower part.

Substratum—

32 inches+, yellowish-gray to gray firm clay; strong medium to coarse angular blocky structure; thinly laminated; calcareous.

A general description of the Glenford soils is given under the heading, Glenford series. Following is a typical profile of Glenford silt loam, 0 to 2 percent slopes.

Surface soil—

0 to 7 inches, grayish-brown friable silt loam; moderate to weak fine to moderately fine granular structure; medium content of organic matter; medium acid to strongly acid.

7 to 14 inches, pale yellowish-brown friable fine silt loam; moderate fine granular and subangular blocky structure; medium acid to strongly acid.

Subsoil—

14 to 33 inches, pale-yellow firm silty clay loam that has faint to distinct, gray and light-gray mottles, especially in lower part; moderate medium to coarse subangular blocky structure; medium acid to strongly acid.

Substratum—

33 inches+, mottled gray and yellow, firm, stratified silty, clayey, and sandy materials; massive structure; noncalcareous.

The subsoil of the Glenford silt loam varies from 19 to 26 inches in thickness. In a few places the surface soil is loam or fine sandy loam. Most of this unit is practically uneroded.

Most of this unit is in crops, but a few irregular areas are in pasture or forest. The wet spots in the Glenford soil should be drained by tile. Hay should be grown in the rotation to help keep the soil in good tilth and to supply organic matter. Lime and fertilizer are needed.

Markland and Glenford silt loams, 2 to 6 percent slopes, slightly eroded (MdB1, Capability unit IIe–1).—This unit is similar to Markland and Glenford silt loams, 0 to 2 percent slopes. If cropped, these soils should be limed and fertilized and protected against further erosion.

Markland and Glenford silt loams, 2 to 6 percent slopes, moderately eroded (MdB2, Capability unit IIe–1).—These two soils are like Markland and Glenford silt loams, 0 to 2 percent slopes, except that part of the surface soil has been removed by erosion. The plow layer in this unit is now a mixture of surface soil and subsoil. Further erosion of these soils should be prevented. Lime and fertilizer will benefit crops. Hay should be grown in the rotation to supply organic matter and improve tilth.

McGary series

These somewhat poorly drained Gray-Brown Podzolic soils of the terraces have some characteristics typical of the Planosols (claypan soils). They developed from stratified, calcareous, lacustrine silty and clayey materials of Wisconsin age. The native vegetation was a forest of beech, maple, and elm.

The associated soils are the well drained Markland soils, the moderately well drained Glenford soils, the somewhat poorly drained Fitchville soils, the poorly drained Sebring soils, and the very poorly drained Montgomery soils. The areas of McGary soils are so intermingled with areas of Fitchville soils or of Sebring soils that they are not mapped separately in this county.

The texture of the subsoil and surface soil varies somewhat, depending on the parent material, but generally the surface soil is medium textured and the subsoil is clayey. The surface soil is medium to low in organic matter. It should not be worked when too wet, because it may puddle or clod. The grayish subsoils are slowly permeable. In wet weather, a perched water table may develop. The root zone is shallow to moderately deep. Runoff ranges from very slow to medium, depending on slope and plant cover. These soils are suitable for crops only if they are drained.

McGary and Fitchville silt loams, 0 to 2 percent slopes (MgA1, Capability unit IIw–2).—In this mapping unit, small areas of McGary silt loam are mingled with small areas of Fitchville silt loam on nearly level terraces. The two soils developed from similar parent materials, but the substratum of the McGary soils is calcareous, and that of the Fitchville soils is noncalcareous. A typical profile of McGary silt loam, 0 to 2 percent slopes, follows:

Surface soil—

0 to 7 inches, dark grayish-brown friable silt loam; moderate to weak fine granular structure; medium to low in organic matter; slightly acid to medium acid.

Subsoil—

7 to 15 inches, mottled light-gray and light yellowish-brown firm silty clay loam; moderate fine angular blocky and subangular blocky structure; medium acid.

15 to 32 inches, mottled gray and pale-yellow firm silty clay loam; strong coarse and medium angular blocky and subangular blocky structure; plastic when wet; medium acid to slightly acid in upper part, grading to neutral in lower part.

Substratum—

32 inches+, mottled light brownish-gray, brownish-yellow, and gray firm silty and clayey materials; massive in place; thinly laminated; calcareous.

A general description of Fitchville soils is given under the heading, Fitchville series. A typical profile of Fitchville silt loam, 0 to 2 percent slopes, follows.

Surface soil—

0 to 8 inches, dark grayish-brown to dark-gray friable silt loam; moderate to weak very fine and fine granular structure; medium to low in organic matter; medium acid.

Subsoil—

8 to 14 inches, mottled yellowish-brown and grayish-brown firm to friable silty clay loam; moderate fine subangular blocky structure; strongly acid.

14 to 31 inches, prominently mottled grayish-brown and yellowish-brown very firm silty clay loam; moderate medium to coarse subangular blocky structure; strongly acid.

Substratum—

31 inches+, mottled yellowish-brown and gray firm clayey materials; massive and thinly laminated; noncalcareous and mildly acid.

Small areas near Pleasantville have substrata of interlayered glacial till and stratified clayey and silty materials. Some areas have sand or sandy clay substrata. Low terraces next to streams that occasionally flood are covered with 4 to 12 inches of recent alluvium. About half of this mapping unit is slightly eroded.

About one-half to two-thirds of the unit is drained and used for crops. Undrained and irregular areas are in pasture or forest. The surface soils are medium to low in organic matter. They may puddle or clod if worked when too wet. Tilth can be improved and more organic matter supplied by including hay in the rotation. If cropped, these soils need to be limed, fertilized, and protected against erosion.

McGary and Fitchville silt loams, 2 to 6 percent slopes, slightly eroded (MgB1, Capability unit IIw–2).—This unit is like McGary and Fitchville silt loams, 0 to 2 percent slopes. A few small areas are practically uneroded. These soils need surface and subsurface drainage to make them suitable for crops, but it is difficult to drain them without causing erosion.

McGary and Fitchville loams, 0 to 2 percent slopes (MeAO, Capability unit IIw–2).—The profile of McGary loam in this unit is similar to that of McGary silt loam, 0 to 2 percent slopes, and the profile of Fitchville loam is similar to that of Fitchville silt loam, 0 to 2 percent slopes. Both soils are somewhat coarser textured throughout than the silt loams of their respective series. In several small areas the surface texture is fine sandy loam or sandy loam. The depth to the lower subsoil is about 2 to 3 inches more than in the corresponding silt loams.

A few small areas are slightly eroded. Drainage is the chief management problem. Lime, fertilizer, and organic matter should be applied to improve tilth and increase fertility.

McGary and Sebring silt loams, 0 to 2 percent slopes (MhAO, Capability unit IIIw–2).—The Sebring soil predominates in this unit. A profile of McGary silt loam is described under McGary and Fitchville silt loams, 0 to 2 percent slopes. General characteristics of Sebring soils are described under the heading, Sebring series. A typical profile of Sebring silt loam follows.

Surface soil—

0 to 8 inches, light-gray to brownish-gray friable silt loam; weak very fine and fine granular structure; low in organic matter; slightly acid to medium acid.

Subsoil—

8 to 14 inches, light brownish-gray friable silty clay loam with faint to distinct, light olive-brown mottles; moderate fine to medium subangular blocky structure; strongly acid.

14 to 32 inches, olive-gray very firm clay or fine silty clay loam with distinct, yellowish-brown mottles; moderate very coarse to coarse angular blocky and subangular blocky structure; strongly acid.

Substratum—

32 inches+, mottled gray and yellowish-brown very firm clay; massive in place and thinly laminated; medium acid to strongly acid in upper part, grading to neutral in lower part; noncalcareous.

Several small areas are slightly eroded. Most of the area is in pasture or forest. Better drained areas are used for grain and hay.

These soils are suitable for crops only if they are drained. Tile works fairly well, but surface drainage usually is more practical. The surface soil is low in organic matter. If worked when too wet, it may puddle or clod. If cropped, these soils need to be limed and fertilized. Hay should be included in the rotation to supply organic matter and to improve tilth.

Mentor series

These are well-drained Gray-Brown Podzolic soils. They developed on terraces over noncalcareous, stratified, silty and clayey materials of Wisconsin age. The associated soils are the well drained and moderately well drained Markland and Glenford soils, the somewhat poorly drained McGary and Fitchville soils, the poorly drained Sebring soils complex, and the very poorly drained Montgomery soils.

The surface soil is medium textured. The texture of the subsoil and substratum varies. The root zone is deep to moderately deep. The subsoil is moderately permeable. Runoff varies from medium to rapid, depending on the slope and the vegetation. The surface soil contains a medium amount of organic matter. It is friable and easy to work at normal moisture content.

A deciduous forest of oak, hickory, and maple was the native vegetation. Small areas are now used for forest or for pasture, but most of this soil is used for corn, wheat, soybeans, and hay.

Mentor silt loam, 0 to 2 percent slopes (MkAO, Capability unit I–1).—Nearly all of this soil is uneroded, but a few areas are slightly eroded. A typical profile follows.

Surface soil—

0 to 8 inches, grayish-brown, friable, and smooth silt loam; moderate medium to coarse granular structure; medium content of organic matter; medium acid.

8 to 11 inches, brown, friable silt loam; moderate medium subangular blocky structure; medium acid.

Subsoil—

11 to 16 inches, strong-brown firm silty clay loam; moderate medium subangular blocky structure; medium acid to strongly acid.

16 to 32 inches, strong-brown firm clay loam or sandy clay loam; moderate medium to coarse subangular blocky structure; strongly acid.

Substratum—

32 inches+, yellowish-brown friable sandy loam; massive in place and thinly laminated; strongly acid to a depth of 60 inches or more; mildly alkaline or calcareous below 60 inches.

The depth to the calcareous material is normally 5 to 10 feet. In some places, the subsoil is silty clay loam and the substratum is silty and clayey. In such places, the depth to calcareous material is less than 5 feet.

If cropped, these soils should be limed and fertilized and protected from erosion. Enough meadow crops should be included in the rotation to keep the soil in good tilth and to maintain the supply of organic matter.

Mentor silt loam, 2 to 6 percent slopes, slightly eroded (MkB1, Capability unit IIe–1).—This soil is similar to Mentor silt loam, 0 to 2 percent slopes, but it needs more care to prevent erosion. A few areas have a darker colored surface soil like that of prairie soils.

Mentor silt loam, 2 to 6 percent slopes, moderately eroded (MkB2, Capability unit IIe–1).—This soil is similar to Mentor silt loam, 0 to 2 percent slopes, but part of the surface soil has been removed by erosion. The plow layer is a mixture of surface soil and subsoil.

Mentor silt loam, 6 to 12 percent slopes, slightly eroded (MkC1, Capability unit IIIe–1).—Except that the depth of the surface soil and subsoil is about 3 to 6 inches less, this soil is similar to Mentor silt loam, 0 to 2 percent slopes.

Mentor silt loam, 6 to 12 percent slopes, moderately eroded (MkC2, Capability unit IIIe–1).—This soil is similar to Mentor silt loam, 0 to 2 percent slopes, except that the depth of the surface soil and subsoil is about 3 to 6 inches less. Part of the surface soil is gone, and the rest has been mixed into the upper subsoil by cultivation. Several areas are severely eroded. This soil can be used for rotation crops, but intensive erosion control practices will be needed. Permanent pasture and forest are other suitable uses for this soil.

Mentor silt loam, 12 to 18 percent slopes, moderately eroded (MkD2, Capability unit IVe–1).—Except that the surface soil and the subsoil are about 5 to 8 inches less in depth, this soil is similar to Mentor silt loam, 0 to 2 percent slopes. Part of the upper subsoil has been mixed into the remaining surface soil. A few areas are severely eroded. In places some slopes range from 18 to 35 percent.

This soil is not suitable for row crops. It should be used for pasture and forest.

Miami series

These well-drained Gray-Brown Podzolic soils developed over highly calcareous Wisconsin glacial till. They are not extensive. They occur on the uplands at the western edge of the county. Associated soils are the moderately well drained Celina, the somewhat poorly drained Crosby, and the very poorly drained Brookston soils.

The surface soil of this series is predominantly medium textured, but in the severely eroded areas it is moderately fine textured. It contains a medium amount of organic matter. It is easily worked at normal moisture content. The root zone is deep to moderately deep. The subsoil is moderately permeable. Runoff varies from medium to rapid, depending on the slope and the vegetative cover.

A deciduous forest of oak, hickory, and maple is the native vegetation. Small irregular areas are in forest or pasture, but these soils are used mostly for corn, wheat, soybeans, and hay.

Miami silt loam, 2 to 6 percent slopes, slightly eroded (MmB1, Capability unit IIe–1).—A typical profile of Miami silt loam, 2 to 6 percent slopes, slightly eroded, follows.

Surface soil—
- 0 to 7 inches, dark grayish-brown friable silt loam; moderate fine to medium granular structure; medium content of organic matter; slightly acid to medium acid.
- 7 to 10 inches, dark-brown friable fine silt loam; weak thin platy structure; slightly acid to medium acid.

Subsoil—
- 10 to 14 inches, dark yellowish-brown friable to firm coarse clay loam; moderate fine to medium subangular blocky structure; medium acid.
- 14 to 26 inches, dark-brown firm clay loam to silty clay loam; strong medium to coarse angular blocky structure; sticky and plastic when wet; medium acid in upper part; grades to neutral in lower part.

Substratum—
- 26 inches+, light yellowish-brown to yellowish-brown firm loam glacial till; massive in place; highly calcareous.

Several areas of this soil have a darker colored surface soil like that of Brunizem soils. If cropped, this soil should be limed and fertilized and protected from erosion. Hay should be included in the crop rotation to help keep the soil in good tilth and to supply organic matter.

Miami silt loam, 2 to 6 percent slopes, moderately eroded (MmB2, Capability unit IIe–1).—This soil is similar to Miami silt loam, 2 to 6 percent slopes, slightly eroded, except that part of the surface soil has been removed by erosion. Surface soil and subsoil are now mixed in the plow layer. The slopes are irregular in some areas.

Miami silt loam, 6 to 12 percent slopes, moderately eroded (MmC2, Capability unit IIIe–1).—Except that the depth of the surface soil and subsoil combined is about 3 to 6 inches less, this soil is similar to Miami silt loam, 2 to 6 percent slopes, slightly eroded. Erosion has removed part of the original surface layer, and the plow layer is a mixture of subsoil and surface soil. If cropped, this soil should be protected against further erosion.

Miami silt loam, 12 to 18 percent slopes, moderately eroded (MmD2, Capability unit IVe–1).—Except that the surface soil and subsoil combined are about 5 to 8 inches less deep, this soil is similar to Miami silt loam, 2 to 6 percent slopes, slightly eroded. Part of the surface soil has been eroded away, and the rest has been mixed with the upper part of the subsoil.

This soil should not be used for row crops. Hay, pasture, and forest are more suitable for these areas.

Miami silty clay loam, 6 to 12 percent slopes, severely eroded (MnC3, Capability unit IVe–1).—This soil resulted from severe erosion of Miami silt loam on slopes of 6 to 12 percent. It contains little organic matter and has very poor tilth. When wet, the surface is sticky, plastic, and massive. A typical profile follows

Surface soil—
- 0 to 7 inches, dark yellowish-brown and yellowish-brown firm silty clay loam; weak very fine to fine granular structure; sticky and plastic when wet, hard when dry; low in organic matter; medium acid.

Subsoil—
- 7 to 18 inches, dark-brown firm clay loam to silty clay loam; moderate medium to coarse angular blocky structure; sticky and plastic when wet; medium acid in upper part; grades to neutral in lower part.

Substratum—
- 18 inches+, light yellowish-brown firm loam glacial till; massive in place; highly calcareous.

In some places the surface soil is silt loam.

This soil is not suitable for row crops. It can be used for meadow or pasture if fertilized and limed. It is also suitable for forest.

Miami silty clay loam, 12 to 18 percent slopes, severely eroded (MnD3, Capability unit VIe–1).—This soil is the result of severe erosion of Miami silt loam on slopes of 12 to 18 percent. It is similar to Miami silty clay loam, 6 to 12 percent slopes, severely eroded. Silt loam and silty clay loam textures occur in a spotty land pattern. Several areas have slopes of 18 to 25 percent.

Tilth is poor. The organic matter content is low. The surface soil is sticky and plastic when wet.

This soil is not suitable for crops. It can be used for meadow or pasture if limed and fertilized. It is also suitable for forest.

Montgomery series

These are dark-colored, very poorly drained Humic Gley soils that occur in level to depressed areas on terraces. They developed over water-laid calcareous clayey and silty materials of Wisconsin age. The somewhat poorly drained McGary and Fitchville soils and the poorly drained Sebring soils are associated with the Montgomery soils. Maple, beech, elm, and oak made up the original forest.

The typical surface soil is medium textured to moderately fine textured. Along the edges the Montgomery soils grade to other soils, and their surface soil is, therefore, thinner and lighter colored.

Surface water ponds or runs off slowly. The surface soil is medium to high in organic matter. It will puddle and clod if worked when too wet. The gray, clayey subsoil is slowly to moderately permeable. In wet weather a perched water table may develop. In drained areas the root zone is moderately deep.

Most of the acreage has been drained, so it can be used for crops; but some is in pasture and forest. Cropped areas need lime and fertilizer. Meadow crops will improve tilth and supply organic matter.

Montgomery silty clay loam (MpAO, Capability unit IIw–3).—This soil is on slopes of less than 2 percent. Little or no erosion is evident. A typical profile follows.

Surface soil—
- 0 to 8 inches, very dark gray to black, firm to friable silty clay loam; moderate medium to fine granular structure; medium to high in organic matter; neutral to slightly acid.
- 8 to 15 inches, dark brownish-gray, firm silty clay loam; moderate to strong medium angular blocky structure; medium in organic matter; neutral to slightly acid.

Subsoil—
- 15 to 24 inches, dark-gray firm silty clay loam with distinct yellowish-brown mottles; moderate to strong coarse angular blocky structure; neutral.
- 24 to 54 inches, mottled dark-gray and yellowish-brown very firm clay; moderate to strong coarse angular blocky structure; neutral.

Substratum—
- 54 inches+, mottled light olive-brown and gray very firm silty clay; massive in place; calcareous.

In a few areas, slopes range up to 6 percent. Some of these areas are slightly eroded.

Montgomery silt loam (MoAO, Capability unit IIw–3).—This soil is similar to Montgomery silty clay loam, but the surface soil is a little coarser textured. Slopes of less than 2 percent predominate; in a few places slopes range up to 6 percent. The stronger slopes are slightly eroded.

Muskingum series

These are well-drained residual upland soils developed over interbedded acid sandstones and shales. They are Sols Bruns Acides, but they have some characteristics of each of the following great soil groups: Gray-Brown Podzolic, Red-Yellow Podzolic, and Lithosol. The associated soils are the well drained Wellston and the moderately well drained to somewhat poorly drained Keene.

In most places these soils are less than 24 inches deep over the bedrock. On the steeper slopes, they are shallower. The subsoil may rest directly on bedrock or on unconsolidated fragments of bedrock material. The surface soil is medium textured where shale bedrock predominates and moderately coarse textured where the bedrock is mostly sandstone.

These are droughty soils. The subsoil is moderately permeable, but the root zone is shallow because bedrock is so near the surface. Runoff is rapid to moderately rapid, depending on slope and vegetation. At normal moisture content these soils are easy to work. The surface soil is medium in organic matter except where it is severely eroded.

Forests of oak, hickory, and maple originally grew on these soils. Some areas where slopes are less than 18 percent have been cleared for crops. Most of these have since been abandoned because they are severely eroded and low in productivity. They now produce a little pasture, but they should be converted to forest of pine and hardwoods.

Muskingum silt loam, 2 to 6 percent slopes, slightly to moderately eroded (MuB1, Capability unit IIe–1).—This soil developed over fine-grained sandstone and interbedded shale. The silt in the surface soil and subsoil may indicate a deposit of loess. A typical profile follows.

Surface soil—
- 0 to 8 inches, brown to grayish-brown very friable smooth silt loam; weak to moderate fine granular structure; medium content of organic matter; medium acid.

Subsoil—
- 8 to 20 inches, yellowish-brown friable silt loam; weak very fine and fine subangular blocky structure; contains small, flat fragments of sandstone and shale; medium acid.

Substratum—
- 20 inches+, fine-grained interbedded sandstone and shale; contains unconsolidated silty materials mixed with flat fragments of various sizes; medium acid to strongly acid.

In some areas the surface soil contains flat stones, which may limit cultivation of some fields.

This soil can be used for crop rotations, but enough dense meadow crops should be included to control erosion. Fertilizer and lime should be applied.

Muskingum silt loam, 6 to 12 percent slopes, slightly eroded (MuC1, Capability unit IIIe–2).—This soil is about 3 to 6 inches shallower over bedrock than Muskingum silt loam, 2 to 6 percent slopes, slightly to moderately eroded. It can be used for rotation crops if adequate erosion control measures are taken. It is suited to meadow, permanent pasture, or forest.

Muskingum silt loam, 6 to 12 percent slopes, moderately eroded (MuC2, Capability unit IIIe–2).—This soil is about 3 to 6 inches shallower than Muskingum silt loam, 2 to 6 percent slopes, slightly to moderately eroded. Part of the surface soil has been removed by erosion, and the plow layer is now a mixture of surface soil and subsoil. Erosion control is essential. This soil is suited to hay, pasture, and forest.

Muskingum silt loam, 6 to 12 percent slope , s v(rely eroded (MuC3, Capability unit IVe-1).—Most of this soil has a profile like the following.

Surface soil and subsoil—
0 to 12 inches, yellowish-brown, firm to friable, fine silt loam; weak very fine to fine granular and subangular blocky structure; sticky and plastic when wet; low in organic matter; medium acid.
Substratum—
12 inches+, fine-grained interbedded sandstone and shale; contains unconsolidated silty materials mixed with flat stones of various sizes; medium acid to strongly acid.

The upper layer of this soil is generally low in organic matter. Small spots that are less severely eroded contain more organic matter. Tilth is very poor. When wet, the surface layer is plastic and massive.

This soil can be used for hay or pasture if enough lime and fertilizer are applied. It is also suitable for forest.

Muskingum silt loam, 12 to 18 percent slopes, slightly eroded (MuD1, Capability unit IIIe-4).—This soil is similar to Muskingum silt loam, 2 to 6 percent slopes, slightly to moderately eroded, except that the surface soil and subsoil are about 5 to 8 inches shallower. It is suitable for pasture or forest. It can be used for crops if carefully protected from erosion.

Muskingum silt loam, 12 to 18 percent slopes, moderately eroded (MuD2, Capability unit IIIe-4).—The combined depth of the surface soil and subsoil is 5 to 8 inches less than in Muskingum silt loam, 2 to 6 percent slopes, slightly to moderately eroded. Part of the surface soil has been removed by erosion, and the rest has been mixed into the subsoil. This soil should be used for hay, pasture, or forest. A row crop and small grain can be grown on them occasionally, but they will need careful control of erosion.

Muskingum silt loam, 12 to 18 percent slopes, severely eroded (MuD3, Capability unit VIe-1).—This soil is similar to Muskingum silt loam, 6 to 12 percent slopes, severely eroded, but some areas are gullied. The surface is fine silt loam in most places.

The surface soil contains little organic matter, except in small spots that are less severely eroded. Tilth is very poor. When wet, the surface soil is plastic and massive.

This soil should not be used for rotation crops. If enough lime and fertilizer are applied, it can be used for hay or pasture. It is suitable for forest.

Muskingum silt loam, 18 to 25 percent slopes, slightly eroded (MuE1, Capability unit IVe-2).—A typical profile of this soil follows.

Surface soil—
0 to 8 inches, brown to grayish-brown very friable and smooth silt loam; weak to moderate fine granular structure; medium content of organic matter; medium acid.
Subsoil—
8 to 16 inches, yellowish-brown friable silt loam; weak very fine and fine subangular blocky structure; contains small flat fragments of sandstone and shale; medium acid.
Substratum—
16 inches+, fine-grained interbedded sandstone and shale; contains unconsolidated silty materials mixed with flat stone fragments of various sizes; medium acid to strongly acid.

This soil should not be used for row crops unless extreme care is used to control erosion. Suitable uses are hay, pasture, and forest.

Muskingum silt loam, 18 to 25 percent slopes, moderately eroded (MuE2, Capability unit IVe-2).—This soil is like Muskingum silt loam, 18 to 25 percent slopes, slightly eroded. Some of the surface soil has been removed by erosion, and the rest is mixed into the upper subsoil. This soil can be used for pasture or forest. Row crops and small grain can be grown occasionally if better land is not available. Extreme care will be needed to control erosion.

Muskingum silt loam, 18 to 25 percent slopes, severely eroded (MuE3, Capability unit VIe-1).—This soil is similar to Muskingum silt loam, 6 to 12 percent slopes, severely eroded, but several areas are gullied. The surface soil is a fine silt loam. It contains little organic matter, except in some less severely eroded spots. Tilth is poor.

This soil should not be used for crops. If well limed and fertilized, it can be used for pasture. It is also suitable for forest.

Muskingum silt loam, 25 to 50 percent slopes, slightly eroded (MuF1, Capability unit VIIe-1).—This soil is similar to Muskingum silt loam, 18 to 25 percent slopes, slightly eroded. It cannot be used for crops, but it is suitable for forest.

Muskingum silt loam, 25 to 50 percent slopes, moderately to severely eroded (MuF2, Capability unit VIIe-1). —This soil is like Muskingum silt loam, 18 to 25 percent slopes, slightly eroded, except that part of the surface soil has been washed away and the rest has been mixed into the upper subsoil. About one-tenth of the area has slopes of 25 to 35 percent and is severely eroded.

This soil is not suitable for crops. It should be reforested.

Muskingum fine and very fine sandy loams, 6 to 12 percent slopes, slightly to moderately eroded (MrC1, Capability unit IIIe-2).—These soils occur on uplands. The bedrock is mostly fine textured sandstone. A typical profile follows.

Surface soil—
0 to 9 inches, grayish-brown, very friable fine and very fine sandy loams; structure of weak crumbs, single grains, and nearly single-grain units; medium content of organic matter; medium acid.
Subsoil—
9 to 20 inches, brownish-yellow, very friable fine and very fine sandy loam; single-grain and nearly single-grain structure; medium acid.
Substratum—
20 inches+, unconsolidated sandstone bedrock of varying texture, mostly fine; contains yellowish-brown fine sandy loam mixed with sandstone fragments; sandstone is less weathered at greater depths; medium acid to strongly acid.

These soils can be used for rotation crops, but they should be protected against erosion. Hay should be included in the rotation. Lime and fertilizer should be applied. Pasture and forest are suitable uses.

Muskingum fine and very fine sandy loams, 12 to 18 percent slopes, slightly to moderately eroded (MrD2, Capability unit IIIe-4).—These soils have lost part of their surface soil through erosion. The remaining surface soil is mixed with the upper subsoil. Intensive erosion control is needed if these soils are used for crops. Meadow crops should be an important part of the rotation, and lime and fertilizer should be applied. These soils could be used for forest.

Muskingum fine and very fine sandy loams, 18 to 25 percent slopes, slightly to moderately eroded (MrE2, Capability unit IVe–2).—These soils are about 2 to 3 inches shallower than Muskingum fine and very fine sandy loams, 6 to 12 percent slopes, slightly to moderately eroded. Erosion has removed part of the original surface layer. The rest is mixed into the upper subsoil.

These soils are best suited to hay, pasture, or forest. Row crops and small grain can be grown occasionally, provided extreme care is taken to control erosion.

Muskingum sandy loam, 2 to 6 percent slopes, slightly to moderately eroded (MtB1, Capability unit IIe–1).—The sandstone bedrock beneath this upland soil is predominantly coarse in texture. A typical profile follows.

Surface soil—
0 to 9 inches, light yellowish-brown to grayish-brown very friable sandy loam; structure of weak crumbs, single grains, and nearly single-grain units; medium content of organic matter; medium acid.

Subsoil—
9 to 22 inches, brownish-yellow to light yellowish-brown very friable sandy loam mixed with flat sandstone fragments of various sizes; single-grain and nearly single-grain structure; medium acid.

Substratum—
22 inches+, unconsolidated sandstone bedrock of varying texture, mostly coarse; contains brownish-yellow, loose loamy sand mixed with sandstone fragments; bedrock materials are less weathered at lower depths; medium acid to strongly acid.

Meadow crops should be included in the rotation to help control erosion. Lime and fertilizer should be applied to crops and to pastures. This soil is suitable for forest. High yields of timber are reported.

Muskingum sandy loam, 6 to 12 percent slopes, slightly eroded (MtC1, Capability unit IIIe–2).—The surface soil and subsoil combined are 3 to 6 inches shallower than in Muskingum sandy loam, 2 to 6 percent slopes, slightly to moderately eroded. It can be used for crops if erosion is controlled. Fertilizer and lime should be applied. This soil is suitable for pasture or for forest. It produces good yields of timber.

Muskingum sandy loam, 6 to 12 percent slopes, moderately eroded (MtC2, Capability unit IIIe–2).—This soil is about 3 to 6 inches shallower over the substratum than Muskingum sandy loam, 2 to 6 percent slopes, slightly to moderately eroded. It has lost part of the surface soil by erosion. The present plow layer is a mixture of surface soil and subsoil. If this soil is cropped, it must be limed and fertilized and protected against further erosion.

Muskingum sandy loam, 12 to 18 percent slopes (MtD1, Capability unit IIIe–4).—This soil is 5 to 8 inches shallower than Muskingum sandy loam, 2 to 6 percent slopes, slightly to moderately eroded. A few areas are slightly eroded. This is not good cropland, but it can be used for crops if the rotation includes enough hay crops, if erosion control practices are used, and if lime and fertilizer are applied. This soil produces good yields of timber.

Muskingum sandy loam, 12 to 18 percent slopes, moderately eroded (MtD2, Capability unit IIIe–4).—This soil is like Muskingum sandy loam, 2 to 6 percent slopes, slightly to moderately eroded, except that the combined depth of the surface soil and subsoil is 5 to 8 inches less. Part of the surface soil has been removed by erosion, and the rest of it is mixed with the upper subsoil. If this soil is used for crops, it needs lime and fertilizer, and erosion should be controlled. Crop rotations should consist largely of meadow crops. This soil is suitable for forest.

Muskingum sandy loam, 12 to 18 percent slopes, severely eroded (MtD3, Capability unit VIe–1).—This soil results when Muskingum sandy loams on slopes of 12 to 18 percent are severely eroded. The surface layer in most places contains little organic matter, but spots that are less eroded contain somewhat more. A typical profile follows.

Surface soil—
0 to 6 inches, brownish-yellow to light yellowish-brown very friable sandy loam; single-grain to nearly single-grain structure; low in organic matter; medium acid.

Subsoil—
6 to 12 inches, brownish-yellow to light yellowish-brown very friable sandy loam; contains flat sandstone fragments of various sizes; single-grain and nearly single-grain structure; medium acid.

Substratum—
12 inches+, unconsolidated sandstone bedrock of varying texture, mostly coarse; contains brownish-yellow, loose loamy sand mixed with sandstone fragments; sandstone is less weathered at lower depths; medium acid to strongly acid.

This soil is not suitable for crops, but, if enough lime and fertilizer are applied, it can be used for hay or pasture. It is also suitable for forest.

Muskingum sandy loam, 18 to 25 percent slopes, slightly eroded (MtE1, Capability unit IVe–2).—This upland soil is underlain by coarse-textured sandstone. A typical profile follows.

Surface soil—
0 to 8 inches, light yellowish-brown to grayish-brown very friable sandy loam; structure of weak crumbs, single grains, and nearly single-grain units; medium content of organic matter; medium acid.

Subsoil—
8 to 17 inches, brownish-yellow to light yellowish-brown very friable sandy loam; single-grain and nearly single-grain structure; contains flat sandstone fragments of various sizes; medium acid.

Substratum—
17 inches+, unconsolidated bedrock dominated by sandstone of various textures, mostly coarse; contains brownish-yellow, loose loamy sand mixed with the sandstone fragments; bedrock materials are less weathered at greater depths; medium acid to strongly acid.

This soil should be used for forest. Timber production is fairly high. The soil can be used for limited cropping if erosion is controlled. The moisture-holding capacity is low.

Muskingum sandy loam, 18 to 25 percent slopes, moderately eroded (MtE2, Capability unit IVe–2).—This soil is like Muskingum sandy loam, 18 to 25 percent slopes, slightly eroded, but part of the surface soil has been washed away. The surface layer is now a mixture of surface soil and part of the subsoil. This soil is droughty. Forestry is the best use for it. It can be used for limited cropping if erosion is controlled.

Muskingum sandy loam, 18 to 25 percent slopes, severely eroded (MtE3, Capability unit VIe–1).—This soil resulted from severe erosion of Muskingum sandy loam on slopes of 18 to 25 percent. The profile is like that of Muskingum sandy loam, 12 to 18 percent slopes, severely eroded. The surface layer contains little organic matter, but small spots that are less eroded contain somewhat more. If this soil is used for pasture, it needs lime and fertilizer. It is suitable for forest.

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Muskingum sandy loam, 25 to 50 percent slopes, slightly eroded (MtF1, Capability unit VIIe-1).—This soil is 3 to 9 inches less in depth over the substratum than Muskingum sandy loam, 18 to 25 percent slopes, slightly eroded. It may have a very thin subsoil or none at all. Forest is the best use for this soil. Timber yields are relatively high for slopes as steep as these.

Muskingum sandy loam, 25 to 50 percent slopes, moderately eroded (MtF2, Capability unit VIIe-1).—This soil is 3 to 9 inches shallower than Muskingum sandy loam, 18 to 25 percent slopes, slightly eroded. Part of the surface soil has been removed by erosion. The subsoil may be very thin or absent. The present surface layer is a mixture of the remaining surface soil with the subsoil or with part of the substratum.

Forest is the best use for this soil.

Muskingum rocky sandy loam, 6 to 18 percent slopes, slightly to moderately eroded (MsD2, Capability unit VIIe-1).—This soil formed over bedrock of coarse sandstone. Large and small fragments of sandstone are scattered throughout the soil profile. Bedrock outcrops and steep rocky cliffs occur in many areas. A typical profile follows.

Surface soil—
- 0 to 9 inches, light yellowish-brown to grayish-brown very friable rocky sandy loam; structure of weak crumbs, single grains, and nearly single-grain units; medium content of organic matter; medium acid.

Subsoil—
- 9 to 20 inches, brownish-yellow to light yellowish-brown very friable rocky sandy loam; single-grain and nearly single-grain structure; medium acid.

Substratum—
- 20 inches+, unconsolidated bedrock dominated by sandstone of various textures, mostly coarse; contains brownish-yellow loose loamy sand mixed with sandstone fragments; bedrock materials are less weathered at greater depths; medium acid to strongly acid.

Under forest, the upper 2 or 3 inches of this soil is dark grayish brown. The depth of the soil varies considerably. In many places the several layers of this soil have been mixed together as the soil material rolled or slid down steep slopes. The number and size of rock fragments also vary. The less rocky areas can be used for pasture; others are suitable only for forest.

Muskingum rocky sandy loam, 18 to 25 percent slopes, slightly to moderately eroded (MsE1, Capability unit VIIe-1).—This soil is like Muskingum rocky sandy loam, 6 to 18 percent slopes, slightly to moderately eroded. In some places it is too rocky even for forest; in other places pasture can be developed. Where trees will grow, timber yields are relatively high.

Muskingum rocky sandy loam, 25 to 50 percent slopes, slightly to moderately eroded (MsG1, Capability unit VIIe-1).—The depth of this soil ranges from 10 to 20 inches. The profile is like that of Muskingum rocky sandy loam, 6 to 18 percent slopes, slightly to moderately eroded. The subsoil may be thin and weakly developed, or it may be absent. Many areas are severely eroded.

In some places this soil is too rocky to be used for forest, but in others the timber yield is relatively high for steep slopes.

Negley series

These are well-drained soils that have some characteristics of soils in the Gray-Brown Podzolic and some characteristic of soils in the Red-Yellow Podzolic great soil groups. They developed over stratified sandy and gravelly materials on glacial outwash, kames, and moraines of Illinoian age. The materials were originally calcareous, but now the upper part is thoroughly leached and weathered. The associated soils are the well-drained Parke and Pike.

The surface soil is gravelly loam or sandy loam. The two types are so intermingled that they are not mapped separately. The surface soil contains little organic matter. The root zone is shallow. Runoff and internal drainage are both rapid. The soils are droughty and hold little water. The native vegetation is a forest of oak and hickory.

On kames and moraines the slopes are irregular. These soils are used mostly for pasture and forest.

Negley gravelly and sandy loams, 6 to 12 percent slopes, moderately eroded (NaC2, Capability unit IIIe-2).—A profile of Negley gravelly loam, 6 to 12 percent slopes, moderately eroded, is described below.

Surface soil—
- 0 to 8 inches, grayish-brown to brown very friable to loose gravelly loam; weak fine subangular blocky structure; contains gravel; low in organic matter; strongly acid.

Subsoil—
- 8 to 14 inches, yellowish-brown friable gravelly loam; weak fine subangular blocky structure; contains gravel; strongly acid.
- 14 to 32 inches, strong-brown to dark-brown firm gravelly loam; weak fine subangular blocky structure; sticky when wet; contains considerable fine gravel; strongly acid.

Substratum—
- 32 inches+, strong-brown to yellowish-red loose sandy gravel and gravelly loam; single-grain structure; massive; less weathered at greater depths; strongly acid; in some areas stratified sandy and gravelly material is mixed with calcareous materials at depths of 5 to 7 feet.

Following is a typical profile of Negley sandy loam, 6 to 12 percent slopes, moderately eroded.

Surface soil—
- 0 to 8 inches, grayish-brown to brown very friable sandy loam; structure of weak very fine subangular blocks, single grains, and nearly single-grain units; low in organic matter; strongly acid.

Subsoil—
- 8 to 25 inches, strong-brown friable to firm sandy clay loam; structure of weak very fine subangular blocks, single grains, and nearly single-grain units; sticky when wet; strongly acid.

Substratum—
- 25 inches+, yellowish-red very friable to loose sand and sandy loam; single-grain to nearly single-grain structure; less weathered at greater depths; strongly acid; in some areas the sandy materials are mixed with calcareous materials at depths of 3 to 4 feet; a few thin layers of clay occur in some places.

These soils can be used for rotation crops, but they are very droughty. They need drought-resistant vegetation and control of erosion. If limed and fertilized, they are suitable for early and late pasture, but pastures dry out in most summers.

Negley gravelly and sandy loams, 12 to 18 percent slopes, moderately eroded (NaD2, Capability unit IVe-1).—The soils in this unit are like those in Negley gravelly and sandy loams, 6 to 12 percent slopes, moderately eroded, except that they are 3 to 6 inches shallower. About one-fifth of the acreage is on irregular slopes. They can be used for hay and for permanent pasture if limed and fertilized. Tree planting should include pines.

Negley gravelly and sandy loams, 12 to 18 percent slopes, severely eroded (NaD3, Capability unit VIe–1).—A typical profile of Negley gravelly loam, 12 to 18 percent slopes, severely eroded, follows.

Surface layer—
0 to 7 inches, strong-brown friable to firm gravelly loam and gravelly clay loam; structure of weak fine and very fine granules, single grains, and nearly single-grain units; sticky when wet; low in organic matter; strongly acid.
Subsoil—
7 to 19 inches, strong-brown to dark-brown firm gravelly loam; weak fine subangular blocky structure; sticky when wet; contains considerable fine gravel; strongly acid.
Substratum—
19 inches+, strong-brown to yellowish-red loose sandy gravel and gravelly loam; single-grain structure; massive; less weathered at greater depths; strongly acid; in some areas stratified sandy and gravelly material is mixed with calcareous materials at depths of 5 to 7 feet.

Following is a typical profile of Negley sandy loam, 12 to 18 percent slopes, severely eroded.

Surface soil—
0 to 7 inches, strong-brown friable sandy loam and sandy clay loam; structure of weak very fine and fine granules, single grains, and nearly single-grain units; low in organic matter; strongly acid.
Subsoil—
7 to 17 inches, strong-brown friable to firm sandy clay loam; structure of weak very fine subangular blocks, single grains, and nearly single-grain units; sticky when wet; strongly acid.
Substratum—
17 inches+, yellowish-red very friable to loose sand and sandy loam; single-grain to nearly single-grain structure; less weathered at lower depths; strongly acid; in some areas the sandy materials are mixed with calcareous materials at depths of 3 to 4 feet; a few thin layers of clay in some places.

Less eroded spots in each soil contain somewhat more organic matter than is typical of this mapping unit.

These soils should not be cultivated. A permanent forest is the best protection against erosion.

Negley gravelly and sandy loams, 18 to 25 percent slopes, slightly eroded (NaE1, Capability unit VIe–1).—A typical profile of Negley gravelly loam, 18 to 25 percent slopes, slightly eroded, follows.

Surface soil—
0 to 8 inches, grayish-brown to brown very friable to loose gravelly loam; weak to moderate fine to medium subangular blocky structure; contains gravel; low in organic matter.
Subsoil—
8 to 13 inches, yellowish-brown friable gravelly loam; weak fine subangular blocky structure; contains gravel; strongly acid.
13 to 22 inches, strong-brown to dark-brown firm gravelly loam; weak fine subangular blocky structure; sticky when wet; contains considerable fine gravel; strongly acid.
Substratum—
22 inches+, strong-brown to yellowish-red loose sandy gravel and gravelly loam; single-grain structure; massive; less weathered at greater depths; strongly acid; in some areas stratified sandy and gravelly materials are mixed with calcareous materials at depths of 5 to 7 feet.

Following is a typical profile of Negley sandy loam, 18 to 25 percent slopes, slightly eroded.

Surface soil—
0 to 8 inches, grayish-brown to brown very friable sandy loam; structure of weak to moderate very fine and fine subangular blocks, single grains, and nearly single-grain units; low in organic matter; strongly acid.
Subsoil—
8 to 18 inches, strong-brown friable to firm sandy clay loam; structure of weak very fine subangular blocks, single grains, and nearly single-grain units; sticky when wet; strongly acid.
Substratum—
18 inches+, yellowish-red very friable to loose sand and sandy loam; single-grain to nearly single-grain structure; less weathered at lower depths; strongly acid; in some areas the sandy materials are mixed with calcareous materials at depths of 3 to 4 feet; a few thin layers of clay in some places.

Negley gravelly and sandy loams, 18 to 25 percent slopes, moderately eroded (NaE2, Capability unit VIe–1).—This mapping unit is like Negley gravelly and sandy loams, 18 to 25 percent slopes, slightly eroded, except that part of the surface soil has been removed by erosion, and the rest is mixed into the upper subsoil. Several areas have irregular slopes.

These soils should be permanently covered with vegetation. They can be used for pasture if enough lime and fertilizer are applied. They are best suited for forestry.

Negley gravelly and sandy loams, 18 to 25 percent slopes, severely eroded (NaE3, Capability unit VIIe–1).—These soils are like Negley gravelly and sandy loams, 12 to 18 percent slopes, severely eroded, but they are 1 to 2 inches shallower. The organic-matter content is low, except in some of the less eroded areas.

These soils are not suitable for crops or pasture. They should be reforested.

Negley gravelly and sandy loams, 25 to 50 percent slopes, slightly eroded (NaF1, Capability unit VIIe–1).—These soils are about 2 to 3 inches shallower than Negley gravelly and sandy loams, 18 to 25 percent slopes, slightly eroded. They are suitable only for forest.

Negley gravelly and sandy loams, 25 to 50 percent slopes, moderately eroded (NaF2, Capability unit VIIe–1).—These soils are 2 to 3 inches shallower than Negley gravelly and sandy loams, 18 to 25 percent slopes, slightly eroded. Part of the surface soil has been removed by erosion, and the rest is mixed into the subsoil.

Negley gravelly and sandy loams, 25 to 50 percent slopes, severely eroded (NaF3, Capability unit VIIe–1).—This mapping unit is like Negley gravelly and sandy loams, 12 to 18 percent slopes, severely eroded, except that the combined depth of the surface soil and the subsoil is 1 to 3 inches less. Except for the less eroded spots, these soils are low in organic matter. They should be kept in forest.

Ockley series

These are well-drained Gray-Brown Podzolic soils on outwash terraces. The surface soil and upper subsoil developed in smooth silty and loamy deposits, more than 42 inches deep, washed or blown over calcareous, stratified, gravelly and sandy materials of Wisconsin age. The well drained Fox soils, the moderately well drained Thackery soils, the somewhat poorly drained Sleeth soils, and the very poorly drained Westland soils are associated with soils of this series. The native vegetation was a forest of oak, hickory, and maple.

The surface soil is medium in organic matter. It is friable and easy to work. Tilth is excellent. The subsoil is moderately permeable, and the root zone is deep to moderately deep. Runoff ranges from medium to rapid, depending on the slope and vegetation.

These soils warm up early in spring. The moderately permeable surface soil and subsoil hold enough water for crops. Excess rainwater and irrigation water drain away readily through the coarse-textured substratum. Fertilizer and lime are needed.

Practically all of these soils are in crops. Large areas on gentle slopes are well suited to irrigated special crops.

Ockley silt loam, 0 to 2 percent slopes (ObA1, Capability unit I–1).—Most of this soil has had little or no erosion. A typical profile follows.

Surface soil—
- 0 to 7 inches, brown to dark-brown friable silt loam; moderate fine to medium granular structure; medium content of organic matter; slightly acid to medium acid.
- 7 to 11 inches, yellowish-brown to brown friable silt loam; moderate fine to medium subangular blocky structure; medium acid to strongly acid.

Subsoil—
- 11 to 23 inches, yellowish-brown firm to friable silt loam to fine silt loam; moderate fine subangular blocky structure; medium acid to strongly acid.
- 23 to 44 inches, dark-brown to reddish-brown firm to very firm gravelly clay loam, sandy clay loam, and silty clay loam; moderate to weak medium to coarse subangular blocky structure; sticky when wet; medium acid to strongly acid in upper part, grading to neutral in lower part.

Substratum—
- 44 inches+, pale-brown or light brownish-gray stratified gravel and sand; calcareous.

This is an excellent soil for crops. It is well drained and has good moisture-holding capacity. It is not easily eroded because of its level topography. It is suited to a wide range of crops, including early truck crops. It is well suited to irrigation. It needs lime to correct acidity and fertilizer to increase yields.

Ockley silt loam, 2 to 6 percent slopes, slightly eroded (ObB1, Capability unit IIe–1).—This is a good soil for crops, but it needs lime and fertilizer. It is well suited to irrigation. Crop rotations should include hay crops, which will supply organic matter, prevent further erosion, and keep the soil in good tilth.

Ockley silt loam, 2 to 6 percent slopes, moderately eroded (ObB2, Capability unit IIe–1).—This soil is like Ockley silt loam, 0 to 2 percent slopes, except that part of the surface soil has been removed by erosion. The plow layer is a mixture of original surface soil and subsoil.

When this soil is used for crops, it should be protected against erosion. Hay should be included in the rotation to improve tilth and to supply organic matter. Lime and fertilizer are needed. This soil can be irrigated and used for special crops.

Ockley silt loam, 6 to 12 percent slopes, slightly eroded (ObC1, Capability unit IIIe–1).—This soil is 2 to 4 inches shallower than Ockley silt loam, 0 to 2 percent slopes. It is suitable for rotation crops, but it should not be irrigated because of the erosion hazard. It needs lime, fertilizer, and protection against erosion.

Ockley silt loam, 6 to 12 percent slopes, moderately eroded (ObC2, Capability unit IIIe–1).—This soil is like Ockley silt loam, 0 to 2 percent slopes, except that it is 2 to 4 inches shallower. Part of the surface soil has been removed by erosion, and the rest has been plowed into the upper subsoil.

Enough hay crops should be grown in the rotation to keep the soil in good tilth and to supply organic matter. Lime and fertilizer are needed. Protection against further erosion is necessary.

Ockley loam, 0 to 2 percent slopes (OaA1, Capability unit I–1).—This soil is slightly eroded to uneroded. A typical profile follows.

Surface soil—
- 0 to 7 inches, brown to dark-brown friable loam; weak very fine and fine granular to crumb structure; medium content of organic matter; slightly acid to medium acid.
- 7 to 11 inches, yellowish-brown to brown friable loam; moderate fine to medium granular to subangular blocky structure; medium acid to strongly acid.

Subsoil—
- 11 to 23 inches, yellowish-brown friable loam; moderate medium to fine subangular blocky structure; medium acid to strongly acid.
- 23 to 44 inches, dark-brown to reddish-brown firm to very firm gravelly clay loam, sandy clay loam, and silty clay loam; moderate to weak medium to coarse subangular blocky structure; sticky when wet; medium acid to strongly acid in upper part, grading to neutral in lower part.

Substratum—
- 44 inches+, pale-brown or light brownish-gray stratified gravel and sand; calcareous.

This is a very good soil for special crops and also for general crops. It is suitable for irrigation. It needs lime and fertilizer.

Ockley loam, 2 to 6 percent slopes, slightly eroded (OaB1, Capability unit IIe–1).—This soil is similar to Ockley loam, 0 to 2 percent slopes. Some areas are on irregular slopes. This soil is suitable for irrigation but needs to be protected against further erosion. Hay should be part of the rotation, as it adds organic matter and improves tilth.

Ockley loam, 2 to 6 percent slopes, moderately eroded (OaB2, Capability unit IIe–1).—This soil is similar to Ockley loam, 0 to 2 percent slopes, except that part of the surface layer has been removed by erosion. The plow layer is now a mixture of surface soil and subsoil.

This soil can be irrigated if care is taken to prevent erosion. It is suitable for special crops as well as rotation crops if lime and fertilizer are applied.

Orrville series

These are somewhat poorly drained Alluvial soils. They formed from alluvium derived from sandstone, shale, or noncalcareous glacial till. They occur in long strips along stream bottoms and are associated with well drained Chagrin soils and moderately well drained Lobdell soils. The native forest is elm and maple.

The surface soil is medium textured or moderately coarse textured. It is medium to low in organic matter. If worked when too wet, it will puddle and clod.

Nearby streams normally flood these soils every year. Surface water is ponded or runs off slowly from slight slopes. These soils are slowly to very slowly permeable. During wet weather a perched water table develops. Where a good system of surface and subsurface drainage has been established, the root zone is shallow to moderately deep.

These soils need drainage by tile or ditches, or both. Rotation crops can be grown if they are not drowned out by floods or by excess water in the root zone. Lime and fertilizer are needed. Meadow and cover crops should be grown to keep the soil in good tilth and to supply organic matter. Along small streams and in irregular areas, these soils are used for pasture or forest.

Orrville silt loam (OdAO, Capability unit IIw–1).—This soil occurs on slopes of 0 to 2 percent. It is practically uneroded. A typical profile follows.

Surface soil—
- 0 to 7 inches, grayish-brown friable silt loam; weak coarse to medium granular structure; medium to low in organic matter; slightly acid.

Subsoil—
- 7 to 14 inches, grayish-brown friable silt loam to fine silt loam, with a few, fine, faint, yellowish-brown mottles; weak fine subangular blocky to coarse granular structure; medium acid to neutral.
- 14 to 50 inches, mottled grayish-brown, brownish-yellow, and light brownish-gray friable to slightly firm silty clay loam; weak medium subangular blocky structure to massive; contains sandy layers; medium acid to neutral.

Substratum—
- 50 inches+, brownish-yellow and olive-gray firm clay loam; massive; medium acid to neutral.

Orrville fine sandy loam (OcAO, Capability unit IIw–1).—This soil is sandier than Orrville silt loam, both in the surface soil and in the subsoil. Several areas have a loam surface layer. Little or no erosion has taken place. Slopes are less than 2 percent.

Otwell series

These well-drained soils have characteristics both of soils in the Gray-Brown Podzolic and of soils in the Red-Yellow Podzolic great soil groups. They occur on high benches or terraces, usually next to the upland Muskingum soils. They developed in a deep uniform deposit of silty alluvium or loess over laminated noncalcareous lacustrine clayey and silty materials of Illinoian age. The native vegetation was a forest of oak, hickory, and maple.

The surface soil is medium textured. It is medium in organic matter. At a normal moisture content, it is friable and easy to work. The root zone is deep to moderately deep. The subsoil is moderately permeable. Runoff ranges from medium to rapid, depending on slope and plant cover.

Most of these soils are now in crops, but steeper areas and small or odd areas are in pasture or forest.

Otwell silt loam, 2 to 6 percent slopes, slightly to moderately eroded (OeB2, Capability unit IIe–1).—A typical profile of this soil follows.

Surface soil—
- 0 to 7 inches, brown to grayish-brown very friable and smooth silt loam; moderate medium to fine granular structure; medium content of organic matter; medium acid.
- 7 to 11 inches, light yellowish-brown very friable silt loam; moderate medium to fine granular to subangular blocky structure; strongly acid.

Subsoil—
- 11 to 21 inches, pale-brown to yellowish-brown friable fine silt loam to silty clay loam; moderate fine to medium subangular blocky and angular blocky structure; strongly acid.
- 21 to 50 inches, yellowish-brown to pale-yellow friable to firm silty clay loam; prismatic structure, which breaks to moderate medium angular blocky or subangular blocky structure; very strongly acid.

Substratum—
- 50 inches+, weak-yellow to light-yellow friable to firm fine silt loam to silty clay loam; massive; underlain by laminated sandy and clayey materials; very strongly acid.

This soil can be used for rotation crops, but it should be protected from further erosion. Meadow crops should be grown part of the time. Lime and fertilizer should be applied.

Otwell silt loam, 6 to 12 percent slopes, slightly eroded (OeC1, Capability unit IIIe–1).—This soil is 3 to 6 inches shallower than Otwell silt loam, 2 to 6 percent slopes, slightly to moderately eroded. It can be used for rotation crops, but great care should be taken to prevent erosion. Close-growing crops should be included in the rotation. Lime and fertilizer are needed. This soil is suitable for pasture or forest.

Otwell silt loam, 6 to 12 percent slopes, moderately eroded (OeC2, Capability unit IIIe–1).—This soil is like Otwell silt loam, 2 to 6 percent slopes, slightly to moderately eroded, but it is 3 to 6 inches shallower. Erosion is more extensive, and several areas are severely eroded.

This soil is likely to erode further when used for rotation crops. It is suitable for permanent meadow, pasture, or forest.

Otwell silt loam, 12 to 18 percent slopes, moderately eroded (OeD2, Capability unit IVe–1).—This soil is 5 to 8 inches shallower than Otwell silt loam, 2 to 6 percent slopes, slightly to moderately eroded. Some areas are severely eroded.

This soil should not be used for row crops. It is suitable for hay, pasture, or forest.

Otwell silt loam, 18 to 25 percent slopes, moderately eroded (OeE2, Capability unit VIe–1).—The combined depth of the surface soil and subsoil is 6 to 10 inches less in this soil than in Otwell silt loam, 2 to 6 percent slopes, slightly to moderately eroded. Most of this soil is moderately eroded, but some areas are severely eroded.

This soil is suitable for permanent pasture or forest. It should not be used for crops.

Parke series

These well-drained soils have some characteristics of soils in the Gray-Brown Podzolic group, as well as some of soils in the Red-Yellow Podzolic great soil group. They developed on outwash terraces in smooth silty materials that may have been a uniform deposit of alluvium or loess. Horizons of sandy and gravelly material of Illinoian age lie at depths of 18 to 42 inches. Originally, part of this coarse material was calcareous. Weathering has removed the calcareous material from the upper substratum, but in most places calcareous gravel and sand occur at depths of 8 to 10 feet. In some places, large masses of gravel are cemented together with calcium carbonate.

The well-drained Negley and Pike soils are associated with this series. The native forest is oak, hickory, and maple.

Where the surface soil has not been eroded, it is medium textured. It can be worked over a wide moisture range. The organic-matter content is medium. The root zone is moderately deep. Drainage is moderate through the subsoil and rapid through the substratum. Runoff ranges from medium to very rapid, according to the slope and vegetation.

These soils are used for crops, pasture, or forest, depending on slope, erosion, size of area, and associated soils.

Parke silt loam, 2 to 6 percent slopes, slightly eroded (PaB1, Capability unit IIe–1).—A typical profile of this soil follows.

Surface soil—
- 0 to 7 inches, yellowish-brown to brown very friable and smooth silt loam; moderate medium to fine granular structure; medium content of organic matter; medium acid.
- 7 to 11 inches, yellowish-brown friable silt loam; moderate medium subangular blocky structure; medium acid to strongly acid.

Subsoil—
- 11 to 24 inches, brown to yellowish-brown friable silty clay loam; moderate medium subangular blocky structure; sticky and plastic when wet; medium acid to strongly acid.
- 24 to 37 inches, weak reddish-brown to yellowish-brown friable to firm silty clay loam; moderate medium to coarse angular blocky structure; sticky and plastic when wet; strongly acid.

Substratum—
- 37 to 80 inches, reddish-brown to yellowish-brown firm silty clay loam, sandy clay loam, and loam; moderate medium to coarse angular blocky structure; sticky and plastic when wet; strongly acid.
- 80 inches+, yellowish-gray stratified loose sandy and gravelly materials; massive structure; medium acid to slightly acid; calcareous gravel and sand in some places.

The depth to the unweathered lower substratum may be as much as 110 inches.

This soil dries out and warms up early in spring. Large areas are suitable for growing special crops under irrigation. Excess water readily drains away through the moderately permeable subsoil and the rapidly permeable substratum. This soil should be protected against erosion. Lime, fertilizer, and cover crops are needed.

Parke silt loam, 2 to 6 percent slopes, moderately eroded (PaB2, Capability unit IIe–1).—This soil is like Parke silt loam, 2 to 6 percent slopes, slightly eroded, except that more of the surface soil has been removed by erosion. The plow layer is now a mixture of surface soil and subsoil.

Parke silt loam, 6 to 12 percent slopes, slightly eroded (PaC1, Capability unit IIIe–2).—This soil is 2 to 4 inches shallower than Parke silt loam, 2 to 6 percent slopes, slightly eroded, and is not so well suited to irrigation. It can be used for rotation crops if limed, fertilized, and protected from erosion. Meadow crops should be included in the rotation.

Parke silt loam, 6 to 12 percent slopes, moderately eroded (PaC2, Capability unit IIIe–2).—This soil is like Parke silt loam, 2 to 6 percent slopes, slightly eroded, but is 2 to 4 inches shallower. Part of the surface soil has been removed by erosion, and the rest is mixed with the upper subsoil. Several areas have been severely eroded.

This soil can be used for rotation crops if they are protected from further erosion. Lime and fertilizer are needed. The rotation should consist largely of meadow crops.

Parke silt loam, 12 to 18 percent slopes, slightly eroded (PaD1, Capability unit IVe–1).—This soil is 3 to 6 inches shallower than Parke silt loam, 2 to 6 percent slopes, slightly eroded. Some of it is on irregular slopes.

This soil is not suitable for row crops. It should be used for hay, pasture, or forest.

Parke silt loam, 12 to 18 percent slopes, moderately eroded (PaD2, Capability unit IVe–1).—This soil is 3 to 6 inches shallower than Parke silt loam, 2 to 6 percent slopes, slightly eroded. Part of the surface layer has been removed by erosion, and the rest is mixed with the upper subsoil. In some places the slopes are irregular.

This soil is suitable for hay, pasture, or forest but not for row crops.

Parke silt loam, 18 to 25 percent slopes, slightly eroded (PaE1, Capability unit VIe–1).—This soil is similar to Parke silt loam, 2 to 6 percent slopes, slightly eroded, except that it is 4 to 7 inches shallower. It is suitable for pasture or forest.

Parke silt loam, 18 to 25 percent slopes, moderately eroded (PaE2, Capability unit VIe–1).—This soil is 4 to 7 inches shallower than Parke silt loam, 2 to 6 percent slopes, slightly eroded. Some of the surface soil has been removed by erosion, and some has been mixed with the upper subsoil. The slopes are irregular in several areas.

This soil should not be used for rotation crops. It is suitable for pasture and forest.

Parke silty clay loam, 12 to 18 percent slopes, severely eroded (PbD3, Capability unit VIe–1).—This soil is the result of severe erosion of Parke silt loam on slopes of 12 to 18 percent. A typical profile follows.

Surface soil—
- 0 to 7 inches, brown to yellowish-brown firm to friable silty clay loam; weak to moderate fine to medium granular structure; sticky and plastic when wet; low in organic matter; medium acid.

Subsoil—
- 7 to 13 inches, brown to yellowish-brown friable silty clay loam; moderate medium subangular blocky structure; sticky and plastic when wet; medium acid to strongly acid.
- 13 to 26 inches, weak reddish-brown to yellowish-brown friable to firm silty clay loam; moderate medium to coarse angular blocky structure; sticky and plastic when wet; strongly acid.

Substratum—
- 26 to 69 inches, reddish-brown to yellowish-brown firm silty clay loam, sandy clay loam, and loam; moderate medium to coarse angular blocky structure; sticky and plastic when wet; strongly acid.
- 69 inches+, yellowish-gray stratified loose sandy and gravelly materials; massive structure; medium acid to slightly acid. Calcareous gravel and sand are present in some places in this layer and at lower depths.

In places the lower substratum extends to a depth of 100 inches. In many spots the surface soil is silt loam. The tilth is very poor. When wet, the surface soil seals into a sticky, plastic mass. The organic-matter content is low.

This soil can be used for hay or pasture if it receives enough lime and fertilizer. It is also suitable for forestry.

Parke silty clay loam, 18 to 25 percent slopes, severely eroded (PbE3, Capability unit VIIe–1).—This soil resulted from severe erosion of Parke silt loam on slopes of 18 to 25 percent. It is like the Parke silty clay loam, 12 to 18 percent slopes, severely eroded, but it is 1 to 2 inches shallower.

This soil is sticky, plastic, and massive when wet. Tilth is poor. The surface layer contains little organic matter. This soil can be used for pasture if it is limed and fertilized. It is also suitable for forestry.

Pike series

These are well-drained Gray-Brown Podzolic soils. They occur on high outwash terraces in the valleys of the Hocking River and Raccoon Run. The surface soil and subsoil developed from smooth, deep, medium acid, silty material overlying stratified sandy and gravelly deposits of Illinoian age. The silty material was probably a uniform deposit of alluvium or windblown silt. The gravelly and sandy substratum was probably calcareous, but the calcareous materials have been removed by weathering. At depths of 10 to 15 feet, partly stratified, weathered, calcareous sand and gravel occur. In some places, large masses of gravel and sand have been cemented by calcium carbonate below 15 feet.

The associated soils are the droughty, well-drained Negley and the well-drained Parke. The native vegetation was a forest of oak and hickory.

The root zone of these soils is deep. The surface soil is medium textured and medium in organic matter. Tilth is good. The soil dries out and warms up early in spring and can be worked easily over a wide range of moisture content.

Runoff ranges from slow to rapid, depending on slope and vegetation. Irrigation is feasible. The surface soil and subsoil are moderately permeable, and any excess of water drains away readily through the coarse substratum.

Pike silt loam, 0 to 2 percent slopes (PcA1, Capability unit I–1).—Most of this soil is slightly eroded. A typical profile follows.

Surface soil—
- 0 to 8 inches, dark yellowish-brown to brown friable and smooth silt loam; moderate medium granular structure; medium content of organic matter; medium acid.

Subsoil—
- 8 to 11 inches, yellowish-brown friable and smooth silty clay loam; moderate medium subangular blocky structure; medium acid.
- 11 to 30 inches, yellowish-brown friable and smooth silty clay loam to clay loam; moderate medium subangular blocky structure; medium acid.
- 30 to 54 inches, yellowish-brown friable and smooth silty clay loam to fine silt loam with a few, faint, brownish-gray mottles in lower part; weak medium subangular blocky structure; strongly acid.

Substratum—
- 54 inches+, strong-brown firm to friable, thinly and indistinctly stratified sandy clay loam and sandy clay; massive structure; in a few places weathered partly stratified sand and gravel occur at depths of about 10 to 15 feet.

All of this soil is used for crops. Because it is well drained, large areas are suitable for special crops under irrigation. Meadow or cover crops should be grown in the rotations to keep the soil in good tilth and to supply organic matter. Lime and fertilizer should be applied.

Pike silt loam, 2 to 6 percent slopes (PcB1, Capability unit IIe–1).—This soil is similar to Pike silt loam, 0 to 2 percent slopes. It is practically uneroded. Large gently sloping areas are suitable for irrigated crops. The soil needs to be limed and fertilized and protected from erosion.

Pike silt loam, 2 to 6 percent slopes, moderately eroded (PcB2, Capability unit IIe–1).—These soils are like Pike silt loam, 0 to 2 percent slopes, except that part of the surface soil has been removed by erosion. The present plow layer is a mixture of surface soil and subsoil. This soil can be used for irrigated crops, but it should be protected from further erosion. Lime and fertilizer should be applied for crops or pasture.

Pike silt loam, 6 to 12 percent slopes, moderately eroded (PcC2, Capability unit IIIe–1).—This soil is 2 to 3 inches shallower than Pike silt loam, 0 to 2 percent slopes. Part of the surface soil has been removed by erosion, and the rest is mixed with the subsoil. A few areas are only slightly eroded.

This is not a good soil for irrigation because it is too sloping and eroded. It is suitable for rotation crops. Hay should be part of the rotation in order to keep the soil in good tilth and to add organic matter. This soil should be limed, fertilized, and protected from erosion.

Riverwash

Riverwash (Ra).—This is a mixture of pebbles, stones, sand, and small quantities of finer material. It occurs along streams or in abandoned channels. Most of it is highly calcareous because it contains pebbles of limestone and dolomite.

This material is almost worthless for agriculture. Some of the gravel is used for roads and other construction.

Rodman series

These well-drained Rendzina soils developed over calcareous gravel and sand of Wisconsin age. They occur on the very steep terrace escarpments in outwash areas and are associated with the well-drained Casco and Fox soils. The native vegetation is a deciduous forest of oak and hickory.

The typical surface soil is a coarse, gravelly, cobbly loam that is very low in organic matter. Internal drainage is rapid. These soils are droughty in summer, and their root zone is shallow to very shallow.

In this county, the Rodman soils are so closely associated with the Casco soils that they cannot be separated on the soil map. A profile of Rodman loam is described in Casco and Rodman loams, 25 to 40 percent slopes, moderately eroded, under the Casco series.

Ross series

These are well-drained Alluvial soils. They occur in strips along stream bottoms. Most of the neutral alluvium from which they developed was washed from calcareous Wisconsin glacial till. These soils are associated with the well drained Genesee soils, the moderately well drained Eel soils, the somewhat poorly drained Shoals soils, and the very poorly drained Sloan soils. The native vegetation was a deciduous forest of oak, ash, walnut, and sycamore.

The surface soil is medium textured. Its very dark brown color is like that of prairie soils. It is high in organic matter. Runoff is slow. The soils are moderately permeable, and the root zone is deep. Floods sometimes damage crops, but these soils are otherwise productive.

Ross silt loam (RbAO, Capability unit I–2).—This soil occurs on slopes of 0 to 2 percent. It is practically uneroded. A typical profile follows.

Surface soil—
- 0 to 8 inches, very dark brown very friable silt loam; moderate to strong fine to medium granular structure; high in organic matter; neutral.

Subsoil—
- 8 to 16 inches, dark grayish-brown friable silt loam to fine silt loam; moderate medium to coarse granular structure; upper part high in organic matter, lower part lower in organic matter; neutral.
- 16 to 48 inches, yellowish-brown to dark yellowish-brown friable coarsely stratified fine silt loam to silty clay loam; massive structure to weak fine to medium subangular blocky structure; contains some scattered gravel; neutral.

Substratum—
- 48 inches+, grayish-brown to gray, thin, indistinct layers of stratified sandy, silty, and clayey materials; massive structure; neutral to calcareous.

Most of this soil is used for rotation crops. It can be cropped heavily. In a few irregular areas and along small streams, it is used for pasture or forest. It needs fertilizer and may need a little lime for alfalfa.

Sebring series

These soils are poorly drained Planosols, or claypan soils. They developed on terraces over noncalcareous stratified lacustrine silty and clayey materials of Wisconsin age. Associated soils are the well drained Markland, the moderately well drained Glenford, the somewhat poorly drained McGary and Fitchville, and the very poorly drained Montgomery soils. The native vegetation is a deciduous forest of beech, maple, and elm.

The surface soil is medium textured. It has little organic matter. If the soil is worked when too wet, it may puddle or clod. Surface water ponds or runs off slowly. The grayish clayey subsoil is slowly to very slowly permeable. In wet weather, a perched water table stands above the claypan. The root zone is shallow. This soil is not suitable for crops unless drained.

In this county areas of Sebring soils contain so many small areas of McGary soils that the two series are mapped together as McGary and Sebring silt loams, 0 to 2 percent slopes. The description of this unit, under the McGary series, includes a typical profile of Sebring silt loam.

Shoals series

These somewhat poorly drained Alluvial soils occur in strips along stream bottoms. They developed from neutral alluvium washed from calcareous Wisconsin till. Associated soils are the well drained Genesee soils, the moderately well drained Eel soils, and the very poorly drained Sloan soils. The native forest was elm and maple.

The surface soil is medium to low in organic matter. It will puddle and clod if worked when wet. Surface water may pond or run off slowly from slight slopes. These soils are slowly to very slowly permeable. During wet weather a perched water table waterlogs the upper layers. If a good system of surface drainage, tile drainage, or both, has been installed, the root zone is shallow to moderately deep.

These soils are used mostly for crops. Pasture and forest grow along small streams and in irregular areas. Drainage must be provided or crops will drown out. Seasonal flooding is normal.

Shoals silt loam (SaAO, Capability unit IIw–1).—This soil occurs on slopes of 0 to 2 percent. It is practically uneroded. The following profile is typical.

Surface soil—
- 0 to 7 inches, grayish-brown friable fine silt loam; moderate medium granular structure; medium to low content of organic matter; neutral.

Subsoil—
- 7 to 15 inches, grayish-brown friable fine silt loam mottled with light brownish gray; moderate medium granular structure; neutral.
- 15 to 35 inches, mottled yellowish-brown, dark-gray, and light-gray firm silt loam to fine silt loam; massive to weak fine to medium subangular blocky structure; scattered areas contain roughly stratified gravelly material; neutral.

Substratum—
- 35 inches+, mottled dark-gray, dark grayish-brown, and yellowish-brown, firm to friable, stratified sand and silt; neutral; calcareous sand and gravel are common at depths of about 50 to 60 inches.

In some places sandy loam, fine sandy loam, and silty clay loam have been deposited on the surface by recent floods.

When floods do not damage crops, this soil is reasonably productive. It needs fertilizer and may need lime. Meadow crops in the rotation will supply organic matter and improve tilth.

Sleeth series

These are somewhat poorly drained Gray-Brown Podzolic soils. They developed in silty and loamy materials on outwash terraces. The substratum is stratified calcareous gravelly and sandy material of Wisconsin age. These soils are associated with the well drained Fox and Ockley soils, the moderately well drained Thackery soils, and the very poorly drained Westland soils. A forest of oak, maple, beech, and elm was the native vegetation.

The surface soil is medium textured and contains a medium amount of organic matter. It will clod if worked when too wet. Runoff varies from slow to medium, depending on the slope and plant cover. The grayish clayey subsoil is slowly permeable. A perched water table stands above this layer during wet weather. The root zone is shallow to moderately deep.

These soils are used mostly for crops. Small areas are in pasture or forest. Artificial drainage is necessary for farming these soils. Tile drains work well.

Sleeth silt loam, 0 to 2 percent slopes (SbA1, Capability unit IIw–2).—Most of this soil is practically uneroded, but a few areas are slightly eroded. The profile that follows is typical of this soil.

Surface soil—
- 0 to 7 inches, grayish-brown to dark grayish-brown friable and smooth silt loam; weak to moderate very fine to fine granular structure; medium content of organic matter; slightly acid.
- 7 to 12 inches, mottled yellowish-brown and grayish-brown friable and smooth silt loam; weak fine platy to moderate medium subangular blocky structure; slightly acid.

Subsoil—
- 12 to 18 inches, mottled yellowish-brown and light grayish-brown firm to friable fine silt loam to silty clay loam; moderate fine to medium subangular blocky structure; medium acid to strongly acid.
- 18 to 32 inches, distinctly mottled light brownish-gray and yellowish-brown firm silty clay loam; moderate medium to coarse subangular blocky structure; medium acid to strongly acid.

Substratum—
- 32 to 50 inches, distinctly mottled light brownish-gray and yellowish-brown firm clay loam, gravelly clay loam, and sandy clay loam; weak coarse to very coarse subangular blocky structure; medium acid to strongly acid in upper part; grading to slightly acid or neutral in lower part.
- 50 inches+, gray and brownish-gray stratified sand and gravel; calcareous.

This soil should be drained by tile, surface ditches, or both. Meadow crops should be included in the rotation to improve tilth. Crops need lime and fertilizer.

Sleeth silt loam, 2 to 6 percent slopes, slightly eroded (SbB1, Capability unit IIw–2).—This soil is like Sleeth silt loam, 0 to 2 percent slopes, but presents a more difficult problem of erosion control. It needs surface and subsurface drainage. The rotation should include enough meadow and cover crops to hold the soil and supply organic matter. Lime and fertilizer should be applied.

Sloan series

These very poorly drained Humic Gley soils occur in strips along the stream bottoms. The neutral alluvium from which they developed was washed primarily from calcareous Wisconsin till. The well drained Genesee soils, the moderately well drained Eel soils, and the somewhat poorly drained Shoals soils are associated with this series. The native vegetation was a deciduous forest of oak, maple, beech, and elm.

The surface soil is medium to moderately fine in texture. It is medium to high in organic matter. Floods occur frequently, and the water ponds or runs off slowly from slight slopes. Permeability is moderate. In wet weather a perched water table waterlogs the soil. If a good drainage system has been installed, the root zone is moderately deep.

A few areas are in pasture or forest, but most are used for crops. When crops are not damaged by floods, yields are good. Tile drains, surface ditches, or both, are necessary to keep crops from drowning out.

Sloan silty clay loam (SdAO, Capability unit IIw-1).—This soil occurs on slopes of 0 to 2 percent. It has little or no erosion. A typical profile follows.

Surface soil—
- 0 to 7 inches, black to very dark gray friable silty clay loam; moderate fine granular structure; medium to high content of organic matter; neutral.

Subsoil—
- 7 to 24 inches, black to very dark gray friable silty clay loam; weak to moderate medium subangular blocky structure; medium to high content of organic matter; neutral.
- 24 to 36 inches, very dark gray to very dark grayish-brown silty clay loam with few to common, faint, fine, dark grayish-brown mottles; moderate medium subangular blocky structure; neutral.

Substratum—
- 36 inches+, mottled yellowish-brown and olive-gray firm to friable silt loam, silty clay loam, and clay loam; massive; contains considerable light-gray weathered limestone gravel and is roughly stratified; neutral.

This is a productive soil for crops when properly drained. Flooding sometimes delays seeding operations or causes damage to crops. Lime is not usually needed. The soil is naturally fertile, but fertilization usually brings some response from crops.

Sloan silt loam (ScAO, Capability unit IIw-1).—This soil is similar to Sloan silty clay loam, except for the surface texture. It is practically uneroded. Slopes range from 0 to 2 percent.

This soil is productive if it is drained and fertilized. Lime is not usually needed. Cover crops and meadow crops will help to keep the soil in good tilth and to replenish the supply of organic matter.

Stone quarries

Stone quarries.—Stone is quarried only in the Allegheny Plateau part of the county, mostly in areas of Muskingum sandy loam or rocky sandy loam. Most of the stone quarried is the coarse-grained Black Hand sandstone. This stone was once used extensively for buildings, canal locks, and other construction, but little quarrying has been done since about 1920. Larger quarries are outlined on the soil map and marked by the crossed pick and hammer symbol. Smaller quarries are shown by the symbol only.

Thackery series

These moderately well drained Gray-Brown Podzolic soils occur on outwash terraces. They developed in a layer of silt over gravelly and sandy material of Wisconsin age. This material is calcareous and lies at depths of more than 42 inches. The smooth silt of the upper part of the profile may have been a very uniform alluvial deposit or a capping of windblown silt.

These soils are associated with the well-drained Fox and Ockley soils, the somewhat poorly drained Sleeth soils, and the very poorly drained Westland soils. The native forest was oak, hickory, and maple. Almost all of these soils are now cropped.

The surface soil is medium textured and contains a medium amount of organic matter. The subsoil is slightly plastic when wet. Internal drainage is medium to slow, and runoff ranges from slow to medium, depending on vegetation and slope. The root zone is deep to moderately deep. The sloping areas need erosion control, and the wet spots need drainage.

Thackery silt loam, 0 to 2 percent slopes (TaA1, Capability unit I-1).—About half of this soil is slightly eroded. The rest is practically uneroded. The following profile is typical.

Surface soil—
- 0 to 7 inches, brown to dark-brown very friable silt loam; moderate medium granular structure; medium content of organic matter; slightly acid.
- 7 to 11 inches, yellowish-brown to brown friable silt loam; weak to moderate thin platy structure to weak medium subangular blocky structure; medium acid.

Subsoil—
- 11 to 21 inches, yellowish-brown to brown firm to friable silty clay loam; moderate fine subangular blocky structure; medium acid to strongly acid.
- 21 to 40 inches, mottled dark-brown, yellowish-brown, and light brownish-gray firm clay loam; moderate to strong medium to coarse subangular blocky structure; medium acid to strongly acid in upper part, grading to slightly acid in lower part.

Substratum—
- 40 inches+, pale-brown or light brownish-gray stratified gravel, silt, and sand; calcareous.

The depth to the substratum ranges from 40 to 46 inches. Wet spots should be tiled for drainage.

Thackery silt loam, 2 to 6 percent slopes, slightly eroded (TaB1, Capability unit IIe-1).—This soil is similar to Thackery silt loam, 0 to 2 percent slopes. It should be protected against further erosion if used for crops. Lime and fertilizer are needed. Meadow crops should be included in the rotation to keep the soil in good tilth and to supply organic matter.

Tippecanoe series

These moderately well drained Brunizem, or prairie, soils occur on glacial outwash terraces of Wisconsin age. The surface soil and subsoil developed in smooth silty material that overlies the stratified gravelly and sandy substratum. The silty layers were probably a very uniform alluvial deposit or a capping of windblown silt. The calcareous substratum is at a depth of 42 inches, or deeper.

The associated soils belong to the well drained Warsaw, Ockley, and Fox series, the moderately well drained Thackery series, the somewhat poorly drained Sleeth series, and the very poorly drained Westland series. The native vegetation was prairie grass, but some oak and maple trees had grown up on these prairie soils. Practically all of this series is used for crops.

The texture of the surface soil is medium, and the organic-matter content is medium to high. Runoff is slow to medium on the typical slopes of less than 2 percent. The subsoils are slightly plastic when wet and

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medium to slow in permeability. The root zone is deep to moderately deep.

Tippecanoe silt loam (TbA1, Capability unit I–1).—About two-thirds of this soil is slightly eroded. Slopes are less than 2 percent. A typical profile follows.

Surface soil—
- 0 to 11 inches, very dark brown very friable silt loam; moderate medium granular structure; medium to high content of organic matter; slightly acid to medium acid.
- 11 to 14 inches, dark-brown and very dark grayish-brown friable silt loam to silty clay loam; moderate medium to coarse granular structure; medium acid to strongly acid.

Subsoil—
- 14 to 32 inches, yellowish-brown friable to firm silty clay loam with a few pale-brown mottles; moderate fine to medium subangular blocky structure; medium acid to strongly acid.
- 32 to 46 inches, mottled grayish-brown, yellowish-brown, and dark-brown friable to firm clay loam, sandy clay loam, and gravelly clay loam; moderate to weak medium to coarse subangular blocky structure; medium acid to strongly acid in the upper part, grading to neutral in the lower part.

Substratum—
- 46 inches+, pale-brown or light brownish-gray stratified gravelly, silty, and sandy materials; calcareous.

Tile drains should be installed in wet spots. Crops should be limed if the soil is acid. Growing hay and cover crops in the rotation and applying fertilizer will improve the tilth and increase the organic-matter content.

Wallkill series

These very poorly drained soils consist of mineral alluvium underlain by an organic soil. The original soil on these areas was a muck formed from grasses, sedges, and trees that accumulated in very old former ponds and marshes. Its thickness and depth vary. Later, a thick layer of silty alluvium was washed in from higher lying areas of calcareous Wisconsin till and deposited over the the muck. This alluvium is medium textured to moderately fine textured and varies considerably in thickness and in color.

The surface layer will puddle and clod if worked when too wet. It is medium in organic matter, but the mucky subsoil is very high in organic matter. Both layers are moderately to slowly permeable. The water table is high for long periods during and after wet weather, and water is frequently ponded on the surface. Tiling, ditching, or both kinds of drainage must be provided to make these soils suitable for crops. The root zone is moderately deep to shallow after the water is drained from the upper layers of the soil. Surface water from adjoining higher land should be diverted.

The native forest is composed of oak and maple. Some areas are drained and used for crops, and the others are in pasture or forest.

Wallkill silt loam (WaA0, Capability unit IIw–1).—This soil occurs on slopes of 0 to 2 percent. It is practically uneroded. Profiles vary considerably, but the following one is typical.

Surface soil—
- 0 to 12 inches, grayish-brown friable silt loam; moderate medium granular structure; medium content of organic matter; neutral.

Subsoil—
- 12 to 24 inches, black very friable muck; fine granular structure; neutral.

Substratum—
- 24 inches+, dark olive-gray, compact, firm silty and clayey materials; roughly stratified; calcareous. This layer is underlain by calcareous marly gravel at greater depths.

The thickness of the surface soil varies from 1 to 2 feet. The mucky subsoil is 1 to 4 feet thick. Drainage is the chief management problem.

Wallkill silty clay loam (WbA0, Capability unit IIw–1).—This soil is similar to Wallkill silt loam, except that the finer textured surface soil was deposited in slower flowing or ponded water. Slopes are less than 2 percent. Little or no erosion has taken place. This soil needs drainage to make it suitable for crops.

Warsaw series

These well-drained Brunizem, or prairie, soils developed on outwash terraces from silty and loamy materials. Stratified calcareous gravel and sand of Wisconsin age occur at depths of 24 to 42 inches. The associated soils are the well drained Wea, Ockley, and Fox soils, the moderately well drained Tippecanoe and Thackery soils, the somewhat poorly drained Sleeth soils, and the very poorly drained Westland soils. The native vegetation was prairie grass, but some oak and maple trees grew on these areas.

The surface soil is medium textured and medium to high in organic matter. It is friable and easy to work. The root zone is moderately deep. These soils warm up early in spring. Runoff is medium to rapid, depending on the slope and plant cover. Internal drainage is rapid, and the soil tends to be droughty.

These soils are now used mostly for crops. Large areas on gentle slopes are excellent for special crops under irrigation. Both the surface soil and subsoil are moderately permeable. Excess water drains away rapidly through the substratum.

Warsaw silt loam, 0 to 2 percent slopes (WcA0, Capability unit IIs–1).—This soil is practically uneroded. The following profile is typical.

Surface soil—
- 0 to 8 inches, very dark brown very friable silt loam; moderate to strong granular structure to crumb structure; medium to high content of organic matter; neutral to slightly acid.
- 8 to 12 inches, dark-brown friable silt loam; moderate granular structure; slightly acid to medium acid.

Subsoil—
- 12 to 28 inches, dark grayish-brown friable clay loam; moderate subangular to angular blocky structure; contains considerable gravel; medium acid.
- 28 to 40 inches, dark reddish-brown firm to friable gravelly clay loam; massive structure; sticky and plastic when wet; slightly acid to medium acid in upper part, grading to neutral in lower part; irregular lower boundary; tongue-like extensions into substratum.

Substratum—
- 40 inches+, gray and light-yellow, loose, stratified sandy and gravelly materials; highly calcareous.

A few areas have gravelly surface soils.

Warsaw silt loam, 2 to 6 percent slopes, slightly eroded (WcB1, Capability unit IIe–1).—This soil is similar to Warsaw silt loam, 0 to 2 percent slopes. If irrigated, it should be protected against erosion.

Wea series

These are well-drained Brunizem, or prairie, soils. They developed from silty and loamy materials more than 42 inches deep over stratified, calcareous gravel and sand on outwash terraces of Wisconsin age. The smooth siltiness of the upper layers suggests a uniform deposit of alluvium or windblown silt. The associated soils are the well drained Warsaw, Ockley, and Fox soils, the moderately well drained Tippecanoe and Thackery soils, the somewhat poorly drained Sleeth soils, and the very poorly drained Westland soils. The native vegetation was prairie grass and a few oak and maple trees.

The surface soil is medium to high in organic matter. It is medium textured, friable, and easy to work. The root zone is moderately deep to deep. The subsoil is moderately permeable. Runoff varies from medium to rapid, depending on the vegetation and the slope.

Nearly all the acreage of these soils is now cropped. Large areas on gentle slopes are suitable for irrigated special crops because the soils warm up early in spring and are well drained. The surface soil and subsoil are moderately permeable; excess water drains away through the substratum.

Wea silt loam, 0 to 2 percent slopes (WdA1, Capability unit I–1).—About half of this soil is slightly eroded. A typical profile follows.

Surface soil—
- 0 to 7 inches, very dark brown very friable and smooth silt loam; moderate medium granular structure to crumb structure; high in organic matter; medium acid to slightly acid.
- 7 to 12 inches, dark-brown to very dark grayish-brown friable and smooth silt loam; moderate medium to coarse granular structure; medium acid to slightly acid.

Subsoil—
- 12 to 22 inches, dark reddish-brown to dark-brown friable silty clay loam to clay loam; moderate fine to medium subangular blocky structure; medium acid to strongly acid.
- 22 to 46 inches, dark reddish-brown to dark-brown firm to friable sandy and gravelly clay loam; moderate coarse subangular blocky structure; medium acid to strongly acid, grading to neutral in lower part.

Substratum—
- 46 inches+, gray and pale-brown stratified gravelly and sandy materials; calcareous.

This soil needs fertilizer and, in some places, lime. Hay and cover crops should be included in the rotation to keep the soil in good tilth and supply organic matter.

Wea silt loam, 2 to 6 percent slopes, slightly eroded (WdB1, Capability unit IIe–1).—This soil is like Wea silt loam, 0 to 2 percent slopes, but it is more likely to erode under cultivation.

Wellston series

These well-drained Gray-Brown Podzolic soils developed from interbedded acid sandstone and shale on uplands. The smooth silty upper layers in some areas appear to be deposits of windblown silt. The associated soils are the shallow, well drained Muskingum soils and the moderately well drained to somewhat poorly drained Keene soils. The native vegetation is deciduous forest that includes oak and hickory. Tulip-poplar grows in protected areas.

On the steep slopes these soils are shallower, but in most places they are more than 20 inches deep. In some places the subsoil rests directly on bedrock, and in others on unconsolidated material derived from bedrock. The subsoil is moderately permeable. The root zone is moderately deep to deep. Runoff is rapid to moderately rapid, depending on the plant cover and the slope. The surface soil is medium in organic matter. It is easy to work at normal moisture content.

Small and odd-shaped areas of these soils are in pasture or forest, but most of the acreage is in cropland.

Wellston silt loam, 2 to 6 percent slopes, slightly eroded (WeB1, Capability unit IIe–1).—The following profile is typical of this soil.

Surface soil—
- 0 to 8 inches, brown to dark grayish-brown friable and smooth silt loam; moderate medium granular structure; medium content of organic matter; strongly acid to medium acid.
- 8 to 11 inches, yellowish-brown very friable and smooth silt loam; weak fine platy and fine subangular blocky structure; strongly acid to medium acid.

Subsoil—
- 11 to 26 inches, strong-brown to light yellowish-brown friable to firm silty clay loam; moderate medium subangular blocky structure; contains many small flat fragments of sandstone and shale; strongly acid.
- 26 to 32 inches, yellowish-brown firm to friable fine sandy clay loam to silty clay loam; massive structure; contains considerable number of flat fragments of sandstone and shale; strongly acid.

Substratum—
- 32 inches+, interbedded sandstone and shale; acid.

Wellston silt loam, 6 to 12 percent slopes, slightly eroded (WeC1, Capability unit IIIe–2).—This soil is 3 to 6 inches shallower than Wellston silt loam, 2 to 6 percent slopes, slightly eroded. Enough meadow crops should be included in crop rotations to keep the soil in good tilth and to help control erosion. Lime and fertilizer should be applied to crops.

Wellston silt loam, 6 to 12 percent slopes, moderately eroded (WeC2, Capability unit IIIe–2).—This soil is similar to Wellston silt loam, 2 to 6 percent slopes, slightly eroded, except that it is 3 to 6 inches shallower. Part of the surface soil has been removed by erosion, and the remainder has been mixed with the upper subsoil. Several areas are severely eroded.

This soil is suitable for crops, pasture, or forest. If cropped, it should be protected against further erosion.

Wellston silt loam, 12 to 18 percent slopes, slightly to moderately eroded (WeD2, Capability unit IIIe–4).—This soil is 4 to 8 inches shallower than Wellston silt loam, 2 to 6 percent slopes, slightly eroded. The moderately eroded areas have lost part of their surface soil through erosion. The plow layer in these areas is a mixture of surface soil and subsoil.

This soil is very likely to erode if cultivated. It is suitable for hay, pasture, or forest. Row crops and small grain can be grown occasionally if care is taken to prevent erosion.

Westland series

These dark-colored, very poorly drained Humic Gley soils developed in lake-laid silty and fine loamy materials that overlie stratified gravel and sand on outwash terraces of Wisconsin age. Below a depth of 42 inches the gravel and sand are calcareous. The well-drained Thackery soils and the somewhat poorly drained Sleeth soils are associated with the soils of this series. The native forest included maple, beech, elm, and oak.

The grayish, clayey subsoil is slow to medium in permeability. In wet weather a perched water table develops. Surface water ponds or runs off slowly. The surface soil is medium to high in organic matter. Its texture is medium to moderately fine. It will puddle or clod if worked when too wet.

Most of the acreage is in crops, but small areas are in pasture or forest. Tile drains, surface ditches, or both, are needed to make these soils suitable for crops. Adequately drained soils have a moderately deep root zone.

Westland silty clay loam (WhAO, Capability unit IIw-3).—This soil occurs on slopes of less than 2 percent. A typical profile is as follows.

Surface soil—
- 0 to 8 inches, very dark gray to black friable to firm silty clay loam; moderate medium granular structure; medium to high content of organic matter; neutral.
- 8 to 12 inches, black to very dark gray firm fine clay loam to silty clay loam; moderate medium to coarse granular structure; neutral.

Subsoil—
- 12 to 45 inches, mottled gray, pale-yellow, and dark-gray firm clay to clay loam and some gravelly material; moderate medium angular blocky and subangular blocky structure; neutral.

Substratum—
- 45 inches+, gray and pale-yellow stratified silty, sandy, and gravelly materials; calcareous.

Westland silt loam (WgAO, Capability unit IIw-3).—This soil is similar to Westland silty clay loam, except that it has less clay in the surface soil and subsoil. A few areas have a gravelly surface soil. The slope is less than 2 percent.

Willette series

These are black, very poorly drained, organic soils. They were derived from grasses, sedges, trees, and other vegetation that accumulated in ponds, marshes, and potholes after the Wisconsin glacial age. These soils are associated with the black, very poorly drained Carlisle soils and in some places with the dark-colored, very poorly drained Sloan and Algiers soils. The native plants are marsh grasses and sedges and some elm and willow trees.

The soft friable surface layer is composed of the mucky remains of decayed vegetation. It is moderately permeable but is saturated most of the time by the high water table. The depth of the muck over the calcareous clay varies considerably, but in most places it is less than 3 feet. At the base of slopes around the edge of the areas, where a silty overwash has been deposited, the surface soil is a silty muck.

Surface drainage is necessary to make these soils suitable for crops. Partly drained areas provide good pasture during dry weather. Undrained areas are in pasture or forest. These soils do not support weight well. They are unsuitable for foundations for buildings and roads. They should not be worked with heavy machinery.

Willette muck (WkAO, Capability unit Vw-1). This soil occurs in slight depressions. Slopes are less than 2 percent. The profile varies considerably, but the following one is typical.

Surface soil—
- 0 to 36 inches, black to dark reddish-brown muck; granular structure; soft when moist, firm when dry; contains numerous fragments of partly decayed wood of various sizes; slightly acid to neutral.

Substratum—
- 36 inches+, dark olive-gray firm silty clay; calcareous.

The thickness of the muck surface soil ranges from 12 to 36 inches. The silty clay subsoil extends to 48 inches or more in depth. This is underlain by gravel in some areas.

Ponds and lakes

The 349 farm ponds in the county range from ¼ acre to 4 acres in size. They are used mainly to supply water for livestock, but many are stocked with fish. A large pond near Carroll and another in the southeastern part of Berne Township were constructed especially for fishing and recreation. About 1,213 acres of Buckeye Lake lie in the northeastern corner of the county. Buckeye Lake is an artificial reservoir constructed in the early nineteenth century as a feeder for the Ohio Canal system. It is now a vacation resort.

Use and Management of Soils

This section has six main parts. The first explains how soils are grouped according to their capability and assigns the soils of Fairfield County to capability units. The second gives suggestions on management of soils when used for row crops, pasture and hay, or forest. The third gives estimates of the yields that can be obtained from each soil under two levels of management. The fourth part tells which soils of the county are suitable for irrigation and what difficulties may be encountered. The fifth discusses the production of commercial vegetables in the county. The final part of this section suggests management to increase the number and variety of game animals and birds.

Capability Groups

Capability grouping is a system of classification used to show the relative suitability of soils for crops, grazing, forestry, or wildlife. It is a practical grouping based on the needs and limitations of the soils, the risks of damage to them, and also their response to management. In this report, soils have been grouped on three levels above the soil mapping unit. They are the capability unit, the subclass, and the class.

The capability unit, which can also be called a management group of soils, is the lowest level of capability grouping. A capability unit is made up of soils similar in kind of management needed, in risk of damage, and in general suitability for use.

The next broader grouping, the subclass, is used to indicate the dominant kind of limitation. The letter symbol "e" means that the main limiting factor is risk of erosion if the plant cover is not maintained. The symbol "w" means that excess water retards plant growth or interferes with cultivation. The symbol "s" means that the soils are shallow, droughty, or low in fertility.

The broadest grouping, the class, is identified by Roman numerals. All the soils in one class have limitations and management problems of about the same degree, but of different kinds as shown by the subclass. All the classes except class I may have one or more subclasses.

In classes I, II, and III are soils that are suitable for annual or periodic cultivation of annual or short-lived crops.

Class I soils are those that have the widest range of use and the least risk of damage. They are level or nearly level, productive, well drained, and easy to work. They can be cultivated with almost no risk of erosion and will remain productive if managed with normal care.

Class II soils can be cultivated regularly, but they do not have quite so wide a range of suitability as class I soils. Some class II soils are gently sloping and consequently need moderate care to prevent erosion. Other soils in class II may be slightly droughty, slightly wet, or somewhat limited in depth.

Class III soils can be cropped regularly, but they have a narrower range of use. They need even more careful management.

In class IV are soils that should be cultivated only occasionally or only under very careful management.

In classes V, VI, and VII are soils that normally should not be cultivated for annual or short-lived crops but can be used for pasture, for woodland, or for wildlife shelter.

Class V soils are nearly level and gently sloping, but they are droughty, wet, low in fertility, or otherwise unsuitable for cultivation.

Class VI soils are not suitable for crops because they are steep or droughty or otherwise limited, but they give fair yields of forage and fair to high yields of forest products. Some soils in class VI can, without damage, be cultivated enough so that fruit trees or forest trees can be set out or pasture crops seeded.

Class VII soils provide only poor to fair yields of forage. Yields of forest products may be fair to high. The soils have characteristics that severely limit their use for pasture and, in some places, for woodland.

In class VIII are soils that have practically no agricultural use. Some areas have value for watershed protection, wildlife shelter, or scenery. No class VIII soils have been mapped in Fairfield County.

The soils of Fairfield County have been grouped into the following classes, subclasses, and units.

Class I.—Deep, nearly level, productive soils that have few or no permanent limitations; suitable for tilled crops and other uses.
- Unit I–1.—Nearly level, well drained or moderately well drained soils of uplands.
- Unit I–2.—Nearly level, well drained or moderately well drained soils of bottom lands.

Class II.—Soils that have moderate limitations if tilled; suitable for crops, pasture, and trees.
- Subclass IIe.—Gently sloping soils, subject to erosion if cover is not maintained.
  - Unit IIe–1.—Gently sloping, well drained or moderately well drained soils.
- Subclass IIw.—Moderately wet soils.
  - Unit IIw–1.—Somewhat poorly drained or poorly drained soils of bottom lands.
  - Unit IIw–2.—Somewhat poorly drained or poorly drained, light-colored soils of uplands.
  - Unit IIw–3.—Somewhat poorly drained or poorly drained, dark-colored soils of upland depressions.
- Subclass IIs.—Soils somewhat limited by low moisture-holding capacity.
  - Unit IIs–1.—Gravelly or shallow soils.

Class III.—Soils that have severe limitations and require careful management if tilled; suitable for crops, pasture, and trees.
- Subclass IIIe.—Sloping soils that have high risk of erosion when tilled.
  - Unit IIIe–1.—Sloping, well-drained, deep soils on uplands and terraces.
  - Unit IIIe–2.—Sloping, well-drained, shallow or sandy soils on uplands and terraces.
  - Unit IIIe–3.—Sloping, moderately well drained soils on uplands.
  - Unit IIIe–4.—Strongly sloping, well-drained soils on uplands.
- Subclass IIIw.—Wet soils that require artificial drainage if they are tilled.
  - Unit IIIw–1.—Muck that is suitable for cultivation if drained.
  - Unit IIIw–2.—Wet, claypan soils.

Class IV.—Soils that have severe limitations if tilled; suitable for only limited or occasional cultivation but suited to pasture or trees.
- Subclass IVe.—Soils severely limited by risk of erosion if cover is not maintained.
  - Unit IVe–1.—Moderately steep, hilly, or eroded soils.
  - Unit IVe–2.—Gravelly or steep soils.

Class V.—Soils that have few limitations for pasture or trees; not suited to tilled crops.
- Subclass Vw.—Wet soils not suited to cultivation.
  - Unit Vw–1.—Slowly permeable muck over clay.

Class VI.—Soils that have moderate limitations for pasture or trees; not suited to tilled crops.
- Subclass VIe.—Soils moderately limited for pasture or trees by risk of erosion if cover is not maintained.
  - Unit VIe–1.—Steep or eroded soils.

Class VII.—Soils that have severe limitations for pasture or trees.
- Subclass VIIe.—Soils limited by risk of erosion if cover is not maintained.
  - Unit VIIe–1.—Steep, eroded, or rocky soils.

In the following pages each capability unit is described briefly, the soils in each are listed, and some suggestions for use and management are given.

Capability unit I–1

This unit consists of nearly level, well drained or moderately well drained soils of the uplands and terraces. The surface soils and subsoils are friable when moist. Water moves through the soil easily, and roots can grow freely. The natural drainage and the water-holding capacity are good. These soils are seldom too wet or too dry for crops. They are acid, except where they have been limed.

The soils in this unit are—

Alexandria silt loam, 0 to 2 percent slopes.
Cardington silt loam, 0 to 2 percent slopes.
Celina silt loam, 0 to 2 percent slopes.
Kendallville silt loam, 0 to 2 percent slopes.
Markland and Glenford silt loams, 0 to 2 percent slopes.
Mentor silt loam, 0 to 2 percent slopes.
Ockley loam, 0 to 2 percent slopes.
Ockley silt loam, 0 to 2 percent slopes.
Pike silt loam, 0 to 2 percent slopes.
Thackery silt loam, 0 to 2 percent slopes.
Tippecanoe silt loam.
Wea silt loam, 0 to 2 percent slopes.

These soils can be cropped intensively under good management. Maintaining the supply of organic matter, the fertility, and the good tilth are the major needs. The soils are low in phosphorus and potassium, and they need lime. The rotation should include at least 1 year of hay or pasture in each 3 years, and it is better to grow hay or pasture 3 years out of 5.

These soils, when fertilized and limed, will support good pastures, but they are normally used for rotation crops. New plantings of trees are ordinarily not made on these soils. If trees are planted, those that will grow in acid soil should be chosen. Pines for Christmas trees should grow well.

Capability unit I–2

These are nearly level, well drained or moderatey well drained soils of bottom lands. When moist, the surface soils and subsoils are friable and provide a good root zone. The Eel and Lobdell soils are usually wet during winter and spring. All of the soils in this group are likely to be flooded occasionally.

The soils in this unit are—

Chagrin fine sandy loam.
Chagrin silt loam.
Eel loam.
Eel silt loam.
Genesee loam.
Genesee silt loam.
Lobdell fine sandy loam.
Lobdell silt loam.
Ross silt loam.

Row crops can be grown more frequently on these soils than on any others in the county. For best results a green-manure crop should be plowed down every other year, or a sod crop should be grown at least 1 year in 4.

Any legume or grass that does well in this climate will grow on these soils. Grass-legume mixtures should be planted for hay or pasture. Lime should be applied according to the need shown by soil tests. Alfalfa and timothy will produce well if lime and fertilizer are used. Ladino clover and possibly orchardgrass can be added if the forage is to be grazed.

Open areas in the woodlands can be filled in with black walnut, yellow-poplar, and white ash. Pines are not recommended.

Capability unit IIe–1

The soils in this unit are gently sloping. They lie on uplands or old alluvial terraces. Internal drainage is good or moderately good. These soils are acid except where they have been limed. They are low in mineral nutrients. Crops respond to lime and fertilizer. These soils will erode if planted to row crops, unless the amount and rate of runoff are controlled.

The soils in this unit are—

Alexandria silt loam, 2 to 6 percent slopes, slightly eroded.
Alexandria silt loam, 2 to 6 percent slopes, moderately eroded.
Cardington silt loam, 2 to 6 percent slopes, slightly eroded.
Cardington silt loam, 2 to 6 percent slopes, moderately eroded.
Celina silt loam, 2 to 6 percent slopes, slightly eroded.
Celina silt loam, 2 to 6 percent slopes, moderately eroded.
Fox loam, 2 to 6 percent slopes, slightly eroded.
Fox loam, 2 to 6 percent slopes, moderately eroded.
Fox silt loam, 2 to 6 percent slopes, slightly eroded.
Fox silt loam, 2 to 6 percent slopes, moderately eroded.
Hanover silt loam, 2 to 6 percent slopes, slightly eroded.
Hanover silt loam, 2 to 6 percent slopes, moderately eroded.
Kendallville silt loam, 2 to 6 percent slopes, slightly eroded.
Kendallville silt loam, 2 to 6 percent slopes, moderately eroded.
Loudonville silt loam, 2 to 6 percent slopes, slightly eroded.
Loudonville silt loam, 2 to 6 percent slopes, moderately eroded.
Markland and Glenford silt loams, 2 to 6 percent slopes, slightly eroded.
Markland and Glenford silt loams, 2 to 6 percent slopes, moderately eroded.
Mentor silt loam, 2 to 6 percent slopes, slightly eroded.
Mentor silt loam, 2 to 6 percent slopes, moderately eroded.
Miami silt loam, 2 to 6 percent slopes, slightly eroded.
Miami silt loam, 2 to 6 percent slopes, moderately eroded.
Muskingum sandy loam, 2 to 6 percent slopes, slightly to moderately eroded.
Muskingum silt loam, 2 to 6 percent slopes, slightly to moderately eroded.
Ockley loam, 2 to 6 percent slopes, slightly eroded.
Ockley loam, 2 to 6 percent slopes, moderately eroded.
Ockley silt loam, 2 to 6 percent slopes, slightly eroded.
Ockley silt loam, 2 to 6 percent slopes, moderately eroded.
Otwell silt loam, 2 to 6 percent slopes, slightly to moderately eroded.
Parke silt loam, 2 to 6 percent slopes, slightly eroded.
Parke silt loam, 2 to 6 percent slopes, moderately-eroded.
Pike silt loam, 2 to 6 percent slopes.
Pike silt loam, 2 to 6 percent slopes, moderately eroded.
Thackery silt loam, 2 to 6 percent slopes, slightly eroded.
Warsaw silt loam, 2 to 6 percent slopes, slightly eroded.
Wea silt loam, 2 to 6 percent slopes, slightly eroded.
Wellston silt loam, 2 to 6 percent slopes, slightly eroded.

On slopes that are more than 150 feet long and are not broken by diversion terraces or natural barriers, hay or pasture should be grown at least 3 of each 5 years. If these long slopes are stripcropped and cultivated on the contour, the rotation may safely include 2 years of row crops, or 1 row crop and 1 grain crop, in each 4 years. Half of the acreage should be in hay or pasture.

Slopes less than 150 feet long need to be in hay or pasture for 2 years out of 4 if no other erosion control practices are used. If these slopes are farmed in strips and on the contour, 1 year of grass in 3 years is enough to control erosion. If field terraces are installed, the effective length of the slope is reduced to the distance between terraces, and a 3-year rotation that includes 1 year of hay or pasture can be used.

Establish outlets before field terraces or diversion terraces are built, and keep the outlets covered with grass. In fields that are not terraced, establish sod waterways wherever water flows. Make channels smooth and wide enough to carry away slowly the runoff from the heaviest storms. The soil conservationist will help you plan a good design and layout. Fertilize and mow outlets and waterways to establish and keep a dense sod.

Pasture and hay should be managed according to the general suggestions in the section General Management Suggestions. If the hay or pasture is to last only 1 or 2 years, the alfalfa that is seeded need not be a wilt-resistant variety.

New plantings of trees can be expected to survive and grow well if they are species suited to acid soil. Pines for Christmas trees should grow well. In open areas in the existing woodlands, black walnut, yellow-poplar, and white ash can be planted to improve the stand.

Capability unit IIw–1

This unit consists of somewhat poorly drained or poorly drained soils of the bottom lands. The somewhat poorly drained soils are wet a good part of the time; they have mottled subsoils. The poorly drained soils are wet most of the time; they are gray or dark gray from the surface downward. All of these soils are likely to be flooded at times. Unless they are artificially drained, water stands on the surface part of the time.

The soils in this unit are—

Algiers silt loam.
Algiers silty clay loam.
Orrville fine sandy loam.
Orrville silt loam.
Shoals silt loam.

Sloan silt loam.
Sloan silty clay loam.
Wallkill silt loam.
Wallkill silty clay loam.

These soils need little or no lime because they are neutral or nearly so. However, they should be tested occasionally to see if they need lime. They are likely to puddle or clod if they are tilled while wet.

Surface drainage can be improved by shallow ditches. The low, wet places should be drained by tile; in fact, most of the acreage can be improved by a complete tiling system. Tile lines should be 50 to 70 feet apart and 36 to 42 inches deep to work best in these soils. If the plow layer has a grayish color, tile lines and drainage ditches should be closer together. Diversion ditches will be needed if these soils receive water from nearby slopes.

The crop rotation should include either a green-manure crop at least once in 2 years or, once in 3 years, a full-season crop of grass and legumes, the stubble and aftermath of which are plowed under. It may be necessary to grow grass and legumes 2 years out of 5 to get adequate aeration of the soil.

Pastures and hay meadows should be drained by surface ditches or tile. Water-tolerant grasses and legumes should be planted because, even after surface ditches and tile are installed, these soils are likely to be wet occasionally. The general suggestions for management of all soils will apply.

Trees are seldom planted on these soils. Pine is normally not suitable. Open areas can be planted to walnut or ash.

Capability unit IIw-2

Most of the soils of this unit are in nearly level or basinlike areas. A few are on very gentle slopes. They are generally light colored. Internal drainage is somewhat poor, and the subsurface soil and subsoil are mottled. Water moves slowly through the clay subsoil. A perched water table is present during and after wet weather. These soils are likely to puddle and clod if they are worked while wet. They are acid except where lime has been applied. They are naturally low in phosphorus and potassium.

The soils in this unit are—

Bennington silt loam, 0 to 2 percent slopes.
Bennington silt loam, 2 to 6 percent slopes, slightly eroded.
Bennington silt loam, 2 to 6 percent slopes, moderately eroded.
Crosby silt loam, 0 to 2 percent slopes.
Crosby silt loam, 2 to 6 percent slopes, slightly eroded.
McGary and Fitchville loams, 0 to 2 percent slopes.
McGary and Fitchville silt loams, 0 to 2 percent slopes.
McGary and Fitchville silt loams, 2 to 6 percent slopes, slightly eroded.
Sleeth silt loam, 0 to 2 percent slopes.
Sleeth silt loam, 2 to 6 percent slopes, slightly eroded.

The gently sloping soils will erode unless they are protected. Low spots should be tiled. Most of the acreage would be improved by a complete tiling system. Tile lines placed 50 to 70 feet apart and at depths of 36 to 42 inches will be satisfactory in most places.

On the gently sloping soils, contour farming and stripcropping will control erosion if the rotation includes at least 2 years of hay or pasture in each 4 years. On the nearly level soils, 2 years of hay or pasture in each 5 years is enough to maintain the supply of organic matter and preserve the soil structure.

Crop rows should be on a slight grade to prevent drowning of crops. Establish sod waterways wherever water flows, and lay out the rows to drain toward the waterways. Make the channels smooth and wide enough to carry the runoff from the most severe storms. Fertilize and mow the waterways to maintain a dense sod. Construct diversion ditches on slopes more than 150 feet long. Establish outlets first so that the water will flow off without washing away soil.

Follow the general suggestions for management of pastures or hayfields if the soils are drained by tile or by surface ditches. In places that cannot be drained readily, plant a water-tolerant grass. Reed canarygrass makes a good pasture in these places, but it should be mowed regularly so that it will not become coarse and unpalatable.

New plantings of trees generally are not made on these soils. Pine is not suitable. Ash, sycamore, and black walnut should be encouraged and could be planted in open areas in the woodlands.

Capability unit IIw-3

In this capability unit are level or nearly level, dark-colored soils of upland depressions or basinlike slopes. They have clay subsoils which water and air permeate slowly. In spring the water table is near the surface, except where the soils are artificially drained. Some of these soils need phosphorus and potassium.

The soils in this unit are—

Brookston clay loam.
Marengo silt loam.
Marengo silty clay loam.
Montgomery silt loam.
Montgomery silty clay loam.
Westland silt loam.
Westland silty clay loam.

These soils are naturally wet. Water moves slowly through the clay subsoils. If worked when too wet, especially with heavy machines, these soils are likely to puddle and clod. Continuous cropping to row crops or grain uses up the organic matter and tends to make the surface soil hard and cloddy. After the surface soil becomes compact and hard, little water will soak in.

Good soil structure can be maintained and good yields obtained by using a rotation that includes 1 year of hay or pasture in each 3 years. Better results are obtained by growing hay or pasture 2 years in each 4. Soil structure will be further improved if all the stubble and residue is left on the soil or plowed under.

Both surface and subsurface drainage are needed to remove surplus water and lower the water table enough so there will be an adequate root zone. Although the subsoil is slowly permeable, these soils can be drained with tile. As a rule, tile lines placed 50 to 70 feet apart and 36 to 42 inches deep are satisfactory.

Diversion terraces are needed in some places where water flows from higher land (fig. 6). Build sod waterways wide enough to carry all of the water from heavy storms and use them as outlets for the diversion terraces and wherever water flows in fields. Fertilize and mow the waterways to maintain a dense sod (fig. 7).

Remove the excess water from pastures or hayfields by tile or surface ditches and follow the general suggestions for management of pastures. Include in the seeding mixture legumes and grasses that will grow on soils that are wet part of the time. For permanent

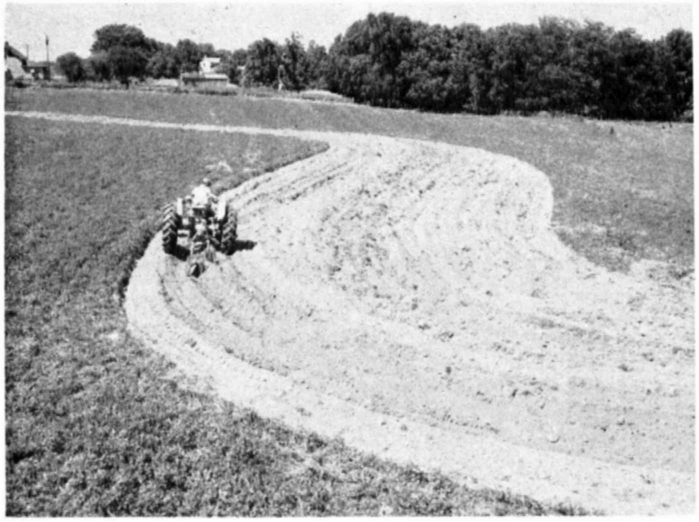

Figure 6.—**Constructing a diversion terrace to hold soil moisture and reduce erosion.**

Figure 7.—**Mowing a diversion terrace. A good cover of grass allows water to be conducted away safely.**

pastures in places not easily drained, plant reed canarygrass; it will grow well and provide pasture throughout the summer. The pastures should be clipped often enough to keep the grass from growing so tall that it becomes coarse and unpalatable.

As a rule, new plantings of trees are not made on these soils. Pine does not do well because of the poor drainage In open areas in existing woodlands, hard maple and white oak seedlings should be encouraged. Some replanting of these species might be worth while.

Capability unit IIs-1

The soils in this unit are gravelly loams or shallow soils over gravel. They lie on alluvial terraces. Water percolates through these soils rapidly, and the gravelly substratum has a low capacity to hold moisture.

The soils in this unit are—

Fox gravelly loam, 0 to 2 percent slopes.
Fox gravelly loam, 2 to 6 percent slopes, slightly eroded.
Fox gravelly loam, 2 to 6 percent slopes, moderately eroded.
Fox loam, 0 to 2 percent slopes.
Fox silt loam, 0 to 2 percent slopes.
Warsaw silt loam, 0 to 2 percent slopes.

Early crops have a good chance to mature on these soils in most years, but full-season crops are likely to be injured by drought. Conservation of moisture is necessary. A sod crop should be grown at least 1 year for each 3 years of the rotation.

Organic matter will help to improve the moisture-holding capacity. If manure is not available, a full growth of hay or its residue after seed is harvested should be plowed under. If specialty crops are grown intensively, heavy applications of manure or other organic matter will be needed, and green-manure crops should be grown frequently. These soils can be irrigated if water is available, but it is practical only if a high-value crop is grown.

These soils are not normally used for pasture because they are unproductive during summer. Pasture and hay crops can be grown on them if a mixture of drought-resistant grasses is seeded.

New plantings of trees are usually not made. Any trees that are planted should be of species that will grow well on acid soils. Pine trees for Christmas trees will grow well, although probably more slowly than on the moister soils. Open areas in the existing woodlands can be planted to black walnut, yellow-poplar, and white ash.

Capability unit IIIe-1

These are sloping, well-drained soils on uplands and silty alluvial terraces. They are acid unless they have been limed. They are low in phosphorus and potassium.

The soils in this unit are—

Alexandria silt loam, 6 to 12 percent slopes, slightly eroded.
Alexandria silt loam, 6 to 12 percent slopes, moderately eroded.
Hanover silt loam, 6 to 12 percent slopes, slightly eroded.
Hanover silt loam, 6 to 12 percent slopes, moderately eroded.
Kendallville silt loam, 6 to 12 percent slopes, moderately eroded.
Mentor silt loam, 6 to 12 percent slopes, slightly eroded.
Mentor silt loam, 6 to 12 percent slopes, moderately eroded.
Miami silt loam, 6 to 12 percent slopes, moderately eroded.
Ockley silt loam, 6 to 12 percent slopes, slightly eroded.
Ockley silt loam, 6 to 12 percent slopes, moderately eroded.
Otwell silt loam, 6 to 12 percent slopes, slightly eroded.
Otwell silt loam, 6 to 12 percent slopes, moderately eroded.
Pike silt loam, 6 to 12 percent slopes, moderately eroded.

These soils are suited to a wide range of crops, and they respond to good management. They will erode if they are cultivated without protection. Lime and fertilizer and regular additions of organic matter are needed.

If terraces are used to control runoff and erosion, the cropping system can be a 3-year rotation consisting of a row crop, grain, and hay or pasture. If stripcropping is practiced without terraces, the rotation should include at least 2 years of hay or pasture in each 4 years. To control erosion without terracing or stripcropping, it is necessary to omit the row crop and use a rotation made up of a small grain and hay or pasture.

Lime and fertilizer are needed on hay or pasture. If trees are planted, they should be of species suited to acid soils. Pines for Christmas trees grow well on these soils.

Capability unit IIIe-2

This capability unit consists of well-drained soils of uplands and terraces. These soils are a little more sandy or shallow than those of capability unit IIIe-1, but the slope range is the same. These soils are acid, except where they have been limed. They are naturally low in phosphorus and potassium. The moisture-holding capacity is less than that of soils in unit IIIe-1.

The soils in this unit are—

- Fox gravelly loam, 6 to 12 percent slopes, moderately eroded.
- Fox loam, 6 to 12 percent slopes, moderately eroded.
- Fox silt loam, 6 to 12 percent slopes, slightly eroded.
- Fox silt loam, 6 to 12 percent slopes, moderately eroded.
- Loudonville silt loam, 6 to 12 percent slopes, slightly eroded.
- Loudonville silt loam, 6 to 12 percent slopes, moderately eroded.
- Muskingum fine and very fine sandy loams, 6 to 12 percent slopes, slightly to moderately eroded.
- Muskingum sandy loam, 6 to 12 percent slopes, slightly eroded.
- Muskingum sandy loam, 6 to 12 percent slopes, moderately eroded.
- Muskingum silt loam, 6 to 12 percent slopes, slightly eroded.
- Muskingum silt loam, 6 to 12 percent slopes, moderately eroded.
- Negley gravelly and sandy loams, 6 to 12 percent slopes, moderately eroded.
- Parke silt loam, 6 to 12 percent slopes, slightly eroded.
- Parke silt loam, 6 to 12 percent slopes, moderately eroded.
- Wellston silt loam, 6 to 12 percent slopes, slightly eroded.
- Wellston silt loam, 6 to 12 percent slopes, moderately eroded.

These soils will erode if they are not protected when tilled. The rotations and the management suggested for the soils of this unit are about the same as for the soils in capability unit IIIe–1. These soils respond fairly well to good management, but they are likely to be a little less productive than the soils in unit IIIe–1 because they are shallower and droughtier. Trees grow at about the same rate on the soils of both units.

Capability unit IIIe–3

This unit consists of sloping, moderately well drained, slightly or moderately eroded soils of the uplands. The subsoil contains more clay than that of the soils in capability units IIIe–1 and IIIe–2. The mottling in the subsoil shows that natural drainage is somewhat retarded. These soils are acid unless they have been limed. The supply of phosphorus and potassium is low.

The soils in this unit are—

- Cardington silt loam, 6 to 12 percent slopes, slightly eroded.
- Cardington silt loam, 6 to 12 percent slopes, moderately eroded.
- Keene silt loam, shallow, 2 to 12 percent slopes, slightly to moderately eroded.

These soils can be farmed in the same way as those of capability unit IIIe–1. The danger of erosion is somewhat greater, and there is more surplus water to be disposed of in the spring and during wet weather. The proportion of sod crops in the rotation and the supporting practices needed are like those described for unit IIIe–1.

Pasture, hay, and trees can be grown on these soils in accordance with the general suggestions for management.

Capability unit IIIe–4

The soils of this unit are well drained and rather shallow. They are similar to those in capability unit IIIe–2, but they are steeper. They are more droughty than any of the other soils in class III. They are acid except where they are limed. They are low in phosphorus and potassium.

The soils in this unit are—

- Loudonville silt loam, 12 to 18 percent slopes, slightly eroded.
- Loudonville silt loam, 12 to 18 percent slopes, moderately eroded.
- Muskingum fine and very fine sandy loams, 12 to 18 percent slopes, slightly to moderately eroded.
- Muskingum sandy loam, 12 to 18 percent slopes.
- Muskingum sandy loam, 12 to 18 percent slopes, moderately eroded.
- Muskingum silt loam, 12 to 18 percent slopes, slightly eroded.
- Muskingum silt loam, 12 to 18 percent slopes, moderately eroded.
- Wellston silt loam, 12 to 18 percent slopes, slightly to moderately eroded.

Control of runoff and erosion is necessary if these soils are tilled, but the soils are too steep and too shallow for field terraces. If row crops are grown, stripcropping is needed to control erosion, and sod crops should be grown at least 2 of every 4 years. A rotation consisting of a small grain followed by several years of hay or pasture is suitable. Pastures are less productive on these soils than on other soils of class III. Pines and hardwoods suited to acid soils can be planted successfully.

Capability unit IIIw–1

The only soil in this unit is Carlisle muck. It consists of muck about 3 feet deep, underlain by gray plastic clay. Water stands on the surface most of the time, unless the soil has been artificially drained. The soil is low in potassium.

Crops can be grown on this soil if it is suitably drained. Either tile or open ditches can be used. For general crops, tile can be spaced from 80 to 200 feet apart and placed at depths of 42 to 54 inches.

Row crops can be grown every year, but cover crops and green-manure crops should be grown between seasons. Special fertilization is needed to provide enough potassium for crops. Manure will add nutrients. An occasional sod crop will supply fresh organic matter.

To have good pastures during the summer, plant grasses that will grow in moist soil and dispose of excess surface water by furrows and ditches. If water runs in from surrounding areas, build a diversion ditch along the edge of the bog. Plant reed canarygrass for permanent pasture in areas that cannot be drained. Mow when the soil is dry enough to support machinery, and keep stock out when the soil is very wet.

In woodlands, encourage or plant swamp white oak or ash. Pine probably will not grow well.

Capability unit IIIw–2

The soils in this unit are level or nearly level; some occupy basinlike areas. They have poor natural drainage. They are saturated in spring, except where they are artificially drained. The subsoil is clayey, plastic, and almost impermeable to water and air.

These soils are acid unless they are limed. The supply of available phosphorus and potassium is low. The supply of nitrogen and organic matter is also likely to be low.

The soils in this unit are—

- Condit silt loam.
- McGary and Sebring silt loams, 0 to 2 percent slopes.

Water must be removed before crops can be grown on these soils. The subsoil does not drain well. Installing tile lines close enough together to give good drainage is likely to be too expensive for general crops. If small areas of these soils occur within larger areas of other soils and the entire field is to be drained, the tile lines in these soils should be from 45 to 60 feet apart and from 30 to 36 inches deep. Large areas can be drained nearly as well by surface ditches as by tile, and at less cost. The surface can be drained by plowing in narrow lands and providing shallow ditches to take the water from the dead furrows.

To improve the tilth and aeration of the soil, the cropping system should include at least 2 years of hay or pasture in each 5 years.

In pastures or hayfields, surface ditches are needed to remove water. Spots that remain wet can be planted to reed canarygrass. Such spots should be mowed often enough to keep the grass succulent.

Swamp white oak and ash should be encouraged or planted in open places in the existing woodlands. Pine is not suited to these soils.

Capability unit IVe-1

This unit contains soils that are moderately steep or hilly and sloping soils that are severely eroded. The risk of erosion is high if these soils are cultivated. All of these soils are acid unless they have been limed. The content of phosphorus and potassium is low. Most of these soils do not hold as much water as crops are likely to need during the dry seasons.

The soils in this unit are—

- Alexandria silt loam, 12 to 18 percent slopes, slightly eroded.
- Alexandria silt loam, 12 to 18 percent slopes, moderately eroded.
- Alexandria silty clay loam, 6 to 12 percent slopes, severely eroded.
- Cardington silt loam, 12 to 18 percent slopes, moderately eroded.
- Fox loam, 12 to 18 percent slopes, moderately eroded.
- Fox silty clay loam, 6 to 12 percent slopes, severely eroded.
- Hanover silt loam, 12 to 18 percent slopes, slightly eroded.
- Hanover silt loam, 12 to 18 percent slopes, moderately eroded.
- Loudonville silt loam, 6 to 12 percent slopes, severely eroded.
- Mentor silt loam, 12 to 18 percent slopes, moderately eroded.
- Miami silt loam, 12 to 18 percent slopes, moderately eroded.
- Miami silty clay loam, 6 to 12 percent slopes, severely eroded.
- Muskingum silt loam, 6 to 12 percent slopes, severely eroded.
- Negley gravelly and sandy loams, 12 to 18 percent slopes, moderately eroded.
- Otwell silt loam, 12 to 18 percent slopes, moderately eroded.
- Parke silt loam, 12 to 18 percent slopes, slightly eroded.
- Parke silt loam, 12 to 18 percent slopes, moderately eroded.

These soils can be used for row crops occasionally, but only if extreme care is taken to control erosion. They are not suitable for terracing. Legumes and grasses will grow well if they are seeded carefully and fertilized. A grain crop can be grown every 4 to 6 years as a nurse crop for a new seeding of forage. The trash-mulch method can be used for reseeding hay or pasture. The general suggestions for management of hay and pasture apply to this unit.

Most of these soils will support a good stand of trees. Trees suited to acid, well-drained soils should be planted. Pines for Christmas trees will grow well. New plantings on the severely eroded soils do not grow as rapidly as they would on the soils that still have most of the original surface layer.

Capability unit IVe-2

Most of the soils in this capability unit are shallow or moderately deep. Two are gravelly soils that are moderately or severely eroded. All of them are likely to erode seriously if they are tilled. They are acid, unless they have been limed. Their supply of phosphorus and potassium is low. They do not hold as much water as crops are likely to need during dry weather.

The soils in this unit are—

- Casco gravelly loam, 12 to 18 percent slopes, moderately eroded.
- Fox gravelly clay loam, 6 to 12 percent slopes, severely eroded.
- Loudonville silt loam, 18 to 25-percent slopes, slightly eroded.
- Loudonville silt loam, 18 to 25 percent slopes, moderately eroded.
- Muskingum fine and very fine sandy loams, 18 to 25 percent slopes, slightly to moderately eroded.
- Muskingum sandy loam, 18 to 25 percent slopes, slightly eroded.
- Muskingum sandy loam, 18 to 25 percent slopes, moderately eroded.
- Muskingum silt loam, 18 to 25 percent slopes, slightly eroded.
- Muskingum silt loam, 18 to 25 percent slopes, moderately eroded.

These soils can be used for semipermanent or long-term hay or pasture by following the general suggestions given for management of hayfields or pastures. A grain crop can be grown once in 4 to 6 years as a nurse crop while a new sod is being established. If row crops are needed, mulch tillage should be practiced and extreme care should be taken to prevent erosion.

All except the most gravelly of these soils will produce fairly good stands of trees. Follow the general suggestions for planting and management.

Capability unit Vw-1

The only soil in this unit is Willette muck. It consists of 12 to 36 inches of muck over plastic clay. It is slowly permeable and would be difficult to drain. These bogs are good for pasture during the summer if excess surface water is removed by furrows and ditches. Reed canarygrass will provide more forage than the volunteer grasses.

Capability unit VIe-1

This unit consists of steep or eroded soils. They are too shallow or erodible to be suitable for crops that require tillage, but they are not so steep, so droughty, or so stony as the soils in capability class VII. Most of these soils are more droughty than soils on gentler slopes. Runoff is rapid, and the moisture-holding capacity is generally not more than moderate.

The soils in this unit are—

- Alexandria silt loam, 18 to 25 percent slopes, slightly eroded.
- Alexandria silt loam, 18 to 25 percent slopes, moderately eroded.
- Alexandria silty clay loam, 12 to 18 percent slopes, severely eroded.
- Casco loam, 18 to 25 percent slopes, moderately eroded.
- Fox clay loam, 12 to 18 percent slopes, severely eroded.
- Hanover silt loam, 12 to 18 percent slopes, severely eroded.
- Keene silty clay loam, shallow, 12 to 18 percent slopes, severely eroded.
- Kendallville silt loam, 12 to 18 percent slopes, moderately to severely eroded.
- Loudonville silt loam, 12 to 18 percent slopes, severely eroded.
- Loudonville silt loam, 18 to 25 percent slopes, severely eroded.
- Miami silty clay loam, 12 to 18 percent slopes, severely eroded.
- Muskingum sandy loam, 12 to 18 percent slopes, severely eroded.
- Muskingum sandy loam, 18 to 25 percent slopes, severely eroded.
- Muskingum silt loam, 12 to 18 percent slopes, severely eroded.
- Muskingum silt loam, 18 to 25 percent slopes, severely eroded.
- Negley gravelly and sandy loams, 12 to 18 percent slopes, severely eroded.
- Negley gravelly and sandy loams, 18 to 25 percent slopes, slightly eroded.
- Negley gravelly and sandy loams, 18 to 25 percent slopes, moderately eroded.
- Otwell silt loam, 18 to 25 percent slopes, moderately eroded.
- Parke silt loam, 18 to 25 percent slopes, slightly eroded.
- Parke silt loam, 18 to 25 percent slopes, moderately eroded.
- Parke silty clay loam, 12 to 18 percent slopes, severely eroded.

These soils should not be cultivated. Established pastures are good during spring and fall but are not dependable in summer. If the pasture is grazed closely in dry weather, the good pasture plants will be weakened and weeds will come in. Pastures on moister soils should be used during the summer season. Lime and fertilizer are needed to get high yields of forage in spring and fall.

When establishing a new pasture, take soil samples in the fall before seeding and test for acidity and fertility. Add enough lime to bring the reaction to about pH 6.5. Apply fertilizer before seeding and every 2 years after that. Inoculate the seed. Prepare the seedbed carefully. Keep a mulch on the surface to hold moisture for the seedlings and to control erosion until the new stand gets started. Allow the young plants to get well established before they are grazed. Since a well-fertilized and properly grazed pasture will last from 20 to 40 years, it is worth while to buy a good seed mixture and enough lime and fertilizer and to take a great deal of care in preparing the soil, planting the seed, and managing the new pasture.

Birdsfoot trefoil is a good legume to use with Kentucky bluegrass in pasture mixtures. If it is properly established and not grazed too closely, a good stand of bluegrass and birdsfoot trefoil can be maintained for many years.

New plantings of forest trees are successful in most sites on these soils. Plant trees that are suited to acid, well drained and moderately well drained soils. Trees should be planted on the contour, especially if furrows are opened to prepare the site. On severely eroded sites, trees will be more difficult to establish and will grow more slowly than on the better soils.

Capability unit VIIe-1

The soils in this capability unit are steep, eroded, or rocky. They have severe limitations if used for pasture, but they can be used for forest.

The soils in this unit are—

- Alexandria silt loam, 25 to 50 percent slopes, moderately eroded.
- Alexandria silty clay loam, 18 to 25 percent slopes, severely eroded.
- Casco clay loam, 18 to 25 percent slopes, severely eroded.
- Casco and Rodman loams, 25 to 40 percent slopes, moderately eroded.
- Loudonville silt loam, 25 to 50 percent slopes, moderately eroded.
- Muskingum rocky sandy loam, 6 to 18 percent slopes, slightly to moderately eroded.
- Muskingum rocky sandy loam, 18 to 25 percent slopes, slightly to moderately eroded.
- Muskingum rocky sandy loam, 25 to 50 percent slopes, slightly to moderately eroded.
- Muskingum sandy loam, 25 to 50 percent slopes, slightly eroded.
- Muskingum sandy loam, 25 to 50 percent slopes, moderately eroded.
- Muskingum silt loam, 25 to 50 percent slopes, slightly eroded.
- Muskingum silt loam, 25 to 50 percent slopes, moderately to severely eroded.
- Negley gravelly and sandy loams, 18 to 25 percent slopes, severely eroded.
- Negley gravelly and sandy loams, 25 to 50 percent slopes, slightly eroded.
- Negley gravelly and sandy loams, 25 to 50 percent slopes, moderately eroded.
- Negley gravelly and sandy loams, 25 to 50 percent slopes, severely eroded.
- Parke silty clay loam, 18 to 25 percent slopes, severely eroded.

Pastures on these soils are not dependable in dry seasons. They should not be grazed during the summer.

Trees can be planted successfully on all except the driest sites. New plantings should be made on the contour. Use trees suited to acid, well-drained soils. On severely eroded sites, trees will be difficult to establish and will grow slowly.

General Management Suggestions

Although the various soils differ somewhat in their suitability for use and their needs for management, some general needs are common to nearly all of the soils of this county.

Crops will respond to fertilizer on most soils of the county. Soil tests will show which plant nutrients are needed. The amount needed depends on the crop to be grown and on the characteristics of the soil, especially water supply, water-holding capacity, and aeration. The probable yields and the labor requirements will influence the farmer in deciding the kind and amount of fertilizer to apply.

Regular additions of organic matter are needed on all the soils. As fresh organic matter decays, the structure and aeration of the soil are improved and nitrogen is made available to plants.

Nearly all of the soils of Fairfield County need lime every few years to maintain a favorable reaction and to supply calcium and magnesium. The amount of lime needed depends on the kind of soil, its reaction (which can be measured by a soil test), and the needs of the crop.

Some soils need drainage, and others need to have control of runoff to save water and limit erosion (figs. 8 and 9).

***Figure 8.*—Contour furrows help to hold water and control erosion.**

Some of the sloping, imperfectly drained soils need both.

Recent information on cropping systems, crop varieties, and conservation practices can be obtained from the Ohio Agricultural Extension Service and the Soil Conservation Service.

Row crops

Row crops are generally the most important part of the rotation on those soils that are suitable for them. Sod crops, cover crops, and green-manure crops add organic matter and help to control runoff and erosion; thus, they are also important in every cropping system.

A good rotation provides sod crops or green-manure crops often enough to keep up the supply of organic matter. The most intensive cropping system suggested in the capability groups, that for the nearly level bottomland soils of capability unit I-2, provides that a green-manure crop be turned under in alternate years, or that a sod crop be on the soil 1 year in each 4 years. A larger

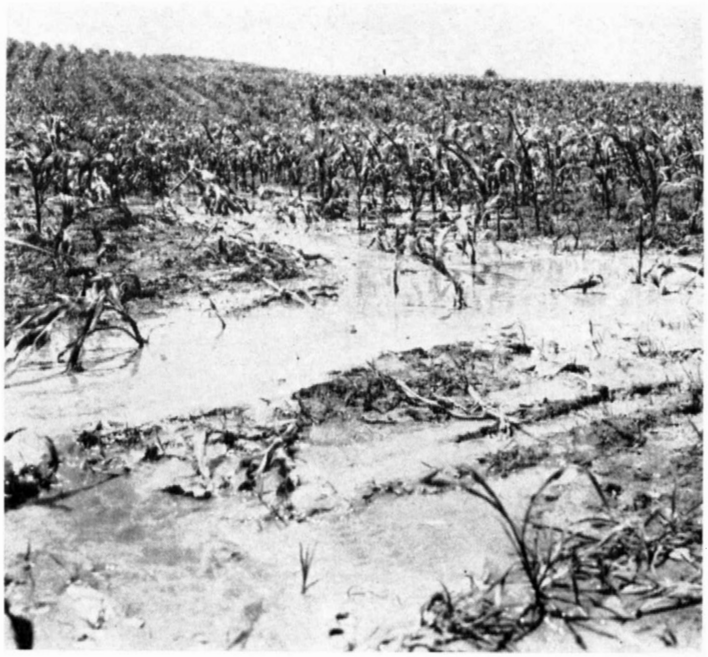

Figure 9.—Excessive runoff from unprotected fields damages crops and causes erosion.

proportion of green-manure or sod crops is needed in crop rotations on any of the other soils.

A good way to add organic matter is to grow grasses or legumes for 1 or more years and plow down the sod. Cornstalks, straw, and all crop residues should be returned to the soil. Animal manure is an excellent source of organic matter and some plant nutrients; in rotations, it should be applied on the crop that will make the greatest response.

Lime and fertilizer should be applied according to the needs of the crops. Drainage or control of runoff, or both, may be needed. Sod crops and mulches help to control runoff. Other supporting practices, such as contour cultivation, contour stripcropping, diversion terraces, and field terraces, help control runoff and erosion on sloping cropland. The combination to be used depends on the kind of soil and the cropping system (fig. 10). Some of the suitable choices are given under the different capability units.

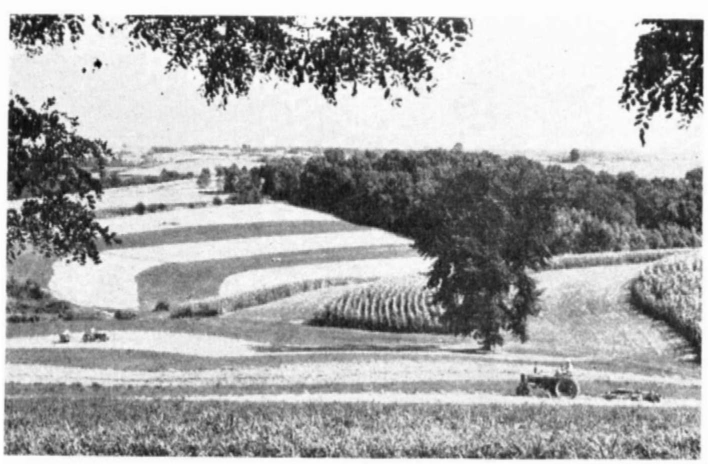

Figure 10.—Stripcropping on the Coshocton Research Station farm in Coshocton County.

The following suggestions apply to all of the soils that are used for row crops.

a. Return all crop residues, corn stover, and straw, except on new seedings. Since straw and other residues can injure young seedlings of grass or legumes, find out from your soil conservationist or county agricultural agent how to seed if mulch is used.

b. Apply all available manure, and use more on eroded areas than on uneroded soil.

c. Arrange for timely plowing, planting, cultivation, and harvesting.

d. Avoid excessive tilling in preparing seedbeds. Do not operate tractors and other machines in soil that is too wet.

e. Plant suitable crop varieties at the recommended rate. See the latest bulletin of the Ohio Agricultural Extension Service on crop varieties and hybrids.

f. Inoculate legume seeds.

Pasture and hay

Cattle, hogs, and dairy products make up about two-thirds of the total farm products in Fairfield County. Dairy and beef cattle need large amounts of forage if they are to be produced efficiently. An increasing number of farmers are pasturing their hogs.

Many of the sloping soils will produce better yields of forage than of grain crops, and at less cost. A good pasture program will provide early grazing and an even distribution of forage through summer and fall. Production can be spread through a longer season by using drought-resistant legumes. Pastures will need to be limed and fertilized and seeded with carefully selected mixtures. Methods and rates of seeding and fertilizing and other aspects of pasture management are covered in bulletins of the Ohio Agricultural Extension Service. Information can be obtained from the County Extension Office or the Soil Conservation Service.

Some pastures are grazed from 1 to 4 years in a crop rotation. Others, especially those on soils not so well suited to cultivation, are used as semipermanent pastures and are grazed for 4 to 6 years. Soils in capability class VI, if needed for pasture, should be kept permanently in sod that is renovated and reseeded when necessary.

On the soils that are in capability classes I through IV, pastures can be seeded in a trash mulch or in a nurse crop of small grain. The trash-mulch method is used mostly on class IV or class VI soils that are to be in pasture for several years. Pastures that are part of a regular crop rotation are usually seeded in a small grain.

Collect soil samples in the fall, before seeding, and have them tested. Apply enough lime to bring the pH value to about 6.5, and add fertilizer according to recommendations made on the basis of the tests. For a high-quality pasture that is to last no more than 4 years, apply fertilizer every year.

On many of the soils, bromegrass and alfalfa make a good seeding mixture for hay or pasture stands intended to last no more than 4 years. Wilt-resistant varieties of alfalfa should be used. Most pastures should also contain some ladino clover. In small areas, some orchardgrass can be seeded with the alfalfa and ladino clover, for early intensive grazing or for early cutting for silage. Orchardgrass grows rapidly, however, and will soon become coarse and unpalatable if it is not pastured heavily or clipped frequently.

Control of grazing, preferably by rotation of animals in different lots, is needed to maintain stands of good grasses and legumes. About 4 inches of growth should remain at all times. The pastures should be mowed frequently. Surplus forage not eaten by the animals can be cut for hay or silage.

For semipermanent meadow or pasture—one that is to last 5 or 6 years—test the soil and go ahead as though seeding for a short-term pasture. Seed a mixture of grasses and legumes suitable for the soil. The most productive pastures contain bromegrass, alfalfa, and ladino clover. If the forage is to be cut for hay, ladino clover should not be planted. As in short-term seedings, some orchardgrass can be planted for early spring grazing, but it grows rapidly and should be clipped frequently.

Every year, apply the amount of fertilizer that is recommended by the Extension Service for your kind of soil and pasture. Regulate grazing, preferably by rotation in different lots, so that at least 4 inches of growth remains at all times.

For establishing and managing long-term pastures, follow the suggestions given under capability unit VIe-1.

Forest

There are about 43,000 acres of forest in Fairfield County.[3] Most of the forest is in the unglaciated southeastern part of the county, on Muskingum and associated soils. Nearly all of it is in small tracts, mostly farm woodlands. Some large tracts are owned by the State, and some belong to groups who use them for recreation.

A mixed hardwood forest originally covered nearly all of the county. Most of it was cleared for farming. Most of the present forest is on soils not suitable for crops or pasture.

For many years, the best trees were cut and the others allowed to grow, and now many forests contain small or inferior trees. Most of them, however, contain some trees that could be sold now. Most of the forests will increase in value if they are managed well.

Many acres could profitably be reforested. Some areas of soils in capability class VII are used for pasture, and some have been abandoned after attempts to use them for crops. Most of the class VII land will produce more income from trees than from any other use. Soils in the other capability classes make much better forest sites, but their value for pasture or crops outweighs their value for forest.

Suggestions for using certain soils for forestry or for raising Christmas trees are given in the discussions of the suitable capability units. For more information about managing woodland for profit, consult the county agent, the extension forester, or the soil conservationist.

The following general recommendations apply to all the woodlands.

a. Protect the woods from fire and grazing, to give young trees a chance to grow and to let open areas grow up to trees.

b. Cut or girdle undesirable trees that are likely to crowd young trees or slow their growth. Cut grapevines and other weeds if they are damaging good trees.

c. Plant trees in some locations to hasten reforestation and to vary the composition of the stand.

d. Harvest trees when they are mature. Cut and remove them with the least possible damage to surrounding trees.

e. Leave a few den trees for wildlife.

Estimated Yields

Table 3 shows, for each soil in the county, the average yields per acre of the principal crops that can be expected over a period of years, under average management and improved management.

In the "A" columns are estimates of yields obtained under the management practices commonly used about 1950. This level of management includes moderately effective control of erosion and runoff; drainage of the wetter areas in fields; moderate fertilization of crops, but no supplemental nitrogen (about 100 pounds of 2-12-6 per crop year); liming of about half the cropland that needs it; and little or no liming and fertilization of pastures.

In the "B" columns are estimates of yields obtained by applying the best information now available to increase production. Under this improved management, soils are limed according to soil tests, and all practices needed to control erosion, to conserve moisture, organic matter, and tilth, and to improve drainage, where necessary, are used. Fertilization is according to soil test and averages about 200 pounds of 5-10-10 or its equivalent per acre per crop year, plus 40 to 60 pounds of supplemental nitrogen on corn. Pastures receive lime and fertilizer according to soil test.

The estimates in table 3 are based primarily on interviews with farmers, the county agent, and members of the Ohio Agricultural Experiment Station; on direct observation by members of the soil survey party; and on results obtained in field trials and experiments at the Experiment Station. They are estimates of the average production over a period of years, according to the two broadly defined levels of management.

These yield figures may not apply directly to specific fields for any particular year, because the soils vary somewhat from place to place, management practices differ slightly from farm to farm, and weather conditions vary from year to year. The estimates are intended only as a general guide to the relative productivity of the soils and an indication of how the soils respond to improved management.

The figures given for pasture are not yield figures. They are index ratings that show the relative productivity of the soil for pasture. A rating of 1 means the soil is poor for pasture, and a rating of 10 means it is good for pasture. An untreated bluegrass pasture having an index of 4 would provide about 40 cow-acre-days of pasture per year.

[3] U. S. FOREST SERVICE. FOREST STATISTICS FOR THE GLACIATED REGION OF OHIO. U. S. Dept. Agr., Central States For. Exp. Sta., Forest Survey Release 16, 33 pp., illus. September 1954.

TABLE 3.—*Estimated average acre yields of principal crops on each soil under two levels of management*

[Estimates in columns "A" are based on average management, and estimates in columns "B" are based on improved management. See the text for definitions of these levels of management. Absence of a yield figure indicates the soil is commonly considered unsuited to that crop]

Soil	Corn		Wheat		Soybeans		Clover and grasses		Alfalfa, clover, and grasses		Pasture	
	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Index rating*	*Index rating*
Alexandria silt loam, 0 to 2 percent slopes	63	100	25	40	20	27	2.7	3.4	3.2	3.9	6	8
Alexandria silt loam, 2 to 6 percent slopes, slightly eroded	61	97	25	40	19	26	2.6	3.3	3.0	3.5	6	8
Alexandria silt loam, 2 to 6 percent slopes, moderately eroded	57	90	22	39	16	22	2.5	3.2	2.8	3.3	6	8
Alexandria silt loam, 6 to 12 percent slopes, slightly eroded	59	94	25	40	18	24	2.6	3.3	3.0	3.5	6	8
Alexandria silt loam, 6 to 12 percent slopes, moderately eroded	54	86	22	35	15	20	2.5	3.2	2.8	3.3	6	8
Alexandria silt loam, 12 to 18 percent slopes, slightly eroded	56	89	24	39	18	24	2.6	3.3	3.0	3.5	6	8
Alexandria silt loam, 12 to 18 percent slopes, moderately eroded	53	84	21	33	15	20	2.5	3.2	2.8	3.3	6	8
Alexandria silt loam, 18 to 25 percent slopes, slightly eroded											5	7
Alexandria silt loam, 18 to 25 percent slopes, moderately eroded											5	7
Alexandria silt loam, 25 to 50 percent slopes, moderately eroded											5	7
Alexandria silty clay loam, 6 to 12 percent slopes, severely eroded	39	61	15	24	8	11	1.0	1.3	2.1	2.7	4	6
Alexandria silty clay loam, 12 to 18 percent slopes, severely eroded	36	56	14	22	8	11	1.0	1.3	2.1	2.7	4	6
Alexandria silty clay loam, 18 to 25 percent slopes, severely eroded											4	6
Algiers silt loam	68	110	20	38	22	29	3.2	3.5	3.5	4.0	8	9
Algiers silty clay loam	68	110	20	38	22	29	3.2	3.5	3.5	4.0	8	9
Bennington silt loam, 0 to 2 percent slopes	55	90	21	38	18	29	2.3	2.9	2.6	3.2	4	7
Bennington silt loam, 2 to 6 percent slopes, slightly eroded	52	85	20	36	17	27	2.2	2.8	2.4	3.0	4	7
Bennington silt loam, 2 to 6 percent slopes, moderately eroded	45	74	18	33	16	26	2.1	2.7	2.2	2.8	4	7
Brookston clay loam	73	110	22	38	23	30	3.2	3.5	3.5	4.0	4	10
Cardington silt loam, 0 to 2 percent slopes	59	95	24	40	19	27	2.5	3.1	2.8	3.4	6	9
Cardington silt loam, 2 to 6 percent slopes, slightly eroded	57	92	22	37	17	25	2.5	3.1	2.8	3.4	6	9
Cardington silt loam, 2 to 6 percent slopes, moderately eroded	55	86	21	35	16	21	2.4	3.0	2.6	3.2	6	9
Cardington silt loam, 6 to 12 percent slopes, slightly eroded	55	88	21	35	17	25	2.5	3.1	2.8	3.4	6	9
Cardington silt loam, 6 to 12 percent slopes, moderately eroded	50	81	20	33	16	21	2.4	3.0	2.6	3.2	6	9
Cardington silt loam, 12 to 18 percent slopes, moderately eroded	49	79	19	32	15	20	2.3	2.9	2.4	3.0	6	9
Carlisle muck	60	110									4	8
Casco loam, 18 to 25 percent slopes, moderately eroded											5	6
Casco clay loam, 18 to 25 percent slopes, severely eroded											5	6
Casco gravelly loam, 12 to 18 percent slopes, moderately eroded											5	6
Casco and Rodman loams, 25 to 40 percent slopes, moderately eroded											4	5
Celina silt loam, 0 to 2 percent slopes	63	95	24	40	20	28	2.5	3.1	2.8	3.4	7	9
Celina silt loam, 2 to 6 percent slopes, slightly eroded	61	92	24	40	19	27	2.5	3.1	2.8	3.4	7	9
Celina silt loam, 2 to 6 percent slopes, moderately eroded	57	86	22	37	17	24	2.4	3.0	2.6	3.2	7	9
Chagrin silt loam	68	107	21	40	22	30	2.4	3.3	2.6	3.5	7	9
Chagrin fine sandy loam	68	107	21	40	22	30	2.4	3.3	2.6	3.5	7	9
Condit silt loam	36	77	14	31	13	28	1.3	2.0		2.5	3	6
Crosby silt loam, 0 to 2 percent slopes	56	94	22	40	19	28	2.3	2.9	2.6	3.2	4	7
Crosby silt loam, 2 to 6 percent slopes, slightly eroded	53	89	19	35	16	24	2.2	2.8	2.4	3.0	4	7

TABLE 3.—*Estimated average acre yields of principal crops on each soil under two levels of management*—Continued

Soil	Corn		Wheat		Soybeans		Clover and grasses		Alfalfa, clover, and grasses		Pasture	
	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Index rating*	*Index rating*
Eel silt loam	68	107	21	40	22	30	2. 7	3. 4	3. 2	3. 9	5	8
Eel loam	68	107	21	40	22	30	2. 7	3. 4	3. 2	3. 9	5	8
Fox silt loam, 0 to 2 percent slopes	55	90	27	39	17	27	2. 5	3. 1	2. 9	3. 3	6	7
Fox silt loam, 2 to 6 percent slopes, slightly eroded	54	88	27	39	17	27	2. 5	3. 1	2. 9	3. 3	6	7
Fox silt loam, 2 to 6 percent slopes, moderately eroded	51	83	23	33	16	25	2. 4	3. 0	2. 7	3. 1	6	7
Fox silt loam, 6 to 12 percent slopes, slightly eroded	53	87	26	38	16	25	2. 5	3. 1	2. 9	3. 3	6	7
Fox silt loam, 6 to 12 percent slopes, moderately eroded	50	82	22	32	15	24	2. 4	3. 0	2. 7	3. 1	6	7
Fox silty clay loam, 6 to 12 percent slopes, severely eroded	39	66	11	25	------	------	1. 8	2. 4	2. 1	2. 5	4	5
Fox loam, 0 to 2 percent slopes	54	88	27	38	17	27	2. 5	3. 1	2. 9	3. 3	6	7
Fox loam, 2 to 6 percent slopes, slightly eroded	53	86	27	38	17	27	2. 5	3. 1	2. 9	3. 3	6	7
Fox loam, 2 to 6 percent slopes, moderately eroded	50	82	23	32	16	25	2. 4	3. 0	2. 7	3. 1	6	7
Fox loam, 6 to 12 percent slopes, moderately eroded	49	80	22	31	15	24	2. 4	3. 0	2. 7	3. 1	6	7
Fox loam, 12 to 18 percent slopes, moderately eroded	46	75	21	30	------	------	2. 3	2. 9	2. 5	2. 9	6	7
Fox clay loam, 12 to 18 percent slopes, severely eroded	------	------	------	------	------	------	1. 7	2. 3	1. 9	2. 3	4	5
Fox gravelly loam, 0 to 2 percent slopes	40	------	23	------	------	------	2. 5	3. 1	2. 9	3. 3	6	7
Fox gravelly loam, 2 to 6 percent slopes, slightly eroded	------	------	22	------	------	------	2. 5	3. 1	2. 9	3. 3	6	7
Fox gravelly loam, 2 to 6 percent slopes, moderately eroded	------	------	18	------	------	------	2. 4	3. 0	2. 7	3. 1	6	7
Fox gravelly loam, 6 to 12 percent slopes, moderately eroded	------	------	16	------	------	------	2. 4	3. 0	2. 7	3. 1	6	7
Fox gravelly clay loam, 6 to 12 percent slopes, severely eroded	------	------	10	------	------	------	1. 7	2. 3	1. 9	2. 3	4	5
Genesee silt loam	70	107	22	40	22	30	2. 7	3. 4	3. 2	3. 9	8	9
Genesee loam	70	107	22	40	22	30	2. 7	3. 4	3. 2	3. 9	8	9
Gravel and sand pits	------	------	------	------	------	------	------	------	------	------	------	------
Hanover silt loam, 2 to 6 percent slopes, slightly eroded	58	94	24	40	17	28	2. 6	3. 3	3. 0	3. 5	6	8
Hanover silt loam, 2 to 6 percent slopes, moderately eroded	56	91	23	37	16	26	2. 5	3. 2	2. 8	3. 3	6	8
Hanover silt loam, 6 to 12 percent slopes, slightly eroded	57	92	23	37	16	26	2. 6	3. 3	3. 0	3. 5	6	8
Hanover silt loam, 6 to 12 percent slopes, moderately eroded	52	84	21	35	14	23	2. 5	3. 2	2. 8	3. 3	6	8
Hanover silt loam, 12 to 18 percent slopes, slightly eroded	54	88	23	37	13	21	2. 6	3. 3	3. 6	3. 5	6	8
Hanover silt loam, 12 to 18 percent slopes, moderately eroded	51	83	21	35	11	18	2. 5	3. 2	2. 8	3. 3	6	8
Hanover silt loam, 12 to 18 percent slopes, severely eroded	44	71	14	23	9	15	1. 8	2. 4	2. 1	2. 5	4	6
Keene silt loam, shallow, 2 to 12 percent slopes, slightly to moderately eroded	45	73	18	30	14	18	2. 4	2. 8	2. 5	3. 0	4	6
Keene silty clay loam, shallow, 12 to 18 percent slopes, severely eroded	------	------	------	------	------	------	9	1. 2	------	2. 5	2	4
Kendallville silt loam, 0 to 2 percent slopes	62	92	25	38	20	25	2. 7	3. 4	3. 2	3. 9	6	9
Kendallville silt loam, 2 to 6 percent slopes, slightly eroded	61	88	24	36	19	24	2. 6	3. 3	3. 0	3. 5	6	9
Kendallville silt loam, 2 to 6 percent slopes, moderately eroded	58	86	22	31	18	23	2. 5	3. 2	2. 8	3. 3	6	9
Kendallville silt loam, 6 to 12 percent slopes, moderately eroded	55	82	21	32	15	19	2. 5	3. 2	2. 8	3. 3	6	9
Kendallville silt loam, 12 to 18 percent slopes, moderately to severely eroded	50	74	20	------	12	15	2. 5	3. 2	2. 8	3. 3	6	9
Lobdell silt loam	67	107	21	39	22	30	2. 4	3. 3	2. 6	3. 5	4	7
Lobdell fine sandy loam	67	107	21	39	22	30	2. 4	3. 3	2. 6	3. 5	4	7
Loudonville silt loam, 2 to 6 percent slopes, slightly eroded	44	84	19	40	------	------	2. 1	2. 7	2. 6	3. 3	5	8
Loudonville silt loam, 2 to 6 percent slopes, moderately eroded	42	80	18	38	------	------	2. 1	2. 6	2. 3	3. 1	5	8

TABLE 3.—*Estimated average acre yields of principal crops on each soil under two levels of management*—Continued

Soil	Corn		Wheat		Soybeans		Clover and grasses		Alfalfa, clover, and grasses		Pasture	
	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Index rating*	*Index rating*
Loudonville silt loam, 6 to 12 percent slopes, slightly eroded	43	82	19	40	------	------	2. 1	2. 7	2. 6	3. 3	5	8
Loudonville silt loam, 6 to 12 percent slopes, moderately eroded	40	76	17	36	------	------	2. 0	2. 6	2. 3	3. 1	5	8
Loudonville silt loam, 6 to 12 percent slopes, severely eroded	24	46	10	21	------	------	1. 5	2. 0	1. 6	2. 4	3	6
Loudonville silt loam, 12 to 18 percent slopes, slightly eroded	40	76	18	38	------	------	2. 1	2. 7	2. 6	3. 3	5	8
Loudonville silt loam, 12 to 18 percent slopes, moderately eroded	38	72	17	36	------	------	2. 1	2. 6	2. 3	3. 1	5	8
Loudonville silt loam, 12 to 18 percent slopes, severely eroded	22	42	9	19	------	------	1. 5	2. 0	1. 6	2. 4	3	6
Loudonville silt loam, 18 to 25 percent slopes, slightly eroded	------	------	------	------	------	------	------	------	------	------	4	7
Loudonville silt loam, 18 to 25 percent slopes, moderately eroded	------	------	------	------	------	------	------	------	------	------	4	7
Loudonville silt loam, 18 to 25 percent slopes, severely eroded	------	------	------	------	------	------	------	------	------	------	4	7
Loudonville silt loam, 25 to 50 percent slopes, moderately eroded	------	------	------	------	------	------	------	------	------	------	4	7
Made land	------	------	------	------	------	------	------	------	------	------	------	------
Marengo silty clay loam	73	110	21	38	23	30	3. 2	3. 5	3. 5	4. 0	5	8
Marengo silt loam	73	110	21	38	23	30	3. 2	3. 5	3. 5	4. 0	5	8
Markland and Glenford silt loams, 0 to 2 percent slopes	63	95	24	40	20	29	2. 5	3. 1	2. 8	3. 4	6	9
Markland and Glenford silt loams, 2 to 6 percent slopes, slightly eroded	61	92	24	40	19	28	2. 5	3. 1	2. 8	3. 4	6	9
Markland and Glenford silt loams, 2 to 6 percent slopes, moderately eroded	58	88	22	37	17	25	2. 4	3. 0	2. 6	3. 2	6	9
McGary and Fitchville silt loams, 0 to 2 percent slopes	56	94	22	38	19	28	2. 3	2. 9	2. 6	3. 2	3	6
McGary and Fitchville silt loams, 2 to 6 percent slopes, slightly eroded	53	89	22	38	17	25	2. 2	2. 8	2. 4	3. 0	3	6
McGary and Fitchville loams, 0 to 2 percent slopes	56	94	22	38	19	28	2. 3	2. 9	2. 6	3. 2	3	6
McGary and Sebring silt loams, 0 to 2 percent slopes	54	82	21	36	18	28	1. 3	2. 0	------	2. 5	3	6
Mentor silt loam, 0 to 2 percent slopes	66	94	26	40	21	28	2. 7	3. 4	3. 2	3. 9	4	7
Mentor silt loam, 2 to 6 percent slopes, slightly eroded	64	91	25	38	20	27	2. 6	3. 3	3. 0	3. 5	4	7
Mentor silt loam, 2 to 6 percent slopes, moderately eroded	63	90	24	37	20	27	2. 5	3. 2	2. 8	3. 3	4	7
Mentor silt loam, 6 to 12 percent slopes, slightly eroded	62	88	24	37	19	25	2. 6	3. 3	3. 0	3. 5	4	7
Mentor silt loam, 6 to 12 percent slopes, moderately eroded	58	84	23	35	18	24	2. 5	3. 2	2. 8	3. 3	4	7
Mentor silt loam, 12 to 18 percent slopes, moderately eroded	56	80	22	34	16	21	2. 5	3. 2	2. 8	3. 3	4	7
Miami silt loam, 2 to 6 percent slopes, slightly eroded	64	100	25	40	20	27	2. 6	3. 3	3. 0	3. 5	6	9
Miami silt loam, 2 to 6 percent slopes, moderately eroded	59	92	22	35	17	23	2. 5	3. 2	2. 8	3. 3	6	9
Miami silt loam, 6 to 12 percent slopes, moderately eroded	57	88	21	34	16	22	2. 5	3. 2	2. 8	3. 3	6	9
Miami silt loam, 12 to 18 percent slopes, moderately eroded	55	86	21	34	13	18	2. 5	3. 2	2. 8	3. 3	6	9
Miami silty clay loam, 6 to 12 percent slopes, severely eroded	39	61	15	24	8	11	1. 0	1. 3	2. 1	2. 7	4	7
Miami silty clay loam, 12 to 18 percent slopes, severely eroded	36	56	14	22	8	11	1. 0	1. 3	2. 1	2. 7	4	7
Montgomery silty clay loam	73	110	22	38	23	30	3. 2	3. 5	3. 5	4. 0	6	10
Montgomery silt loam	73	110	22	38	23	30	3. 2	3. 5	3. 5	4. 0	6	10
Muskingum silt loam, 2 to 6 percent slopes, slightly to moderately eroded	43	84	19	38	------	------	2. 0	2. 6	2. 3	3. 1	4	7
Muskingum silt loam, 6 to 12 percent slopes, slightly eroded	41	82	19	38	------	------	2. 0	2. 6	2. 3	3. 1	4	7
Muskingum silt loam, 6 to 12 percent slopes, moderately eroded	36	70	17	34	------	------	1. 9	2. 5	2. 1	2. 9	4	7

TABLE 3.—*Estimated average acre yields of principal crops on each soil under two levels of management*—Continued

Soil	Corn		Wheat		Soybeans		Clover and grasses		Alfalfa, clover, and grasses		Pasture	
	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Index rating*	*Index rating*
Muskingum silt loam, 6 to 12 percent slopes, severely eroded	26	51	9	18	------	------	1. 5	1. 9	1. 6	2. 4	2	5
Muskingum silt loam, 12 to 18 percent slopes, slightly eroded	39	76	18	36	------	------	1. 9	2. 5	2. 1	2. 9	4	7
Muskingum silt loam, 12 to 18 percent slopes, moderately eroded	34	66	16	32	------	------	1. 7	2. 4	1. 9	2. 7	4	7
Muskingum silt loam, 12 to 18 percent slopes, severely eroded	23	44	9	18	------	------	1. 5	1. 9	1. 6	2. 1	2	5
Muskingum silt loam, 18 to 25 percent slopes, slightly eroded	------	------	------	------	------	------	------	------	------	------	3	6
Muskingum silt loam, 18 to 25 percent slopes, moderately eroded	------	------	------	------	------	------	------	------	------	------	3	6
Muskingum silt loam, 18 to 25 percent slopes, severely eroded	------	------	------	------	------	------	------	------	------	------	2	5
Muskingum silt loam, 25 to 50 percent slopes, slightly eroded	------	------	------	------	------	------	------	------	------	------	3	6
Muskingum silt loam, 25 to 50 percent slopes, moderately to severely eroded	------	------	------	------	------	------	------	------	------	------	3	6
Muskingum fine and very fine sandy loams, 6 to 12 percent slopes, slightly to moderately eroded	35	73	17	35	------	------	1. 9	2. 5	2. 2	3. 0	4	7
Muskingum fine and very fine sandy loams, 12 to 18 percent slopes, slightly to moderately eroded	30	62	14	29	------	------	1. 6	2. 3	1. 8	2. 6	4	7
Muskingum fine and very fine sandy loams, 18 to 25 percent slopes, slightly to moderately eroded	------	------	------	------	------	------	------	------	------	------	------	------
Muskingum sandy loam, 2 to 6 percent slopes, slightly to moderately eroded	37	77	17	35	------	------	1. 9	2. 5	2. 2	3. 0	3	7
Muskingum sandy loam, 6 to 12 percent slopes, slightly eroded	35	73	17	35	------	------	1. 9	2. 5	2. 2	3. 0	3	7
Muskingum sandy loam, 6 to 12 percent slopes, moderately eroded	31	65	14	29	------	------	1. 8	2. 4	2. 0	2. 8	3	7
Muskingum sandy loam, 12 to 18 percent slopes	34	71	16	33	------	------	1. 8	2. 4	2. 0	2. 8	3	7
Muskingum sandy loam, 12 to 18 percent slopes, moderately eroded	30	62	14	29	------	------	1. 6	2. 3	1. 8	2. 6	3	7
Muskingum sandy loam, 12 to 18 percent slopes, severely eroded	17	35	7	14	------	------	1. 4	1. 8	1. 5	2. 0	1	5
Muskingum sandy loam, 18 to 25 percent slopes, slightly eroded	------	------	------	------	------	------	------	------	------	------	2	6
Muskingum sandy loam, 18 to 25 percent slopes, moderately eroded	------	------	------	------	------	------	------	------	------	------	2	6
Muskingum sandy loam, 18 to 25 percent slopes, severely eroded	------	------	------	------	------	------	------	------	------	------	1	5
Muskingum sandy loam, 25 to 50 percent slopes, slightly eroded	------	------	------	------	------	------	------	------	------	------	2	6
Muskingum sandy loam, 25 to 50 percent slopes, moderately eroded	------	------	------	------	------	------	------	------	------	------	2	6
Muskingum rocky sandy loam, 6 to 18 percent slopes, slightly to moderately eroded	------	------	------	------	------	------	------	------	------	------	3	3
Muskingum rocky sandy loam, 18 to 25 percent slopes, slightly to moderately eroded	------	------	------	------	------	------	------	------	------	------	3	3
Muskingum rocky sandy loam, 25 to 50 percent slopes, slightly to moderately eroded	------	------	------	------	------	------	------	------	------	------	3	3
Negley gravelly and sandy loams, 6 to 12 percent slopes, moderately eroded	25	------	14	------	------	------	2. 2	2. 7	2. 4	2. 8	5	6
Negley gravelly and sandy loams, 12 to 18 percent slopes, moderately eroded	22	------	13	------	------	------	2. 2	2. 7	2. 4	2. 8	5	6
Negley gravelly and sandy loams, 12 to 18 percent slopes, severely eroded	15	------	9	------	------	------	1. 4	2. 0	1. 8	2. 1	3	4
Negley gravelly and sandy loams, 18 to 25 percent slopes, slightly eroded	------	------	------	------	------	------	------	------	------	------	4	5
Negley gravelly and sandy loams, 18 to 25 percent slopes, moderately eroded	------	------	------	------	------	------	------	------	------	------	4	5
Negley gravelly and sandy loams, 18 to 25 percent slopes, severely eroded	------	------	------	------	------	------	------	------	------	------	3	4
Negley gravelly and sandy loams, 25 to 50 percent slopes, slightly eroded	------	------	------	------	------	------	------	------	------	------	4	5

TABLE 3.—*Estimated average acre yields of principal crops on each soil under two levels of management*—Continued

Soil	Corn		Wheat		Soybeans		Clover and grasses		Alfalfa, clover, and grasses		Pasture	
	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Index rating*	*Index rating*
Negley gravelly and sandy loams, 25 to 50 percent slopes, moderately eroded	------	------	------	------	------	------	------	------	------	------	4	5
Negley gravelly and sandy loams, 25 to 50 percent slopes, severely eroded	------	------	------	------	------	------	------	------	------	------	3	4
Ockley silt loam, 0 to 2 percent slopes	67	105	28	40	22	28	2. 7	3. 4	3. 2	3. 9	8	10
Ockley silt loam, 2 to 6 percent slopes, slightly eroded	66	105	27	39	21	27	2. 6	3. 3	3. 0	3. 5	8	10
Ockley silt loam, 2 to 6 percent slopes, moderately eroded	61	103	26	37	20	25	2. 5	3. 2	2. 8	3. 3	8	10
Ockley silt loam, 6 to 12 percent slopes, slightly eroded	63	104	27	39	21	27	2. 6	3. 3	3. 0	3. 5	8	10
Ockley silt loam, 6 to 12 percent slopes, moderately eroded	58	102	25	36	18	23	2. 5	3. 2	2. 8	3. 3	8	10
Ockley loam, 0 to 2 percent slopes	67	104	28	40	22	28	2. 7	3. 4	3. 2	3. 9	8	10
Ockley loam, 2 to 6 percent slopes, slightly eroded	66	104	27	39	21	27	2. 6	3. 3	3. 0	3. 5	8	10
Ockley loam, 2 to 6 percent slopes, moderately eroded	61	103	26	37	20	25	2. 5	3. 2	2. 8	3. 3	8	10
Orrville silt loam	60	97	18	38	21	31	2. 3	3. 2	2. 4	3. 3	4	7
Orrville fine sandy loam	60	97	18	38	21	31	2. 3	3. 2	2. 4	3. 3	4	7
Otwell silt loam, 2 to 6 percent slopes, slightly to moderately eroded	61	94	25	40	19	28	2. 5	3. 2	2. 8	3. 3	6	8
Otwell silt loam, 6 to 12 percent slopes, slightly eroded	59	91	24	38	18	27	2. 6	3. 3	3. 0	3. 5	6	8
Otwell silt loam, 6 to 12 percent slopes, moderately eroded	57	88	23	37	16	24	2. 5	3. 2	2. 8	3. 3	6	8
Otwell silt loam, 12 to 18 percent slopes, moderately eroded	53	82	22	35	14	21	2. 5	3. 2	2. 8	3. 3	6	8
Otwell silt loam, 18 to 25 percent slopes, moderately eroded	------	------	------	------	------	------	------	------	------	------	5	7
Parke silt loam, 2 to 6 percent slopes, slightly eroded	62	90	25	40	19	28	2. 5	3. 1	2. 9	3. 3	5	7
Parke silt loam, 2 to 6 percent slopes, moderately eroded	60	88	24	38	17	25	2. 4	3. 0	2. 7	3. 1	5	7
Parke silt loam, 6 to 12 percent slopes, slightly eroded	61	89	24	38	17	25	2. 5	3. 1	2. 9	3. 3	5	7
Parke silt loam, 6 to 12 percent slopes, moderately eroded	58	84	20	32	15	22	2. 4	3. 0	2. 7	3. 1	5	7
Parke silt loam, 12 to 18 percent slopes, slightly eroded	60	88	22	35	15	22	2. 4	3. 0	2. 7	3. 1	5	7
Parke silt loam, 12 to 18 percent slopes, moderately eroded	56	81	18	29	12	18	2. 3	2. 8	2. 5	2. 9	5	7
Parke silt loam, 18 to 25 percent slopes, slightly eroded	------	------	------	------	------	------	------	------	------	------	4	6
Parke silt loam, 18 to 25 percent slopes, moderately eroded	------	------	------	------	------	------	------	------	------	------	4	6
Parke silty clay loam, 12 to 18 percent slopes, severely eroded	45	------	15	------	9	------	1. 7	2. 3	1. 9	2. 3	3	5
Parke silty clay loam, 18 to 25 percent slopes, severely eroded	------	------	------	------	------	------	------	------	------	------	3	5
Pike silt loam, 0 to 2 percent slopes	65	106	25	40	21	28	2. 7	3. 4	3. 2	3. 9	6	8
Pike silt loam, 2 to 6 percent slopes	63	105	24	38	20	27	2. 6	3. 3	3. 0	3. 5	6	8
Pike silt loam, 2 to 6 percent slopes, moderately eroded	59	104	23	37	17	23	2. 5	3. 2	2. 8	3. 3	6	8
Pike silt loam, 6 to 12 percent slopes, moderately eroded	57	104	23	35	15	20	2. 5	3. 2	2. 8	3. 3	6	8
Riverwash	------	------	------	------	------	------	------	------	------	------	------	------
Ross silt loam	78	110	27	42	23	31	3. 3	3. 6	3. 7	4. 2	7	9
Shoals silt loam	60	97	18	38	21	31	2. 3	3. 2	2. 4	3. 3	4	7
Sleeth silt loam, 0 to 2 percent slopes	56	98	22	38	19	31	2. 3	2. 9	2. 6	3. 2	4	7
Sleeth silt loam, 2 to 6 percent slopes, slightly eroded	54	94	21	36	18	29	2. 2	2. 8	2. 4	3. 0	4	7
Sloan silty clay loam	70	110	18	44	23	30	3. 2	3. 5	3. 5	4. 0	4	10
Sloan silt loam	70	110	18	44	23	30	3. 2	3. 5	3. 5	4. 0	4	10
Thackery silt loam, 0 to 2 percent slopes	65	103	24	40	22	29	2. 5	3. 1	2. 8	3. 4	6	9
Thackery silt loam, 2 to 6 percent slopes, slightly eroded	63	103	24	40	21	28	2. 5	3. 1	2. 8	3. 4	6	9
Tippecanoe silt loam	66	104	25	40	23	29	2. 5	3. 1	2. 8	3. 4	7	10
Wallkill silt loam	60	103	------	------	------	------	------	------	------	------	3	8

TABLE 3.—*Estimated average acre yields of principal crops on each soil under two levels of management*—Continued

Soil	Corn		Wheat		Soybeans		Clover and grasses		Alfalfa, clover, and grasses		Pasture	
	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Index rating*	*Index rating*
Wallkill silty clay loam	60	103	----	----	----	----	----	----	----	----	3	8
Warsaw silt loam, 0 to 2 percent slopes	65	95	30	41	20	28	2. 6	3. 2	3. 1	3. 5	9	10
Warsaw silt loam, 2 to 6 percent slopes, slightly eroded	61	95	26	36	17	24	2. 6	3. 2	3. 1	3. 5	9	10
Wea silt loam, 0 to 2 percent slopes	75	109	30	41	23	29	2. 8	3. 5	3. 4	4. 1	7	10
Wea silt loam, 2 to 6 percent slopes, slightly eroded	73	108	29	40	22	28	2. 7	3. 4	3. 2	3. 7	7	10
Wellston silt loam, 2 to 6 percent slopes, slightly eroded	58	90	24	40	17	28	2. 6	3. 3	3. 0	3. 5	3	8
Wellston silt loam, 6 to 12 percent slopes, slightly eroded	56	87	23	38	16	26	2. 6	3. 3	3. 0	3. 5	3	8
Wellston silt loam, 6 to 12 percent slopes, moderately eroded	51	79	21	35	13	21	2. 5	3. 2	2. 8	3. 3	3	8
Wellston silt loam, 12 to 18 percent slopes, slightly to moderately eroded	47	73	20	33	12	20	2. 5	3. 2	2. 8	3. 3	3	8
Westland silty clay loam	73	110	22	38	23	31	3. 2	3. 5	3. 5	4. 0	5	10
Westland silt loam	73	110	22	38	23	31	3. 2	3. 5	3. 5	4. 0	5	10
Willette muck	----	----	----	----	----	----	----	----	----	----	4	8

Irrigation

A farmer who wishes to irrigate should find out about the supply of water and about his right to use it. Before he takes water from a flowing stream for irrigation, he should consult the State Department of Natural Resources. He can drill a well and use ground water if he wishes. He can also use water from a pond, provided he does not cut off or diminish the normal flow to a downstream user.

Only productive soils are worth irrigating. The texture and structure of the surface soil should be such that water will soak in readily. The soil should have a high water-holding capacity, but it should drain readily. It is best if the subsoil and substratum are very permeable, but some soils that are less permeable can be irrigated under careful management.

Irrigation increases yields if the water supply is the factor that limits production. Higher production increases the need for plant nutrients and organic matter; consequently, more intensive management to increase fertility, maintain tilth, and conserve moisture must be practiced under irrigation.

The frequency of irrigation will depend on rainfall, the moisture needs of the crop, and the moisture-holding capacity of the soil. The root zone should, throughout the growing season, contain at least 50 percent of its field moisture capacity.

The most efficient rate of irrigation depends on the infiltration capacity of the soil and the effective soil cover at the time of irrigation. The Fairfield County soils listed as irrigable will handle one-half inch of water per hour applied on bare ground, and 1 inch per hour on soils covered by vegetation.

Fairfield County has 78 soils that are considered suitable for irrigation if water is available and if a crop of high value is to be grown. These soils are arranged in 4 groups according to characteristics that are likely to affect their response to irrigation.

Well-drained, permeable soils

These soils can be irrigated safely if care is taken to avoid erosion on the 2 to 6 percent slopes. Usually they can absorb the water even if rain occurs immediately after irrigation. They ordinarily do not need tile drainage to remove excess water. The soils in this group are—

Chagrin silt loam.
Chagrin fine sandy loam.
Fox silt loam, 0 to 2 percent slopes.
Fox silt loam, 2 to 6 percent slopes, slightly eroded.
Fox silt loam, 2 to 6 percent slopes, moderately eroded.
Fox loam, 0 to 2 percent slopes.
Fox loam, 2 to 6 percent slopes, slightly eroded.
Fox loam, 2 to 6 percent slopes, moderately eroded.
Fox gravelly loam, 0 to 2 percent slopes.
Fox gravelly loam, 2 to 6 percent slopes, slightly eroded.
Fox gravelly loam, 2 to 6 percent slopes, moderately eroded.
Genesee silt loam.
Genesee loam.
Hanover silt loam, 2 to 6 percent slopes, slightly eroded.
Hanover silt loam, 2 to 6 percent slopes, moderately eroded.
Kendallville silt loam, 0 to 2 percent slopes.
Kendallville silt loam, 2 to 6 percent slopes, slightly eroded.
Kendallville silt loam, 2 to 6 percent slopes, moderately eroded.
Loudonville silt loam, 2 to 6 percent slopes, slightly eroded.
Loudonville silt loam, 2 to 6 percent slopes, moderately eroded.
Muskingum silt loam, 2 to 6 percent slopes, slightly to moderately eroded.
Muskingum sandy loam, 2 to 6 percent slopes, slightly to moderately eroded.
Ockley silt loam, 0 to 2 percent slopes.
Ockley silt loam, 2 to 6 percent slopes, slightly eroded.
Ockley silt loam, 2 to 6 percent slopes, moderately eroded.
Ockley loam 0 to 2 percent slopes.
Ockley loam, 2 to 6 percent slopes, slightly eroded.
Ockley loam, 2 to 6 percent slopes, moderately eroded.
Parke silt loam, 2 to 6 percent slopes, slightly eroded.
Parke silt loam, 2 to 6 percent slopes, moderately eroded.
Pike silt loam, 0 to 2 percent slopes.
Pike silt loam, 2 to 6 percent slopes.
Pike silt loam, 2 to 6 percent slopes, moderately eroded.

Ross silt loam
Warsaw silt loam, 0 to 2 percent slopes.
Warsaw silt loam, 2 to 6 percent slopes, slightly eroded.
Wea silt loam, 0 to 2 percent slopes.
Wea silt loam, 2 to 6 percent slopes, slightly eroded.
Wellston silt loam, 2 to 6 percent slopes, slightly eroded.

Well drained and moderately well drained, moderately to slowly permeable soils

These soils have fairly good water-holding capacity, but their productivity is sometimes limited by lack of moisture. A heavy rain after irrigation may make these soils so wet that productivity is reduced and fieldwork has to be postponed. In some places the drainage can be improved by installing tile. The soils in this group are—

Alexandria silt loam, 0 to 2 percent slopes.
Alexandria silt loam, 2 to 6 percent slopes, slightly eroded.
Alexandria silt loam, 2 to 6 percent slopes, moderately eroded.
Cardington silt loam, 0 to 2 percent slopes.
Cardington silt loam, 2 to 6 percent slopes, slightly eroded.
Cardington silt loam, 2 to 6 percent slopes, moderately eroded.
Celina silt loam, 0 to 2 percent slopes.
Celina silt loam, 2 to 6 percent slopes, slightly eroded.
Celina silt loam, 2 to 6 percent slopes, moderately eroded.
Eel silt loam.
Eel loam.
Lobdell silt loam.
Lobdell fine sandy loam.
Markland and Glenford silt loams, 0 to 2 percent slopes.
Markland and Glenford silt loams, 2 to 6 percent slopes, slightly eroded.
Markland and Glenford silt loams, 2 to 6 percent slopes, moderately eroded.
Mentor silt loam, 0 to 2 percent slopes.
Mentor silt loam, 2 to 6 percent slopes, slightly eroded.
Mentor silt loam, 2 to 6 percent slopes, moderately eroded.
Miami silt loam, 2 to 6 percent slopes, slightly eroded.
Miami silt loam, 2 to 6 percent slopes, moderately eroded.
Otwell silt loam, 2 to 6 percent slopes, slightly to moderately eroded.
Thackery silt loam, 0 to 2 percent slopes.
Thackery silt loam, 2 to 6 percent slopes, slightly eroded.
Tippecanoe silt loam.

Poorly and very poorly drained, moderately to slowly permeable soils

These soils should not be irrigated unless a complete tile system is first installed. They have enough water most of the year, but yields can be increased in dry seasons by a few timely applications of water. The soils in this group are—

Algiers silt loam.
Algiers silty clay loam.
Brookston clay loam.
Marengo silt loam.
Marengo silty clay loam.
Montgomery silt loam.
Montgomery silty clay loam.
Sloan silt loam.
Sloan silty clay loam.
Westland silt loam.
Westland silty clay loam.

Very poorly drained soils that are high in organic matter

These are the only soils for which subirrigation is recommended. This can be done by water-level control gates in the drainage ditch. Sprinkler irrigation is possible also, but too much water should not be applied. These soils are—

Carlisle muck.
Wallkill silt loam.
Wallkill silty clay loam.

Commercial Production of Vegetables

Fairfield County is very favorably located with respect to markets for vegetable crops. Besides Columbus and other large towns in nearby counties, these markets include Cleveland and Pittsburgh, which can be reached by overnight hauls.

To have produce ready for the most profitable market, crops should be planted and harvested early. All operations, from planting to harvesting, must be timely and on a rigid schedule. If farmers use the soils that warm up earliest in spring, vegetable crops can be harvested well ahead of those in central and northern Ohio, although slightly later than those along the Ohio River. At Lancaster, April 26 is the average date of the latest killing frost in spring.

Soils that have good internal drainage and are sandy or loose on the surface are ideal for most vegetable crops. The good drainage lets the soil warm up earlier in spring. Tilth is easier to maintain in the coarser soils, and slow infiltration of water is not a problem.

Vegetables require a more fertile soil than most other crops. Soils should be tested, and the values brought up to at least 90 pounds of available phosphate (P_2O_5) and 300 pounds of available potash (K_2O) per acre. The reaction should be maintained at pH 6.5 to 6.8 for most crops. Soils to be used for potatoes should have a much lower pH value.

A large supply of organic matter should be maintained for the intensive production of vegetables. Large amounts of manure, crop residues, cover crops, or green-manure crops should be plowed down annually. This keeps plant nutrients in available form, increases the moisture-holding capacity, improves the tilth of the soil when it is wet, and makes the soil more suitable for irrigation. Organic matter also helps to make the soil resistant to compaction by heavy machinery.

Irrigation can profitably be used to increase production, provided all other practices to improve yields have been followed. All of the soils in the county that are suitable for irrigation are also suitable for intensive vegetable production. The irrigation section of this report lists these soils.

Bulletins and other information on crop varieties, production methods, diseases, and insects are available at the Fairfield County Agricultural Extension Office.

The soils that drain and warm up most quickly in spring are the Fox and Warsaw. These soils have limited moisture-holding capacity, and they run short of water before the summer is over. They need irrigation for long-season crops.

The next soils to be ready for cultivation are the Ockley and Wea. After them come the Chagrin, Genesee, Hanover, Kendallville, Loudonville, Muskingum, Parke, Pike, Ross, and Wellston soils.

Most of the other soils of less than 6 percent slopes can be used for mid-season or late vegetables, if the drainage is good or has been improved. Soils of more than 6 percent slope are not recommended for vegetables because they are too difficult to irrigate and too likely to erode.

In some places the Algiers, Chagrin, Eel, Genesee, Lobdell, Orrville, Ross, Shoals, and Sloan soils are flooded so often that it is not worth while to try to grow vegetables on them. However, areas of bottom-land soils that are not flooded during the growing season are very good for vegetable production.

Wildlife Management

The original wildlife population of the county included many kinds of small game and some larger animals. Since the county has been settled and cleared, both the distribution and the quantity of wildlife have changed.

The soils in capability classes I and II are usually so intensively farmed that few areas remain for wildlife shelter. Most soils in classes III and IV have a few odd areas or steep slopes that can be used to provide cover for wildlife. The soils of classes V, VI, and VII are commonly in uses that provide good cover for wildlife.

Maximum production of wildlife in farming areas requires planning and management. Good cover should be provided, and an abundant supply of food and water must be available. Planting of shrubs and perennials in odd areas, around ponds, along ditches and creeks, and on forest borders will help maintain the wildlife population.

Pheasants thrive where grain is grown. They seem to be most abundant in the areas of Miami, Celina, Crosby, and Brookston soils. They are somewhat less abundant in the areas of Alexandria, Cardington, Bennington, and Marengo soils. Very few pheasants are found in the areas of forested, hilly, residual Muskingum soils. To increase the population of pheasants, leave ditchbanks unmowed until August 1, maintain low brushy vegetation in fence rows, and sod waterways. Do not burn cover areas. In forested areas, maintain dense undergrowth wherever possible. Use a flushing bar when mowing hay. Very wet land may support pheasants after it is drained for farming.

Rabbits and quail are common throughout the county. They will benefit from the practices recommended to encourage pheasants. Brush piles and thorny tangles in waste areas provide good cover for rabbits and quail. Areas that are too steep and irregular to farm can be planted with clumps of pines. Patches of perennial food plants should be maintained in pastures. Very wet land is not suitable for rabbits and quail.

Fox squirrels are most abundant in the forests on the glacial soils, and gray squirrels are most abundant on the forested, hilly Muskingum soils. Conditions are best for them if the forest is protected from fire and grazing. Clear cutting is not recommended. Leave den trees near the edge of the forest and on each acre. Undrained bottom-land forests support fewer squirrels than the upland forests.

Deer and grouse are most abundant in the forested, hilly areas of Muskingum soils. Openings should be made in large tracts of forest by clear-cutting small areas. Undrained, brushy areas provide food and shelter.

The wettest lands, undrained areas, and potholes will support muskrats and ducks if the water level can be controlled. Additional suggestions for the management and protection of wildlife are available from the county game protector.

Engineering Properties of Soils

This soil survey report for Fairfield County, Ohio, contains information that can be used by engineers to—

1. Make soil and land-use studies that will aid in the selection and development of industrial, business, residential, and recreational sites.
2. Assist in designing drainage and irrigation structures and planning dams and other structures for water and soil conservation.
3. Make preliminary evaluations of soil and ground conditions that will aid in selecting highway and airport locations and in planning detailed soil surveys for the intended locations.
4. Locate sand and gravel for use in structures.
5. Correlate performance of engineering structures with types of soil, and thus develop information that will be useful in designing and maintaining the structures.
6. Determine the suitability of soil units for cross-country movements of vehicles and construction equipment.
7. Supplement information obtained from other published maps and reports and aerial photographs, for the purpose of making soil maps and reports that can be readily used by engineers.

The mapping and the descriptive report are somewhat generalized, however, and should be used only in planning more detailed field surveys to determine the in-place condition of the soil at the site of the proposed engineering construction.

Soil Science Terminology

Some of the terms used by the agricultural soil scientist may be unfamiliar to the engineer, and some words may have special meanings in soil science. These terms are defined as follows:

Soil.—The natural medium for the growth of land plants on the surface of the earth; composed of organic and mineral materials.

Clay.—A soil separate or size group of mineral particles less than 0.002 millimeter in diameter. Clay as a textural class consists of soil material that contains more than 40 percent clay, less than 45 percent sand, and less than 40 percent silt.

Silt.—A soil separate ranging from 0.05 millimeter to 0.002 millimeter in diameter. Silt as a textural class consists of soil material that contains 80 percent or more silt and less than 12 percent clay.

Sand.—A soil separate ranging from 2.0 millimeters to 0.05 millimeter in diameter. As a textural class, sand consists of soil material that contains 85 percent or more sand, and a percentage of silt that, added to 1½ times the percentage of clay, does not exceed 15.

Topsoil.—Presumably fertile soil material used to topdress roadbanks, gardens, and lawns.

Aggregate.—A cluster of primary soil particles held together by internal forces to form a clod or fragment.

Granular structure.—Individual grains of soil material grouped into spherical aggregates with indistinct sides. Highly porous granules are commonly called crumbs.

Engineering Classification Systems

Two systems for classification of soils are in general use among engineers. Both will be used in this report.

These classification systems are explained in the PCA Soil Primer.[4]

A. A. S. H. O. classification system

Most highway engineers classify soil materials in accordance with the system approved by the American Association of State Highway Officials.[5] In this system, classification is based on the identification of soils according to their texture and plasticity and their performance in highways. All soil materials are classified in seven principal groups. The groups range from A–1 (gravelly soils of high bearing capacity, the best soils for subgrades) to A–7 (clay soils having low strength when wet, the poorest soils for subgrades). Within each group, the relative engineering value of the soil material is indicated by a group index number. Group indexes range from 0 for the best materials to 20 for the poorest. The group index number is in parentheses after the soil group symbol, in table 4. The Ohio Department of Highways has subdivided the A–4 and A–6 groups to provide a better indication of relative frost susceptibility.[6] The Ohio classification of the tested soils is given in the last column of table 4.

Unified classification system

Some engineers prefer to use the Unified soil classification system established by the Waterways Experiment Station, Corps of Engineers.[7] This system is based on identification of soils according to their texture and plasticity and their performance as engineering construction materials. Soil materials are identified as coarse grained (8 classes), fine grained (6 classes), or highly organic. The classification of the tested soils according to the Unified system is given in table 4.

Soil Data Related to Engineering

Soil samples from 10 of the principal soil series of Fairfield County were tested by standard procedures to help evaluate the soils for engineering purposes. The results of these tests and the classification of each sample according to the Unified system, the A. A. S. H. O. system, and the Ohio State modification of the A. A. S. H. O. system are given in table 4.

These test data are considered to be normal for the specific sampling depths in the respective soils, but considerable variation in texture and plasticity is likely in some of these soils. The samples from all except the Hanover and Marengo soils were obtained from depths of less than 5 feet. Consequently, it may not be possible to estimate accurately from the test data the characteristics of soil materials that will be handled in deep cuts in rolling topography.

The engineering soil classifications in table 4 are based on data obtained by mechanical analysis and by tests to determine liquid limit and plastic limit. The mechanical analysis was made by a combination of the sieve and hydrometer methods. The percentage of clay obtained by the hydrometer method should not be used in naming soil texture classes.

The liquid limit and plastic limit tests measure the effect of water on the consistence of the soil material. As the moisture content of a clayey soil increases from a very dry state, the material changes from a solid to a semisolid or plastic state. As the moisture content is further increased, the material changes from the plastic to a liquid state. The plastic limit is the moisture content, expressed as a percentage of the oven-dry weight of the soil, at which the soil material passes from a solid to a plastic state. The liquid limit is the moisture content at which the material passes from a plastic to a liquid state. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which a soil material is in a plastic condition. Some silty and sandy soils are nonplastic, that is, they will not become plastic at any moisture content.

Table 4 also gives moisture-density, or compaction, data for the tested soils. If a soil material is compacted at successively higher moisture content, assuming that the compactive effort remains constant, the density of the compacted material will increase until the "optimum moisture content" is reached. After that, the density decreases with increase in moisture content. The highest dry density obtained in the compaction test is termed "maximum dry density." Moisture-density data are important in earthwork, for, as a rule, the soil is most stable if it is compacted to about the maximum dry density when it is at approximately the optimum moisture content.

Soil Engineering Interpretations

Table 5 lists all of the soil series of the county and gives a brief description of selected characteristics that might affect the use of the soils for engineering. These data and recommendations are based on the soil-test data in table 4, on information in other sections of this report, and on experience with the same kinds of soil in other counties.

The position of the water table, the drainage characteristics of the soil, and the texture of the soil material are reflected in the rating assigned to show adaptability for winter grading or earthwork. The required standards for earthwork, with respect to compaction of the soil materials, must be maintained; consequently, the thickness of the overburden of fine-grained material over sand or gravel is considered in the ratings.

Susceptibility of the soil material .to frost action and reduction of strength when wet are considered in rating the soils as sources of sand and gravel for use in foundation and base courses of pavements and for selected coarse-grained borrow material. The soils that are rated good, fair, or poor may also be sources of surfacing material for secondary county roads.

Riverwash, which is shown on the soil map but not listed in table 5, may be a "fair to poor" source of sand and gravel. Even if a soil is rated "good," it may be necessary to explore extensively to find material that is suitable for a specific construction. Some soils contain cobblestones, which may need to be removed by screening

[4] PORTLAND CEMENT ASSOCIATION. PCA SOIL PRIMER. 86 pp., illus. Chicago. 1956.

[5] AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS. STANDARD SPECIFICATIONS FOR HIGHWAY MATERIALS AND METHODS OF SAMPLING AND TESTING. Ed. 7, Part 1, 257 pp., illus. 1955.

[6] OHIO STATE HIGHWAY TESTING LABORATORY, OHIO DEPARTMENT OF HIGHWAYS. CLASSIFICATION OF SOILS. Information from the laboratory (30–7). 4 pp., illus. [Unpublished.] February 1955.

[7] WATERWAYS EXPERIMENT STATION, CORPS OF ENGINEERS. THE UNIFIED SOIL CLASSIFICATION SYSTEM. Tech. Memo. 3–357, 1 vol. and 2 appendixes. 1953.

or crushed to make the material suitable in some highway construction operations. It is probable that none of the gravelly materials are suitable for use in structural concrete unless they are treated to remove soft sandstone, shale, or other unsuitable materials.

In areas of residual soils and in some areas where only a few feet of glacial till overlies bedrock, road construction will normally require considerable rock excavation. The rocky material excavated can be used in the lower parts or on the side slopes of embankments, but it should not be used in the upper layer of the embankment because it will prevent the preparation of a smooth surface. In a cut section, the rock should be covered with a foundation of porous material that will provide adequate underdrainage for the pavement.

In a road cut, seepage may occur at the upper surface of a clayey shale substratum. It is a common practice to terrace or bench the back slopes, either to prevent sliding or slumping of the weak, saturated material, or to permit the slumped material to be retained on the benches.

A perched water table in a shallow cut may decrease the bearing capacity of the foundation soil beneath the pavement and cause the pavement to deteriorate. This can be prevented by intercepting the water by side ditches or underdrains.

Many of the soils of the glacial till uplands have a high water table or have ponded water on the surface during part of each year. On these soils, roads must either be constructed on low embankments or be provided with a good system of surface drains and underdrains.

Some of the soils derived from glacial till have, at a slight depth, a moderately to highly plastic layer of clay loam or clay. A thicker pavement is required in a shallow cut if the subgrade is composed of this plastic material instead of the less plastic material above or below it. Where there is a transition from cut to fill, this plastic layer may be at the subgrade level, and as a result the subgrade may have a lower bearing capacity. In such places, the pavement may deteriorate unless a more permeable subgrade material is used or unless the plastic material is mixed with less plastic material from another soil layer.

The stratified lacustrine silts and clays from which the Montgomery, Markland, Glenford, McGary, Fitchville, Mentor, and Sebring soils have developed are not good foundation materials, because the materials are fine grained and the water table is high. They have low strength when wet, and the silt layers are susceptible to differential frost heave. A pavement foundation course of very permeable material should be used over these lacustrine materials.

Muck is not suitable for use in foundations for roads or other engineering structures because of the low strength of the material and the normally high water table. Muck within a roadway cut should be wasted. Muck in an embankment site or below the gradeline in a cut section should be removed and replaced by a suitable soil material. There are small areas of muck that are not shown on the soil map, and in some depressed spots muck may lie beneath several feet of glacial or alluvial material. A thorough field investigation should be made in depressed areas to locate any spots of muck in a construction site.

The lower parts of the bottom lands are likely to be flooded every year. Other parts of the bottom lands are flooded less often. A road in the bottom lands should be constructed on a continuous embankment above the level of the frequent floods. Proper drainage should be provided, because the layers of fine sand and silt in bottomland soils are susceptible to differential frost heave. If a pavement is to be constructed only a few feet above the water table in these soils, foundation materials that are not susceptible to frost action should be used.

At many construction sites, major variations in the soil may occur within the depth of the proposed excavation, and several soil units may occur within a short distance. The soil map and the profile descriptions, as well as the engineering data and recommendations given in this section, should be used in planning detailed surveys of soils at construction sites. The section on physiography and its accompanying maps also contain information of value in planning engineering projects.

Soils and Residential Development

The characteristics of the soil should be considered when choosing a site for residential development. The nature of the subsoil and that of the substratum are important in planning construction of basements and of sewage disposal systems. The soil should be deep enough over bedrock to allow for necessary excavation.

An adequate supply of uncontaminated water is necessary for areas not serviced by town or city water systems. The Division of Water of the Ohio Department of Natural Resources can advise about sources of water. The Ohio Department of Health should be consulted about the possibility of contamination of the proposed water supply.

Good internal drainage is important in a construction site. Soils that have a high water table, either constantly or at certain seasons of the year, will need subsurface drainage to make them suitable for construction. Sewage disposal systems are difficult to maintain in poorly drained soils. Septic tank outlets will not function properly if the soil is not permeable. In a wet soil, constructing a dry basement poses special problems.

A residential site needs good surface drainage to avoid ponding of water near buildings. Some slope is desirable, but if the building site receives overflow or runoff from higher areas, provision should be made to divert or dispose of the water. Danger of floods should also be considered.

Before construction is started, the topsoil should be scraped away from the foundation site and from any area that will be covered with fill material. After construction is completed, this surface soil can be used to grade around the building. It will provide a good basis for a lawn or garden.

Some of the soils in this county have few characteristics that limit their desirability for residential sites. The Casco, Fox, Hanover, Kendallville, Mentor, Negley, Ockley, Pike, Wea, and Warsaw soils are all good soils for construction. They are permeable and well drained. The water table is not high.

Other soils in the county are suitable for residential construction, but present moderate problems. The Alexandria, Cardington, Celina, Miami, Markland, Glenford, Otwell, Thackery, and Tippecanoe soils do not have a high water table. However, the permeability of these soils is fair to poor; consequently, septic tank outlets may be troublesome. Adequate drainage should be provided.

TABLE 4.—*Engineering test data [1] for soil samples*

Soil name and location	Parent material	Bureau of Public Roads report number	Depth	Horizon	Moisture-density: Maximum dry density	Moisture-density: Optimum moisture content	Mechanical analysis [2]: Fragments 1 to 3 inches in size discarded in field sampling	Percentage passing sieve [3]: 3-in.	Percentage passing sieve [3]: 2-in.	Percentage passing sieve [3]: 1½-in.
			Inches		*Lb. per cu. ft.*	*Percent*	*Percent*			
Alexandria silt loam (SW¼ sec. 36, T. 14 N., R. 19 W.).	Moderately calcareous Wisconsin glacial till.	87930	0–7	A	113	14				100
		87931	12–20	B_2	117	14				
		87932	20–34	B_3	114	15				100
		87933	40+	C_2	123	11	12	100		
Bennington silt loam (NW¼ sec. 10, T. 14 N., R. 18 W.).	Moderately calcareous Wisconsin glacial till.	87922	0–8	A_1	105	18				
		87923	15–26	B_2	106	18				
		87924	28+	C	117	14				100
Cardington silt loam (SW¼ sec. 13, T. 15 N., R. 19 W.).	Moderately calcareous Wisconsin glacial till.	87938	2–7	A_2	107	16				
		87939	11–22	B_2	107	19				
		87940	30+	C_1	118	13			100	85
Fox silt loam (SW¼ sec. 26, T. 14 N., R. 19 W.).	Calcareous Wisconsin gravel and sand outwash.	87925	3–10	A_2	111	15				
		87926	15–28	B_2	109	17				100
		87928	40+	C	130	10	40	100		
Hanover silt loam (SW¼ sec. 23, T. 16 N., R. 17 W.).	Illinoian glacial till	87934	0–9½	A_1	105	16				
		87935	17–24	B_2	110	18				
		87936	37–65	Y_2	110	16				
		87937	65+	C_1	117	13				
Marengo silty clay loam (NW¼ sec. 30, T. 16 N., R. 19 W.).	Moderately calcareous Wisconsin glacial till.	87912	0–7	([7])	101	19				
		87913	15–25		109	17				
		87914	52–75		116	14				
McGary silt loam (NE¼ sec. 36, T. 15 N., R. 19 W.).	Stratified Wisconsin silts and clays.	87915	4–10	A_2	101	19				
		87916	20–28	B_3	103	21				
		87917	31+	C_2	104	20				
Miami silt loam (NW¼ sec. 5, T. 13 N., R. 20 W.)	Highly calcareous Wisconsin glacial till.	87941	0–5	A_1	113	15			100	94
		87942	12½–17	B_2	106	17				
		87943	22+	C_1	121	12	10	100		
Muskingum silt loam (NE¼ sec. 22, T. 13 N., R. 18 W.).	Fine-grained sandstone and shale.	87918	0–7	A_1	105	17	10	100		
		87919	12–20	C_1	114	14	50	100		
Muskingum sandy loam (NE¼ sec. 6, T. 13 N., R. 18 W.).	Coarse-grained sandstone.	87920	3–8	A_2	110	16				
		87921	8–28	C_1	123	11				
Westland silty clay loam (SE¼ sec. 7, T. 14 N., R. 19 W.).	Calcareous Wisconsin gravel and sand outwash.	87909	4–10	([7])	95	23				
		87910	25–31		106	19				
		87911	43–53		124	11	12	100		

[1] Tests performed by Bureau of Public Roads in accordance with standard procedures of the American Association of State Highway Officials (A.A.S.H.O.).

[2] Mechanical analyses according to the American Association of State Highway Officials Designation: T 88. Results by this procedure frequently may differ somewhat from results that would have been obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the A.A.S.H.O. procedure, the fine material is analyzed by the hydrometer method and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 mm. in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method and the material coarser than 2 mm. in diameter is excluded from calculations of grain-size fractions. The mechanical analyses used in this table are not suitable for use in naming texture classes for soils.

taken from 11 soil profiles, Fairfield County, Ohio

Mechanical analysis [2]—Continued												Liquid limit	Plasticity index	Classification		
Percentage passing sieve [3]—Continued								Percentage smaller than [3]								
1-in.	¾-in.	⅜-in.	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 60 (0.25 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.			Unified [4]	A.A.S.H.O.[5]	Ohio [6]
97	97	95	94	93	88	85	70	62	44	24	17	24	6	ML-CL	A-4(7)	A-4a(7)
------	------	100	99	98	93	89	71	63	47	31	25	32	14	CL	A-6(9)	A-6a(9)
97	92	90	88	86	80	76	59	54	43	28	23	35	16	CL	A-6(7)	A-6b(7)
88	86	84	83	80	74	70	55	48	31	16	12	21	6	ML-CL	A-4(4)	A-4a(4)
------	100	99	99	98	94	91	82	77	58	30	21	33	10	ML-CL	A-4(8)	A-4b(8)
------	------	------	------	100	96	94	86	83	73	53	42	47	23	CL	A-7-6(15)	A-7-6(15)
98	97	95	93	91	86	84	76	71	57	35	26	32	14	CL	A-6(10)	A-6a(10)
------	------	------	------	100	97	95	86	80	59	31	20	32	10	ML-CL	A-4(8)	A-4b(8)
------	------	------	------	100	98	97	90	86	74	53	40	46	23	CL	A-7-6(14)	A-7-6(14)
85	85	84	82	80	77	75	66	61	49	33	24	32	14	CL	A-6(8)	A-6a(8)
------	------	------	------	100	90	85	79	77	61	33	23	31	10	ML-CL	A-4(8)	A-4a(8)
97	95	90	86	80	65	58	53	51	45	33	31	44	20	CL	A-7-6(8)	A-7-6(8)
60	57	52	44	33	8	5	4	4	3	2	2	19	4	GP	A-1-a(0)	A-1-a(0)
------	------	------	------	100	99	98	97	94	62	24	15	28	6	ML-CL	A-4(8)	A-4b(8)
------	------	------	------	------	------	------	100	96	68	36	30	41	18	CL	A-7-6(11)	A-7-6(11)
------	------	------	------	------	100	99	98	93	62	28	23	36	14	CL	A-6(10)	A-6a(10)
------	------	------	------	100	98	94	89	85	62	27	19	25	8	CL	A-4(8)	A-4b(8)
------	------	------	------	100	97	95	86	81	67	38	28	44	17	ML-CL or OL	A-7-6(12)	A-7-6(12)
------	------	------	------	100	98	96	90	87	75	48	38	46	25	CL	A-7-6(15)	A-7-6(15)
------	100	99	97	95	89	85	74	69	55	38	28	32	14	CL	A-6(9)	A-6a(9)
------	------	------	------	100	98	96	91	88	73	36	22	36	12	ML-CL	A-6(9)	A-6a(9)
------	------	------	------	------	------	100	99	99	97	82	65	62	34	CH	A-7-6(20)	A-7-6(20)
------	------	------	------	100	99	99	98	98	97	77	52	49	23	ML-CL	A-7-6(15)	A-7-6(15)
94	91	89	88	86	79	75	67	64	53	30	21	32	10	ML-CL	A-4(6)	A-4a(6)
100	99	97	96	93	86	82	75	74	69	52	44	54	32	CH	A-7-6(19)	A-7-6(19)
90	90	89	87	83	72	68	59	56	46	29	21	30	13	CL	A-6(6)	A-6a(6)
90	88	86	85	84	83	82	80	76	46	22	15	29	6	ML-CL	A-4(8)	A-4b(8)
50	46	42	40	38	38	37	36	32	21	10	7	24	4	GM-GC	A-4(0)	A-4a(0)
------	------	[8] 100	99	98	94	70	52	47	38	22	15	29	8	ML-CL	A-4(3)	A-4a(3)
[8] 100	99	97	96	95	90	68	53	51	46	26	18	20	7	ML-CL	A-4(4)	A-4a(4)
------	------	------	------	100	97	94	88	85	76	50	39	55	21	MH or OH	A-7-5(15)	A-7-5(15)
------	------	------	------	100	98	96	91	89	81	52	45	63	38	CH	A-7-6(20)	A-7-6(20)
88	86	80	76	72	63	59	49	44	26	17	13	26	8	SC	A-4(3)	A-4a(3)

[3] Based on total material. Laboratory test data corrected for amount discarded in field sampling.
[4] The Unified Soil Classification System, Technical Memorandum No. 3-357, Volume 1, Waterways Experiment Station, March 1953.
[5] The Classification of Soils and Soil-Aggregate Mixtures for Highway Purposes, A.A.S.H.O. Designation: N 145-49.
[6] Information from the Laboratory Classification of Soils, Ohio State Highway Testing Laboratory, February 1, 1955 (Unpublished).
[7] Horizons were not designated for this soil.
[8] Some large, soft particles probably disintegrated in sample preparation.

TABLE 5.—*Highway engineering*

Soil series	Drainage and texture	Dominant slope
Residual Soils		
		Percent
Keene	½ to 1½ feet of moderately well drained to somewhat poorly drained silt loam or silty clay loam over clayey shale or sandstone; numerous soft shale and sandstone channery fragments below a depth of ½ foot.	6 to 12
Muskingum	1 to 2 feet of well-drained silt loam or sandy loam over sandstone or shale; variable quantity of channery fragments throughout the profile.	2 to 35
Wellston	½ to 1 foot of well-drained silt loam on 1½ to 2½ feet of silty clay loam or sandy clay loam that contains channery fragments, over sandstone and shale.	2 to 18
Glacial Till		
Alexandria	2½ to 4 feet of well-drained silt loam to clay loam over loam	2 to 35
Bennington	1 to 1½ feet of somewhat poorly drained silt loam over loam to clay loam; some gravel or rock fragments below a depth of 2 feet.	0 to 6
Brookston	Very poorly drained clay loam; some gravel or limestone fragments below a depth of 4½ feet.	0 to 2
Cardington	1½ to 2½ feet of moderately well drained silt loam to clay loam over loam; may contain more than 15 percent shale or sandstone fragments more than 1 inch in size below depth of 2 feet.	0 to 18
Celina	1½ to 2½ feet of moderately well drained silt loam to clay loam over loam	0 to 6
Condit	1 to 1½ feet of poorly drained silt loam over clay loam or silty clay loam; some rock fragments below depth of 3 feet.	0 to 2
Crosby	About 1 foot of somewhat poorly drained silt loam on 1 to 1½ feet of silty clay loam to clay loam derived from loam to clay loam material.	0 to 6
Hanover	1 to 2 feet of well-drained silt loam on about 1 foot of silty clay loam, over loam, silt loam, or fine sandy loam.	2 to 18
Kendallville	½ to 1 foot of well-drained silt loam or silty clay loam on 1½ to 2½ feet of clay loam or gravelly clay loam, over loam.	2 to 18
Loudonville	½ to 1 foot of well-drained silt loam on 1 to 2 feet of clay loam containing glacial gravel or channery fragments of sandstone and shale, over sandstone and shale.	2 to 12
Marengo	½ to 1 foot of very poorly drained silty clay loam or silt loam on 4 to 5 feet of clay loam, over loam to coarse clay loam.	0 to 2
Miami	½ to 1 foot of well-drained silt loam on 1 to 2 feet of clay loam or silty clay loam, over loam; in places the silt loam layer has been removed by erosion.	2 to 18
Stratified Glacial Deposits		
Fox	½ to 1½ feet of well-drained gravelly loam, loam, or silt loam on 1 to 2 feet of gravelly clay loam or clay loam over stratified gravel and sand.	2 to 18
Negley	1½ to 3 feet of well-drained gravelly loam to sandy clay loam on loose gravelly or sandy loam; underlain by stratified gravel and sand at depth below 5 to 7 feet; in places has thin layers of clay at depth of 3 to 4 feet.	6 to 35
Muck		
Carlisle	3 to 4 feet of very poorly drained muck or peat on stratified silts and clays; underlain by marly gravel at various depths.	0 to 2
Wallkill	1 to 2 feet of very poorly drained silt loam or silty clay loam on 1 to 4 feet of muck; underlain by stratified silty and clayey materials; marly gravel occurs at greater depth.	0 to 2
Willette	1 to 3 feet of very poorly drained muck on silty clay or clay; underlain by marly gravel at depth of several feet.	0 to 2

See footnotes at end of table.

data and recommendations

Estimated soil classification		Depth to seasonally high water table	Adaptability to winter grading	Desired location of grade line	Suitability as source of sand and gravel [1]
A. A. S. H. O.	Unified				
Residual Soils—Continued					
		Feet			
A-4 or A-6	ML or CL	[2] 1 to 2	Not adapted	Anywhere	Not suitable.
A-2, A-4, or A-6	SM, SC, GM, ML or CL.	[3]	Soil not adapted; rock is adapted.	Anywhere	Not suitable.
A-4 or A-6 on A-6 or A-7.	ML or CL on GC, SC, or CL.	[3]	Soil not adapted; rock is adapted.	Anywhere	Not suitable.
Glacial Till—Continued					
A-4 or A-6	ML or CL	6+	Not adapted	Anywhere	Not suitable.
A-4 or A-6 over A-6 or A-7.	ML or CL	0 to 3	Not adapted	3 feet minimum above water table.	Not suitable.
A-6 or A-7	CL or CH	0 to 3	Not adapted	3 feet minimum above water table.	Not suitable.
A-4, A-6, or A-7 over A-4 or A-6.	ML, CL, or CH over ML or CL.	2 to 4	Not adapted	Slight fills preferred in flat to gently sloping areas; grade line in other areas 3 feet minimum above water table.	Not suitable.
A-4, A-6, or A-7 over A-4 or A-6.	ML, CL, or CH over ML or CL.	2 to 4	Not adapted	Slight fills preferred in flat to gently sloping areas; grade line in other areas 3 feet minimum above water table.	Not suitable.
A-4 or A-6 over A-6 or A-7.	ML or CL over CL or CH.	0	Not adapted	3 feet minimum above water table.	Not suitable.
A-4 or A-6 on A-6 or A-7.	ML or CL on CL or CH.	0 to 3	Not adapted	3 feet minimum above water table.	Not suitable.
A-4 or A-6 on A-6 or A-7, over A-4 or A-6.	ML or CH on CL or CH, over SM, SC, ML or CL.	10+	Not adapted	Anywhere	Not suitable.
A-4, A-6, or A-7 on A-6 or A-7, over A-4 or A-6.	ML or CL on GC, CL, or CH, over ML or CL.	10+	Not adapted	Anywhere	Not suitable.
A-4 or A-6 on A-6 or A-7.	ML or CL on CL or CH.	[3]	Soil not adapted; rock is adapted.	Anywhere	Not suitable.
A-4, A-6, or A-7 on A-6 or A-7, over A-4 or A-6.	ML, CL, or OL on CL or CH, over ML or CL.	0 to 3	Not adapted	3 feet minimum above water table.	Not suitable.
A-4 or A-6 on A-6 or A-7, over A-4 or A-6.	ML or CL on CL or CH, over ML or CL.	6+	Not adapted	Anywhere	Not suitable.
Stratified Glacial Deposits—Continued					
A-4 or A-6 on A-6 or A-7, over A-1, A-2, or A-3.	GM, SM, ML, or CL on GC, SC, or CL, over GM, GP, SM, or SP.	10+	Good	Anywhere	Good.
A-2, A-4, or A-6, on A-2 or A-4, over A-1, A-2, or A-3.	GM, SM, or SC on GM or SM, over GM, GP, SM, or SP.	10+	Good	Anywhere	Poor to not suitable.
Muck—Continued					
Muck or peat on A-4, A-6, or A-7.	Pt on ML, CL, or CH	0	Not adapted	4 feet minimum above high water; muck must be removed.	Not suitable.
A-4, A-6, or A-7 on muck, over A-4, A-6, or A-7.	ML or CL on Pt, over ML or CL.	0	Not adapted	4 feet minimum above high water; muck must be removed.	Not suitable.
Muck on A-6 or A-7	Pt on CL, MH, or CH	0	Not adapted	4 feet minimum above high water; muck must be removed.	Not suitable.

TABLE 5.—*Highway engineering*

TERRACE DEPOSITS

Soil series	Drainage and texture	Dominant slope
		Percent
Casco	1 to 2 feet of well-drained loam, clay loam, or gravelly loam over stratified gravel and sand.	18 to 35
Casco and Rodman	1 to 2 feet of well-drained gravelly loam over stratified gravel and sand; in some places has cobbles throughout the profile.	25 to 40
Markland and Glenford	½ to 1½ feet of moderately well drained to well drained silt loam on 2 to 3 feet of silty clay loam, over stratified lacustrine silty, clayey, and sandy materials.	2 to 6
McGary and Fitchville	½ to 1 foot of somewhat poorly drained loam or silt loam on 1½ to 2½ feet of silty clay loam, over stratified lacustrine silts and clays.	0 to 6
McGary and Sebring	½ to 1 foot of somewhat poorly drained to poorly drained silt loam on 1½ to 2½ feet of silty clay or silty clay loam, over stratified lacustrine clays.	0 to 2
Mentor	About 1 foot of well-drained silt loam on 1½ to 2½ feet of clay loam to sandy clay loam, over thin layers of lacustrine sandy loam or silty and clayey materials.	2 to 12
Montgomery	½ to 2½ feet of very poorly drained silt loam or silty clay loam on 2 to 3 feet of clay, over thin layers of lacustrine silty and clayey materials.	0 to 2
Ockley	1½ to 2½ feet of well-drained loam or silt loam on 1½ to 2½ feet of gravelly to silty clay loam, over stratified gravel and sand.	0 to 12
Otwell	1 to 2 feet of well-drained silt loam on 2 to 3 feet of silty clay loam, over thin layers of lacustrine fine sandy and clayey materials.	12 to 25
Parke	½ to 1½ feet of well-drained silt loam on 2 to 3 feet of silty clay loam over 3½ to 6 feet of loam to sandy clay loam; stratified gravel and sand below a depth of about 8 to 10 feet.	2 to 25
Pike	4 to 5 feet of well-drained silt loam to clay loam on sandy clay or sandy clay loam; underlain by strata of gravel and sand at depth of 10 to 15 feet.	0 to 12
Sleeth	2 to 3 feet of somewhat poorly drained silt loam to silty clay loam on 1 to 3 feet of clay loam to gravelly clay loam; underlain by stratified gravelly and sandy materials.	0 to 6
Thackery	½ to 1½ feet of moderately well drained silt loam on 2½ to 3½ feet of silty clay loam or clay loam, over stratified gravelly, sandy, and silty materials.	0 to 6
Tippecanoe	½ to 1½ feet of moderately well drained silt loam on 2½ to 4 feet of clay loam to gravelly clay loam, over stratified gravelly, sandy, and silty materials.	0 to 2
Warsaw	½ to 1½ feet of well-drained silt loam on 1½ to 2½ feet of gravelly clay loam to clay loam, over stratified gravelly and sandy materials.	0 to 6
Wea	½ to 1½ feet of well-drained silt loam on 2½ to 3½ feet of gravelly clay loam to clay loam, over stratified gravelly and sandy materials.	0 to 6
Westland	½ to 1 foot of very poorly drained silt loam or silty clay loam on 2½ to 3½ feet of clay loam or clay over stratified gravelly, sandy, and silty materials.	0 to 2

See footnotes at end of table.

data and recommendations—Continued

TERRACE DEPOSITS—Continued

Estimated soil classification		Depth to seasonally high water table	Adaptability to winter grading	Desired location of grade line	Suitability as source of sand and gravel [1]
A. A. S. H. O.	Unified				
		Feet			
A-4, A-6, or A-7 over A-1, A-2, or A-3.	GM, ML, or CL over GM, GP, SM, or SP.	10+	Good	Anywhere	Good.
A-4 over A-1, A-2, or A-3.	GM or ML over GM, GP, SM, or SP.	10+	Good	Anywhere	Good.
A-4 or A-6 on A-6 or A-7, over A-4, A-6, or A-7.	ML or CL on CL, over SM, ML, and CL.	2 to 4	Not adapted	3 feet minimum above water table; subsurface drainage may be required.	Not suitable.
A-4 or A-6 on A-6 or A-7, over A-4, A-6, or A-7.	ML or CL on CL or CH, over ML, CL, MH, or CH.	0 to 3	Not adapted	3 feet minimum above water table; surface drainage is required.	Not suitable.
A-4 or A-6 on A-6 or A-7, over A-7.	ML or CL on CL, CH, or MH, over MH or CH.	0 to 2	Not adapted	3 feet minimum above water table; surface drainage is required.	Not suitable.
A-4 or A-6 on A-6 or A-7, over A-4, A-6, or A-7.	ML or CL on SC, CL, or CH, over SM, SC, ML, CL, or CH.	10+	Not adapted	Anywhere	Not suitable.
A-4, A-6, or A-7 on A-7, over A-6 or A-7.	ML or CL on CH or MH, over ML, CL, MH, or CH.	0 to 3	Not adapted	3 feet minimum above water table; surface drainage is required.	Not suitable.
A-4 or A-6 on A-6 or A-7, over A-1, A-2, or A-3.	ML or CL on CL, over GM, GP, SM, or SP.	10+	Fair to good	Anywhere	Good.
A-4 or A-6 on A-6 or A-7, over A-4 or A-6.	ML or CL on CL or CH, over SC, ML, or CL.	15+	Not adapted	Anywhere	Not suitable.
A-4 or A-6 on A-6 or A-7, over A-4 or A-6; underlain by A-1, A-2, or A-3.	ML or CL on CL or CH, over ML or CL; underlain by GM, GP, SM, or SP.	10+	Poor	Anywhere	Fair.
A-4, A-6, or A-7 on A-6 or A-7, over A-1, A-2, or A-3.	ML or CL on CL, CH or MH; over GM, GP, SM, or SP.	10+	Not adapted	Anywhere	Poor to fair.
A-4, A-6, or A-7 on A-6 or A-7, over A-2 or A-4.	ML or CL on CL, over GM, GC, SM, or SC.	0 to 3	Not adapted	3 feet minimum above water table; surface drainage is required.	Poor.
A-4 or A-6 on A-6 or A-7, over A-2 or A-4.	ML or CL on CL or CH, over GM, GC, SM, SC, or CL.	2 to 4	Not adapted	3 feet minimum above water table.	Fair.
A-4 or A-6 on A-6 or A-7, over A-2 or A-4.	ML or CL on CL, over GM, GC, SM, SC, or ML.	2 to 4	Not adapted	3 feet minimum above water table.	Fair.
A-4 or A-6 on A-6 or A-7, over A-1, A-2, or A-3.	ML or CL on CL, over GM, GP, SM, or SP.	10+	Fair to good	Anywhere	Fair to good.
A-4 or A-6 on A-6 or A-7, over A-1, A-2, or A-3.	ML or CL on CL, over GM, GP, SM, or SP.	10+	Fair to good	Anywhere	Fair to good.
A-6 or A-7 on A-7, over A-2 and A-4.	CL, CH, or MH on MH or CH, over GM, GC, SM, SC, or ML.	0 to 3	Not adapted	3 feet minimum above water table; surface drainage is required.	Poor to not suitable.

TABLE 5.—*Highway engineering*

BOTTOM LANDS

Soil series	Drainage and texture	Dominant slope
Algiers	2 to 3½ feet of somewhat poorly to poorly drained silt loam or silty clay loam over silty clay	0 to 2
Chagrin	Well-drained silt loam or fine sandy loam	0 to 2
Eel	Moderately well drained silt loam or loam; strata of sand or gravel may occur at a depth below 3½ feet.	0 to 2
Genesee	3 to 6 feet of well-drained loam to silty clay loam over stratified gravel, sand, and finer textured materials.	0 to 2
Lobdell	Moderately well drained silt loam or sandy loam; in some places has layers of loam or clay loam below a depth of 3 feet.	0 to 2
Orrville	½ to 1½ feet of somewhat poorly drained silt loam or fine sandy loam over silty clay loam or clay loam; some layers of sandy materials below a depth of 2 feet.	0 to 2
Ross	4 to 5 feet of well-drained silt loam to silty clay loam over stratified sandy, silty, and clayey materials.	0 to 2
Shoals	2½ to 3½ feet of somewhat poorly drained silt loam over stratified sandy loam, loamy sand, or silty gravel; in places has lenses of sandy or gravelly material at depths of 1½ to 3½ feet.	0 to 2
Sloan	2½ to 3½ feet of very poorly drained silty clay loam over strata of silt loam to clay loam containing some gravel; in places is silt loam to depth of ½ to 1 foot.	0 to 2

[1] Material for use as: (1) Selected borrow, (2) foundation course for pavement, and (3) base course for flexible pavement. Field exploration required to determine suitable source.

The Loudonville, Muskingum, and Wellston soils have permeable subsoil, and they do not have a high water table. Their suitability for construction is limited because they are shallow over bedrock or shale.

The Keene soils are also shallow over shale or sandstone. They do not have a high water table, because their profile is slowly permeable and most of the rainwater runs off.

The Crosby, McGary, Fitchville, Bennington, and Sleeth soils have a high water table at certain periods. They need drainage to make them suitable for construction. The premeability is only fair to poor. These problems are of moderate intensity in the Crosby, McGary, and Fitchville soils, but they seriously limit the desirability of the Bennington and Sleeth soils for residential sites.

The Condit, Brookston, Sebring, Marengo, Montgomery, Westland, and Wallkill soils have a high water table at some seasons. The permeability is fair to poor. Water ponds on the surface in winter and spring. These soils are not desirable residential sites; if they are used, adequate drainage should be provided.

The Chagrin, Eel, Genesee, Lobdell, and Ross soils would be good residential sites, except for the danger of flooding. The soils are permeable and the water table is not high. The Orrville and Shoals soils are also subject to floods, and their desirability for residential sites is further limited by a periodic high water table and fair to poor permeability.

The Algiers and Sloan soils are not suitable for construction unless they are drained. The water table is periodically high, surface water ponds in winter and spring, and the soils are likely to be flooded. The permeability is only fair to poor.

It is not recommended that construction be attempted on the mucky Carlisle or Willette soils.

Formation and Classification of Soils

Soil is formed by the forces of weathering and soil development acting on materials deposited or accumulated by geological activity. The characteristics of the soil at any given point have been acquired through the influences of (1) the physical and mineralogical composition of the parent material, (2) the climate under which the soil material has accumulated and existed since accumulation, (3) the plant and animal life in and on the soil, (4) the relief, or lay of the land, and (5) the length of time the forces of soil development have acted on the soil material.

Soil Formation in Fairfield County

In Fairfield County, the differences among the soils result chiefly from the differences in parent material and relief. The forces of climate and vegetation have strongly influenced the development of the soils, but these factors are so nearly uniform throughout the county that they tend to make the soils similar to, rather than different from, each other.

Parent material

Figure 11 shows the distribution of the principal kinds of parent material in the county. Each kind of parent material developed into a characteristic group of soils that differ from each other because of differences in relief and drainage.

1. *Moderately calcareous glacial till.*—The principal soils developed on this material belong to the Alexandria, Cardington, Bennington, Condit, and Marengo series. The Marengo soils, which developed in depressions, may be derived partly from silty colluvium washed in from

data and recommendations—Continued

BOTTOM LANDS—Continued

Estimated soil classification		Depth to seasonally high water table	Adaptability to winter grading	Desired location of grade line	Suitability as source of sand and gravel [1]
A. A. S. H. O.	Unified				
A–4, A–6, or A–7 over A–7.	ML or CL over MH or CH.	0 to 3	Not adapted	Above high water	Not suitable.
A–2, A–4, or A–6	SM, ML, or CL	4+	Not adapted	Above high water	Not suitable.
A–4 or A–6	ML or CL	2 to 4	Not adapted	Above high water	Not suitable.
A–4, A–6, or A–7 over A–1, A–2, A–3, or A–4.	ML or CL over GM, GC, SM, SC, or ML.	4+	Not adapted	Above high water	Not suitable.
A–4 or A–6	ML or CL	2 to 4	Not adapted	Above high water	Not suitable.
A–4 or A–6 over A–6 or A–7.	SM, ML, or CL over CL.	0 to 3	Not adapted	Above high water	Not suitable.
A–4, A–6, or A–7 over A–2, A–4, or A–6.	ML or CL over SM, SC, ML, or CL.	4+	Not adapted	Above high water	Not suitable.
A–4 or A–6 over A–2 or A–4.	ML or CL over GM, SM, or SC.	0 to 3	Not adapted	Above high water	Not suitable.
A–6 or A–7 over A–4, A–6, or A–7.	CL or CH over ML, CL, or CH.	0 to 3	Not adapted	Above high water	Not suitable.

[2] Water table is perched above very shallow bedrock and impermeable subsoil.
[3] Depth to water table is unknown.

higher land nearby. Some small areas in this unit have no glacial till.

2. *Strongly calcareous glacial till.*—The Miami, Celina, and Crosby soils developed entirely from strongly calcareous till. The Brookston soils, which are in depressions, seem to be derived partly from silty colluvium and partly from the glacial till.

3. *Calcareous gravel and sand.*—This material accumulated in moraines, kames, and kame terraces. In some places it is deep, and in others it is shallow over till. The Fox and Casco soils developed in the deeper material. Where the gravel or sand is shallow, the Kendallville soils developed—the upper layers from the gravelly or sandy material, and the lower layers from the calcareous till beneath.

4. *Calcareous, stratified lacustrine silts, clays, and fine sands.*—The soils developed from these materials are combined in intricate patterns because the random stratification of the parent materials brings different textures to the surface within short distances. The most common soils belong to the Mentor, Markland, Glenford, McGary, Fitchville, Sebring, and Montgomery soil series. The Markland, McGary, and Montgomery soils developed over a calcareous substratum. The substratum of the Glenford, Fitchville, Sebring, and Mentor soils is noncalcareous. Included in these areas are some soils that developed from recent stream alluvium.

5. *Calcareous, stratified gravel and sand.*—The soils developed on these materials are of the Ockley, Thackery, Sleeth, Westland, Wea, Tippecanoe, Fox, Casco, and Kendallville soil series. The Ockley, Thackery, Sleeth, and Westland soils are derived partly from the underlying calcareous gravel and sand, but their surface soil appears to be derived from finer textured silty materials. In some places the gravel and sand are shallow over mixed till. These areas include some recent stream alluvium and the soils developed from it.

6. *Noncalcareous glacial till.*—The Hanover and Loudonville soil series have developed on this material. The distribution of the till is patchy and the deposits are shallow. Many areas are free of glacial drift. The A and B horizons in the Loudonville soils are derived from the till, but the C horizon developed from material weathered from the underlying bedrock. Some of the less strongly sloping Hanover soils appear to have developed from till overlain by wind- or water-deposited silt.

7. *Weakly calcareous gravel and sand.*—This material accumulated in glacial moraines. The upper part has been weathered and leached, but the lower part is calcareous. The Negley and Parke soils have developed from these deposits. The Negley soils were derived from the gravelly and sandy material, but the upper layers of the Parke soils appear to have developed from finer textured silty material.

8. *Calcareous, stratified gravel and sand.*—Like the weakly calcareous material just described, this gravelly and sandy outwash material has been weathered and leached. It underlies the Negley and Parke soils. The Pike soils, the upper layers of which developed from loess or water-laid silt of the Illinoian time, are also in these areas. Some recent stream alluvium and the soils that developed from it are included.

9. *Acid, lacustrine silt, clay, and fine sand.*—The dominant soils in this area are of the Otwell series. They developed in deep, silty, lacustrine deposits of Illinoian age.

10. *Acid sandstone or interbedded sandstone and shale.*—These areas were not glaciated. They are occupied by residual soils developed from material weathered from the

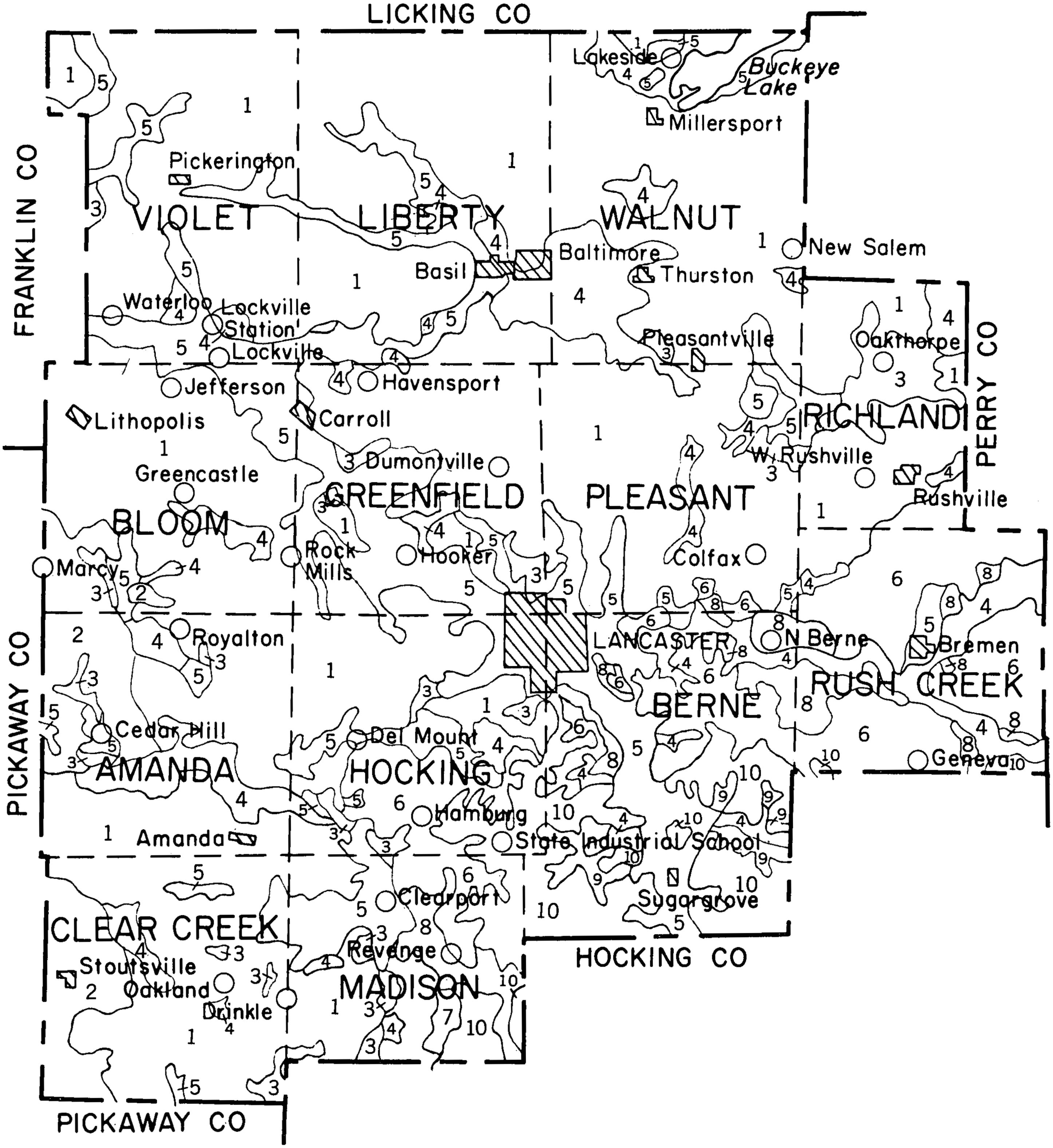

Figure 11.—General distribution of major parent materials of soils in Fairfield County, Ohio.
Late Wisconsin glaciation: (1) Moderately calcareous glacial till; (2) Strongly calcareous glacial till; (3) Calcareous gravel and sand; (4) Calcareous, stratified lacustrine silts, clays, and fine sands; (5) Calcareous, stratified gravel and sand.
Illinoian glaciation: (6) Noncalcareous glacial till; (7) Weakly calcareous gravel and sand; (8) Calcareous, stratified gravel and sand; (9) Acid, lacustrine silt, clay, and fine sand.
No glaciation: (10) Acid sandstone or interbedded sandstone and shale.

bedrock. Muskingum and Wellston soils and the shallow soils of the Keene series are most common in this area. The Muskingum and Keene soils were derived from interbedded sandstone and shale. The lower layer of the Wellston soils was derived from the fine-grained sandstone that underlies it, but the A horizon and the upper part of the B horizon are silty and smooth and were derived either from loess or from siltstone and shale that formerly lay above the sandstone.

Climate

Climate is important in soil development because it influences vegetation, mineralization, the rate of weathering, and the formation of soil structure. It controls the amounts of water and of solar energy available for soil processes. Climate of Fairfield County is characterized by hot and humid summers, cold winters, and about 40 inches of rainfall each year. In this kind of climate, it is likely that podzolization will take place in the soils under forest and that Brunizems will develop in the grass-covered areas. Since the climate is nearly uniform throughout the county, it is not responsible for the differences among the various series of the county.

Native vegetation

Fairfield County was originally almost completely covered by a dense forest of hardwoods. In the hilly southern part of the county, some of the forests were mixtures of hardwoods and conifers. Areas of prairie or savanna were scattered throughout some of the Wisconsin-glaciated valleys.

Although vegetation had an important influence on the properties of the soils in this county, it does not account for great differences between soils. Its effect was modified by relief.

Most of the soils of the county developed under forest, but the Warsaw, Ross, Westland, Carlisle, Willette, and Wallkill soils developed at least partly under prairie grasses. If other soil-forming factors were equal, more organic matter accumulated under prairie vegetation than under forest vegetation.

Relief

The relief of Fairfield County is characterized by wide extremes. More than any other factor, it has influenced the development of differences among the soils of this county. Relief modifies the effectiveness of the active factors of soil formation through its control of runoff, erosion, depth of water table, internal drainage, leaching, accumulation and removal of organic matter, and other phenomena.

The very poorly drained Westland, Carlisle, Willette, and Wallkill soils have more organic matter than the well-drained Warsaw and Ross soils, chiefly because organic matter decomposes more slowly in wet soils. The depressed relief of the Brookston, Marengo, and Montgomery soils has caused development of surface soils that are rich in organic matter, although they developed under forest.

Relief is most effective in differentiating soils if the parent material is moderately permeable. The influence of an impermeable parent material, such as that of the Keene soil, or a very permeable parent material, such as that of the Parke soil, may dominate over the influence of relief in forming the soil.

Time

All soils, except the typical alluvial soil, require some time to develop characteristic profiles. In Fairfield County, time is an important factor because the parent materials range in age from more than 200 million years to less than 10,000 years. Differences in weathering and development of soils are not correlated exactly with differences in age because other soil-forming factors modify the rate of weathering and other processes.

The Genesee, Eel, Shoals, Ross, Chagrin, Lobdell, and Orrville soils, which formed from recent alluvium, have very little or no profile development or horizon differentiation. In the Miami, Celina, Crosby, Alexandria, Cardington, Bennington, and Condit soils, which were derived from Wisconsin glacial till, the horizons are much more strongly differentiated, especially in texture.

The materials in the Illinoian and Wisconsin glacial tills appear to have been very similar in original composition and character, but they differ widely in age. The Hanover soils, which developed from Illinoian till, and the Alexandria soils, which developed from Wisconsin till, have similar relief, drainage, and native vegetation, and their parent material must originally have been similar, but the soils themselves differ considerably. The Hanover soils are more deeply leached and weathered than the Alexandria soils. The corresponding horizons are thicker, siltier, less gritty, less stony, less plastic, and less sticky. The surface soil contains less organic matter and sand. Free carbonates have leached to depths of 6 feet or more in the Hanover soils, but only to depths of 3 to 4 feet in the Alexandria soils. These differences are attributed to the difference in age.

Alteration by man

Soils change considerably under cultivation. In some places surface soil is removed and the lower horizons are exposed by accelerated erosion. The organic-matter content usually decreases under cultivation, even if little erosion occurs. Nitrogen is lost through leaching, and mineral plant nutrients are removed by crops. The crumbly and granular structure of the surface layer in the Brookston, Marengo, Westland, Montgomery, and Sloan soils can be changed to a hard and cloddy structure by continued cultivation.

Artificial drainage affects the characteristics of a soil over a period of years. It improves aeration of lower layers and thus allows some of the minerals in the soil to oxidize.

Other changes in the soil may result from changing the natural flow of surface water by diversion or moisture-holding structures.

Soil Classification in Fairfield County

The soils of Fairfield County belong to eight of the great soil groups and one intergrade between great soil groups. Most of them belong to the Gray-Brown Podzolic group, which developed under forest. Some soils of the county are in an intergrade between the Gray-Brown Podzolic great soil group and the Red-Yellow Podzolic great soil group. A few soils are Brunizems, which developed under grass vegetation. Most of the poorly drained soils are in the Humic Gley or the Planosol great soil groups or are organic soils. The soils that consist of recent alluvium are in the Alluvial great soil group. Other great soil groups represented in the county are the Rendzina soils and Sols Bruns Acides (Acid Brown soils). The combination of the chief variable factors in soil development in this county—parent material and relief or drainage—is usually enough to fix the fundamental characteristics that determine in what great soil group the soil will fall. Table 6, Key to the soil series, shows the relations between the various soil series of this county.

Gray-Brown Podzolic soils

Fourteen of the soil series in this county are classified in the Gray-Brown Podzolic great soil group. These soils developed under a deciduous forest in a humid climate. The dominant process in their formation has been a concentration of clay in the B_2 horizon, probably both by downward movement from the A horizon and by development of clay in the B horizon. The upper few inches of the profile is dark colored because of the accumulation of organic matter, and there is a thin layer of organic litter on the surface.

The well-drained Gray-Brown Podzolic soils in this county are in the Alexandria, Miami, Kendallville, Ockley, Markland, Casco, and Fox series. They have well-developed texture and color profiles. They range from nearly level to steep in relief, but they differ because of differences in parent material or age, not because of differences in slope.

In uncultivated areas, the eluvial horizons—A_1 and A_2—are lighter colored, coarser textured, higher in silica, and lower in sesquioxides than the B horizons. They have been leached of their soluble bases, and their reaction is acid.

The thin A_0 horizon is high in organic matter and soluble bases, especially calcium, because of the decaying leaves and other organic materials it contains. It is less acid than either the A_1 or A_2 horizon.

The illuvial horizon, the B, is finer textured because of the accumulated clay, sesquioxides, and colloidal materials washed in from the A horizons. The B horizon is leached of soluble bases and is acid in reaction.

Free carbonates have been leached from both the A and B horizons of all of these soils. The C horizon of soils derived from calcareous materials deposited by the Wisconsin glacier contains free carbonates.

The thickness of the A and B horizons varies, but it is rarely more than 4 feet. The C horizon contains less clay and less colloidal material than the B horizon.

Profile of Alexandria silt loam, 2 to 6 percent slopes, in a permanent bluegrass pasture in the NW¼ sec. 18, T. 14 N., R. 20 W.:

A_p 0 to 5 inches, brown (10YR 5/3, moist) to dark-brown (10YR 4/3, moist) silt loam; friable when moist; moderate medium granular structure; contains many grass roots; pH 6.6.

A_2 5 to 9 inches, yellowish-brown (10YR 5/6, moist) silt loam; friable when moist; weak thick platy primary structure, breaking to medium granular structure; pH 6.6.

B_1 9 to 13 inches, brown (7.5YR 4/4, moist) loam; friable when moist; moderate fine subangular blocky structure; pH 5.2.

B_{21} 13 to 25 inches, brown (7.5YR 4/4, moist) clay loam; firm when moist, slightly plastic when wet; strong fine and medium blocky structure; pH 4.7.

B_{22} 25 to 42 inches, yellowish-brown (10YR 5/6, moist) to dark yellowish-brown (10YR 4/4, moist) clay loam; firm when moist, slightly plastic when wet; more friable and slightly coarser in texture than the B_{21} horizon; weak coarse blocky structure; contains many small shale and sandstone chips; pH 4.9.

C_1 42 inches+, yellowish-brown (10YR 5/4, moist) loam glacial till of Wisconsin age; firm and slightly compact; massive structure to very weak very coarse blocky structure; contains numerous pebbles of sandstone and shale; moderately calcareous, pH 8.2.

Some of the Gray-Brown Podzolic soils in this county are only moderately well drained. The Cardington, Celina, and Thackery soils are examples. These soils are similar to the well-drained Gray-Brown Podzolic soils, but they have smoother slopes, they are less well drained, and they are mottled in the B_2 and lower horizons. The differences among these series result mainly from differences in parent material.

Profile of Cardington silt loam, 2 to 6 percent slopes, in a pasture in the NE¼ sec. 21, T. 17 N., R. 19 W.:

A_1 0 to 3 inches, dark grayish-brown (10YR 4/2, moist) silt loam; very friable when moist; moderate medium granular structure; pH 6.5.

A_2 3 to 9 inches, dark yellowish-brown (10YR 4/4, moist) silt loam; friable when moist; weak medium platy primary structure, breaking to medium granular structure; pH 6.0.

B_1 9 to 13 inches, yellowish-brown (10YR 5/6, moist) clay loam; slightly firm when moist; fine subangular blocky structure; pH 4.5.

B_{21} 13 to 19 inches, yellowish-brown (10YR 5/6, moist) clay loam, has a few distinct light brownish-gray (10YR 6/2, moist) fine mottles; friable to firm when moist; fine and medium subangular blocky structure; pH 4.2.

B_{22} 19 to 28 inches, yellowish-brown (10YR 5/6, moist) clay loam, distinct medium mottles of grayish brown (10YR 5/2, moist) are common; firm when moist, plastic when wet; strong fine and medium subangular blocky structure; pH 4.2.

B_{23} 28 to 36 inches, dark grayish-brown (10YR 4/2, moist) clay loam, distinct medium mottles of yellowish brown (10YR 5/8, moist) and grayish brown (10YR 5/2, moist) are common; firm when moist, plastic when wet; weak coarse subangular blocky structure; contains numerous small soft dark concretions; contains a few small pebbles and chips of shale; pH 5.3.

C_1 36 inches+, yellowish-brown (10YR 5/4, moist) loam glacial till of Wisconsin age; massive, firm, and compact; calcareous.

Data obtained by mechanical and chemical analyses of samples taken from this profile are shown in table 7. The base saturation of the B_1, B_{21}, and B_{22} horizons in the above profile is low for Gray-Brown Podzolic soils, but the general average for the Cardington soils is probably somewhat higher.

The somewhat poorly drained Gray-Brown Podzolic soils that occur in this county belong to the Bennington, Crosby, Sleeth, and McGary series. These soils have developed under deciduous forest on fairly smooth relief where natural erosion is slow. Surface drainage is slow to very slow. The water table is near the surface most of the time. Although the percolation of water through the A and B horizons is slow and sporadic by seasons, the amount of water is more than the amount that drains through the well drained and moderately well drained Gray-Brown Podzolic soils. The result has been more translocation of materials by eluviation and illuviation, poorer aeration, and slightly deeper A and B horizons.

Concentration of clay in the B horizon has been the chief soil-forming process. The light-colored, leached, eluviated surface layer is underlain by a mottled, grayish and yellowish-brown, strongly illuviated layer, which has developed into a claypan.

The following profile of a Bennington soil was observed next to a depression containing Marengo soil. The parent material of this soil was moderately calcareous coarse clay loam glacial till. The uppermost 24 inches of soil was moist, and the rest of the profile was wet. Profile of Bennington silt loam, 0 to 2 percent slopes, under beech forest in the NW¼ sec. 19, T. 16 N., R. 20 W.:

A_0 1 to 0 inch, partly decomposed leaf litter.

A_1 0 to 2 inches, very dark gray (10YR 3/1 to 10YR 4/1, moist; 10YR 6/1 to 10YR 7/1, dry) silt loam; friable when moist, soft when dry; moderate very coarse granular structure; pH 5.8; clear lower boundary.

A_2 2 to 6 inches, light brownish-gray (2.5Y 6/2, moist) silt loam; friable when moist, soft when dry; weak to moderate very fine subangular blocky structure; pH 5.2; clear lower boundary.

A_{3g} 6 to 10 inches, gray (10YR 6/1, moist) silty clay loam, distinct medium mottles of yellowish brown (10YR 5/6, moist) are common; friable when moist, slightly hard when dry; moderate fine subangular blocky structure; roots are common; pH 4.9; gradual lower boundary.

B_{1g} 10 to 16 inches, light brownish-gray (2.5Y 6/2, moist) light silty clay; light brownish-gray clay coatings on surfaces of peds; interior of peds is light brownish gray distinctly mottled with yellowish brown (10YR 5/6, moist); firm when moist, slightly plastic when wet, hard when dry; moderate fine subangular blocky structure; roots are common; pH 5.0; gradual lower boundary.

B_{21g} 16 to 24 inches, gray (2.5Y 5/0, moist) light silty clay; gray clay coatings on surfaces of peds; interior of peds mottled yellowish brown (10YR 5/8, moist) and grayish brown (10YR 5/2, moist); weak medium prismatic structure, breaking into moderate angular or subangular blocky structure; firm when moist, slightly plastic when wet, very hard when dry; roots common along prism surfaces; pH 5.1; diffuse lower boundary.

B_{22g} 24 to 30 inches, yellowish-brown (10YR 5/8, moist), mottled with gray (10YR 5/1 and 2.5Y 5/0, moist), light silty clay; weak coarse prismatic structure, breaking into weak fine angular to subangular blocky structure; some gray clayey coatings along ped surfaces; similar to horizon B_{21g} in color, but vertical faces are less evident; firm when moist, sticky and slightly plastic when wet, very hard when dry; roots are common, are more horizontal in orientation than in horizon above; water seeps laterally through this horizon; pH 6.2; clear wavy lower boundary.

C_1 30 to 44 inches, brown (10YR 5/3, moist) to dark grayish-brown (10YR 4/2, moist) fine loam, has gray (2.5Y 6/0, moist) coatings on prism faces and some yellowish-brown (10YR 5/8, moist) mottling; very firm in place, but moderately friable when removed, slightly sticky but nonplastic when wet, very hard when dry; weak coarse prismatic structure; contains a few tortuous roots; about 20 percent of volume consists of limestone fragments and cobbles, black shale flakes, and yellowish-brown sandstone fragments; this horizon is only moist when horizon B_{22g} above is saturated.

C_2 44 to 56 inches, dark-brown (10YR 4/3, moist) fine silt loam, with some gray (2.5Y 6/0, moist) coarse silty clay loam coatings and fillings in vertical cracks; massive structure except for few vertical cracks; very firm in place when moist, slightly sticky and nonplastic when wet, hard when dry; 15 to 30 percent of volume consists of grayish-brown and dark-brown limestone cobbles, sandstone fragments, black shale fragments, and a few red pebbles up to 2 inches in diameter that are probably weathered basic rock; contains a few roots along cracks, some etching of limestone cobbles by roots.

C_3 56 to 63 inches, similar to horizon C_2, except that dark-brown color is more prominent; moderately hard.

Mechanical and chemical analyses were made of the upper 30 inches of this profile, and the data obtained are presented in table 7.

Gray-Brown Podzolic soils, intergrading to Red-Yellow Podzolic soils

Eleven soil series in this county have some characteristics like those of the Gray-Brown Podzolic soils and some characteristics like those of the Red-Yellow Podzolic soils. They are considered intergrades between these two great soil groups.

The Loudonville, Otwell, Mentor, Pike, Parke, Negley, Hanover, and Wellston series consist of well-drained soils of the Gray-Brown Podzolic group, but they have some characteristics like those of the Red-Yellow Podzolic soils. Their A_2 and B_1 horizons generally have a higher color value than those of typical Gray-Brown Podzolic soils, and the base saturation is generally lower than in the Gray-Brown Podzolics.

Profile of Hanover silt loam, 2 to 6 percent slopes, in a cultivated field in the NE¼ sec. 27, T. 13 N., R. 19 W.:

A_p 0 to 8 inches, dark yellowish-brown (10YR 4/4, moist) silt loam; smooth and friable when moist; medium granular structure; pH 5.4.

A_2 8 to 11 inches, yellowish-brown (10YR 5/6, moist) silt loam; smooth and friable when moist; coarse granular structure; pH 4.9.

B_1 11 to 17 inches, yellowish-brown (10YR 5/8, moist) fine silt loam; smooth and friable when moist, slightly plastic when wet; strong fine subangular blocky structure; pH 4.8.

B_{21} 17 to 23 inches, yellowish-brown (10YR 5/8, moist) coarse silty clay loam; friable when moist; fine and medium subangular blocky structure; contains a few soft mineral concretions; pH 4.8.

B_{22} 23 to 32 inches, strong-brown (7.5YR 5/6, moist) or yellowish-brown (10YR 5/8, moist) fine silt loam; friable and slightly compact when moist; moderate medium platy structure, which breaks readily to medium blocky aggregates; contains many small dark concretions; contains few stones or none; pH 4.9; sharp lower boundary.

B_3 and C_1 32 to 46 inches, light yellowish-brown (10YR 6/4, moist) very fine sandy loam glacial till of Illinoian age; very compact and firm when moist; massive structure; contains numerous stains and concretions; contains many small stones; pH 5.2.

C_2 46 inches+, light yellowish-brown (10YR 6/4, moist) stony loam glacial till; very compact and firm when moist; contains more stones than horizon above; pH 5.4.

The upper 23 inches of the above profile appears to be derived mainly from loess. The thickness of the loess varies, but may be as much as 30 inches in smooth, uneroded areas.

Mechanical and chemical analyses were made of samples taken from this profile of Hanover silt loam. The data obtained are included in table 7.

Profile of Wellston silt loam on a narrow, undulating ridgetop in the SW¼ sec. 26, T. 12 N., R. 19 W. This site is underlain by Byer sandstone.

A_p 0 to 9 inches, a thin mat of leaf litter and twigs overlying brown (10YR 5/3, moist) silt loam; smooth and very friable when moist; moderate medium granular structure; pH 4.6.

A_2 9 to 13 inches, brownish-yellow (10YR 6/6, moist) heavy silt loam; smooth and very friable when moist; weak fine subangular blocky or coarse granular structure; pH 4.7.

B_1 13 to 17 inches, strong-brown (7.5YR 5/6, moist) heavy silt loam; friable to firm when moist, slightly plastic when wet; moderate fine subangular blocky structure; pH 4.7.

B_2 17 to 22 inches, strong-brown (7.5YR 5/6, moist) to yellowish-red (5YR 4/8, moist) silty clay loam; firm when moist, plastic when wet; moderate medium subangular blocky structure; pH 4.8.

TABLE 6.—*Key to the soil series*

Parent material	Gray-Brown Podzolic soils				Gray-Brown Podzolic soils, intergrading to Red-Yellow Podzolic soils			
	Nearly level to strongly sloping		Nearly level to sloping	Nearly level to gently sloping	Nearly level to strongly sloping		Nearly level to sloping	Nearly level to gently sloping
	Well drained to somewhat excessively drained	Well drained	Moderately well drained	Somewhat poorly drained	Well drained to somewhat excessively drained	Well drained	Moderately well drained	Somewhat poorly drained
Moderately calcareous glacial till of Wisconsin age; loam to clay loam texture; contains large proportion of sandstone and shale.		Alexandria	Cardington	Bennington				
Strongly calcareous glacial till of Wisconsin age; loam texture.		Miami	Celina	Crosby				
Light-textured glacial drift over highly calcareous loam till of Wisconsin age.		Kendallville						
Glacial outwash, silty or loamy texture, more than 42 inches thick over calcareous gravel and sand of Wisconsin age.		Ockley	Thackery	Sleeth				
Glacial outwash, silty or loamy texture, 24 to 42 inches thick over calcareous gravel and sand of Wisconsin age.	Fox							
Glacial outwash, loamy texture, 10 to 24 inches thick over calcareous gravel and sand of Wisconsin age.	Casco							
Neutral to calcareous clay and silt of Wisconsin age.		Markland [1]	Markland [1] McGary [1]	McGary [1]				
Calcareous gravel and sand of Wisconsin age								
Neutral to calcareous alluvium from Wisconsin drift; medium texture.								
Glacial till of Illinoian age; loam texture; contains large proportions of sandstone and shale.						Hanover		
Glacial till of Wisconsin and Illinoian age; loam texture; contains large proportion of sandstone and shale; less than 3 feet thick over sandstone and shale bedrock; in some places has thin capping of loess.						Loudonville		
Bedrock of sandstone and shale; in places has thin capping of loess.						Wellston		
Acid clay shale							Keene [1]	Keene [1]
Acid stratified silt and clay of Illinoian age						Otwell		
Acid stratified sand, silt, and clay of Wisconsin age.						Mentor	Glenford	Fitchville
Silt and loam more than 42 inches thick over sandy and gravelly outwash of Illinoian age.						Pike		
Silt and loam, 18 to 42 inches thick over sandy and gravelly outwash of Illinoian age.					Parke			
Sandy and gravelly outwash of Illinoian age					Negley			
Medium acid to neutral alluvium from Wisconsin glacial drift areas; medium in texture; contains large proportion of sandstone and shale.								
Neutral to calcareous alluvium from Wisconsin glacial drift areas; medium in texture.								
Neutral light-colored alluvium, medium in texture, 10 to 24 inches thick over dark-colored alluvium.								
Mixed organic material from wood, grass, or sedges, more than 42 inches thick.								
Mixed organic material from wood, grass, or sedges, 12 to 42 inches thick over clay mineral material.								
Silty mineral material, 10 to 24 inches thick over mucky or peaty organic materials.								

[1] This soil series is mapped in both drainage positions.

[2] Muskingum soils as mapped in this county include some profiles that are classified as weakly developed Gray-Brown Podzolic soils and some that are classified as weakly developed Red-Yellow Podzolic soils.

[3] The Wallkill series is not a true organic soil; it consists of mineral alluvium over organic soil.

of Fairfield County, Ohio

Humic Gley soils	Brunizems		Rendzina soils	Planosols	Sols Bruns Acides	Alluvial soils				Organic soils
Nearly level to depressional	Nearly level to sloping	Nearly level to gently sloping	Steep	Nearly level	Gently sloping to strongly sloping	Nearly level				Nearly level to depressional
Poorly drained to very poorly drained	Well drained	Moderately well drained	Somewhat excessively drained to excessively drained	Poorly drained	Well drained to somewhat excessively drained	Well drained	Moderately well drained	Somewhat poorly drained	Poorly drained	Very poorly drained
Marengo				Condit						
Brookston										
Westland	Wea	Tippecanoe								
	Warsaw									
Montgomery										
			Rodman							
Sloan						Ross				
					Muskingum[2]					
				Sebring						
						Chagrin	Lobdell	Orrville		
						Genesee	Eel	Shoals		
								Algiers[1]	Algiers[1]	
										Carlisle.
										Willette.
										Wallkill.[3]

B_3 22 to 27 inches, strong-brown (7.5YR 5/8, moist) heavy loam; firm when moist, slightly plastic and sticky when wet; moderate medium subangular blocky structure; contains noticeable grit and fragments of weathered sandstone; pH 5.1.

C_1 27 to 35 inches, yellowish-brown (10YR 5/6, moist) sandy clay loam; aggregates are coated with strong-brown (7.5YR 5/6, moist); firm when moist, distinctly more compact than horizon above; weak medium subangular blocky structure; contains numerous semi-rounded weathered soft sandstone fragments; pH 5.1.

C_2 and D_r 35 inches+, horizontally bedded sandstone; contains strong-brown (7.5YR 5/6, moist) to dark-brown (7.5 YR 4/4, moist) friable fine sandy clay loam between cleavage planes; pH 5.1.

The upper 17 inches of this profile appears to have been derived from loess. The B_2 horizon seems to be a mixture of loess and material weatherd from sandstone. Table 7 shows some data from mechanical and chemical analyses of this profile.

The Keene, Glenford, and Fitchville soil series belong to the Gray-Brown Podzolic great soil group, but they have some characteristics in common with soil series in the Red-Yellow Podzolic great soil group. The Keene and Glenford soils are moderately well drained, but the Fitchville soils are somewhat poorly drained.

Planosols

Planosols were defined by Thorp and Smith [8] as soils having one or more horizons abruptly separated from and sharply contrasting to an adjacent horizon because of cementation, compaction, or high clay content. These soils develop under forest or grass vegetation. The water table fluctuates in most areas. In many areas, a cemented or compacted horizon lies beneath a moderately well developed or well developed B horizon that has a higher percentage of clay than the A horizon.

In Fairfield County, the Planosols are gray and poorly drained. They occur on nearly level to slightly depressed relief. The water table fluctuates, but it is high much of the time. This high water table has caused gleization of the A and B horizons and reduction of iron compounds. The horizons contain ferrous iron. The colors are gray, mottled gray and brown, or yellow.

The Condit and Sebring soils are Planosols that occur in this county. The Sebring soils developed from laminated lacustrine clays and silts deposited during the Wisconsin age.

Profile of Sebring silt loam, 0 to 2 percent slopes, in a cultivated field in the NW¼ sec. 20, T. 15 N., R. 18 W.:

A_p 0 to 6 inches, light brownish-gray (2.5Y 6/2, dry) silt loam; medium granular structure; friable when moist; pH 5.2.

A_{2g} 6 to 9 inches, grayish-brown (2.5Y 5/2, moist) fine silt loam, has a few medium-sized faint mottles of light olive-brown (2.5Y 5/6, moist); fine subangular blocky structure; friable when moist; pH 5.4.

B_{1g} 9 to 13 inches, mottled light brownish-gray (2.5Y 6/2, moist), grayish-brown (2.5Y 5/2, moist), and light olive-brown (2.5Y 5/6, moist) silty clay loam; fine angular blocky structure; firm when moist; pH 5.0.

B_{21g} 13 to 20 inches, olive-gray (5Y 5/2, moist) compact smooth clay or heavy silty clay loam; distinct medium-sized mottles of yellowish brown (10YR 5/8, moist) are common; moderate angular blocky structure; very firm when moist; pH 5.1.

B_{22g} 20 to 27 inches, highly mottled olive-gray (5Y 4/2, moist), dark olive-gray (5Y 3/2, moist), and light olive-brown (2.5Y 5/6, moist) clay loam; weak coarse angular blocky structure; firm when moist; pH 6.4.

B_{3g} 27 to 36 inches, dark-gray (5Y 4/1, moist) clay loam; massive structure to very weak very coarse angular blocky structure; firm when moist; pH 7.1.

C_1 36 inches+, mottled gray (5Y 5/1, moist) and yellowish-brown (10YR 5/8, moist) laminated clay or silty clay; massive structure to very weak very coarse angular blocky structure; very firm when moist; pH 7.2.

Humic Gley soils

Humic Gley soils were defined by Thorp and Smith [8] as poorly to very poorly drained soils that have a dark-colored moderately thick surface layer of mixed organic and mineral materials, underlain by mineral layers that show the effects of poor aeration. Humic Gley soils develop under swamp or marsh vegetation.

The development of soils in this group is dominated by the gleization process. Under natural conditions, the soils were covered with water for long periods. They develop on nearly level to depressed relief, and both internal and external drainage is very slow. Runoff and seepage from nearby higher land collects on these soils. The added water carries colloids, materials in solution, and fine sediments, most of which are rich in organic matter and bases. Anaerobic conditions in the wet soil slow up the decay of accumulating organic matter and cause it to be retained in the surface layers. These conditions also cause reduction of iron compounds to soluble (ferrous) forms. Mottled yellowish and grayish or drab-gray colors are common, if they are not masked by the dark color of organic matter.

The Humic Gley soils in Fairfield County are the Marengo and Brookston soils of the uplands, the Westland and Montgomery soils of the terraces, and the Sloan soils of the bottom lands. All of these series were derived from calcareous parent material. They have been leached of free carbonates to depths of 3 feet or more, but their reaction is nearly neutral throughout the profile.

Although they show less evidence of mechanical and chemical eluviation and illuviation than the Gray-Brown Podzolic soils derived from calcareous materials, these Humic Gley soils have less acid profiles and their free carbonates are leached to greater depths.

The Marengo soils, which were derived from moderately calcareous Wisconsin glacial till, are the most extensive and probably the most nearly representative of the Humic Gley soils in this county.

Profile of Marengo silty clay loam on 0 to 2 percent slopes in a cultivated field in the NW¼ sec. 21, T. 17 N., R. 19 W.:

A_{1p} 0 to 7 inches, very dark gray (10YR 3/1, moist) to black (10YR 2/1, wet) silty clay loam; moderate medium to coarse granular structure; friable when moist; relatively high content of organic matter; pH 6.7.

A_{12} 7 to 13 inches, very dark gray (10YR 3/1, moist) silty clay loam; moderate fine blocky structure; firm to friable when moist, plastic when wet; pH 6.7.

B_{21g} 13 to 36 inches, yellowish-brown (10YR 5/8, moist) clay loam; distinct medium-sized mottles of dark gray (10YR 4/1, moist) are common; weak coarse blocky structure; plastic when wet, firm when moist; pH 7.0.

B_{22g} 36 to 70 inches, strongly mottled grayish-brown (10YR 5/2, moist), brownish-yellow (10YR 6/8, moist), and very dark gray (10YR 3/1, moist) clay loam; weak coarse blocky structure; very plastic and sticky when wet, very firm when moist; pH 7.2.

[8] THORP, JAMES, and SMITH, GUY D. HIGHER CATEGORIES OF SOIL CLASSIFICATION: ORDER, SUBORDER, AND GREAT SOIL GROUPS. Soil Sci. 67 (2): 117–126. February 1949.

C 70 inches+, yellowish-brown (10YR 5/8, moist) and gray (10YR 5/1, moist) light clay loam glacial till; firm when moist; pH 8.1.

Samples from this profile were analyzed in the laboratory, and the data are presented in table 7. A mechanical analysis of the substratum was made without removing the carbonates, and another after the carbonates were removed.

Brunizems (Prairie soils)

Brunizems develop chiefly under tall prairie grass in a temperate, relatively humid climate. They have a very dark brown surface horizon and a predominantly brown, well-oxidized subsoil that directly overlies the lighter colored parent material. These soils develop from calcareous materials. Enough water flows through them to leach the free carbonates from the solum but not enough to produce a low degree of base saturation.

The Brunizems in this county belong to the Wea, Tippecanoe, and Warsaw series. The Ross soils, classified as Alluvial soils, also have a dark-colored surface soil.

Profile of Warsaw silt loam, 0 to 2 percent slopes, in a cultivated field in the NW¼ sec. 35, T. 15 N., R. 19 W.:

A_p 0 to 7 inches, very dark brown (7.5YR 3/2, moist) silt loam; moderate medium granular structure; friable when moist; pH 6.7.

A_{12} 7 to 12 inches, dark-brown (7.5YR 3/2, moist) silt loam; coarse granular to fine subangular blocky structure; friable when moist; pH 6.6.

B_1 12 to 20 inches, dark-brown (7.5YR 4/2, moist) heavy loam; yellowish brown (10YR 5/6, moist) when crushed; moderate medium subangular blocky structure; friable when moist; pH 5.6.

B_{21} 20 to 28 inches, dark reddish-brown (5YR 3/3, moist) gravelly clay loam; moderate medium subangular to angular blocky structure; firm when moist, plastic and sticky when wet; pH 5.2.

B_{22} 28 to 39 inches, dark reddish-brown (5YR 3/3, moist) gravelly clay loam; massive to weak very coarse subangular blocky structure; firm when moist, plastic and sticky when wet; at least 50 percent of volume is gravel averaging 1 inch in diameter; pH 5.4.

D 39 inches+, well-assorted gravelly and coarse sandy materials; highly calcareous.

Rendzina soils

The Rodman soils are the only Rendzina soils in this county. They occur on relatively steep relief. In uneroded areas they have a dark-colored A_1 horizon that is high in organic matter. The B horizon is thin or lacking entirely. They are underlain by loose calcareous gravel and sand. Where erosion has removed the A_1 horizon and exposed the gravel and sand, these soils are nearly like Regosols.

Profile of a Rodman soil:

A_1 0 to 4 inches, very dark brown (10YR 2/2, moist) or dark grayish-brown (10YR 4/2, moist) gravelly loam; granular in upper part; calcareous.

A_{12} 4 to 12 inches, brown (10YR 5/3, moist) or dark-brown (10YR 4/3, moist) gravelly loam; colors are lighter and brighter as depth increases; calcareous.

D_1 12 inches+, yellowish-brown (10YR 5/6, moist) loose gravel and sand; contains much limestone; highly calcareous.

Organic soils

These soils develop in a humid or subhumid climate, under swamp or marsh vegetation. They occur in depressions and are covered with water during their development. The very poor drainage favors the accumulation of thick deposits of organic materials. These soils have mucky surface layers, usually underlain by peat.

In Fairfield County, the organic soils occur only in the Wisconsin glacial outwash valleys or in the Wisconsin glacial lacustrine basins. Carlisle muck, Willette muck, and Wallkill silt loam are the organic soils mapped in this county.

Profile of Carlisle muck on 0 to 2 percent slopes in a pasture in the SE¼ sec. 20, T. 14 N., R. 19 W.:

1. 0 to 8 inches, black (2.5Y 2/0, moist) muck; weak fine granular structure; very friable when moist, loose when dry.
2. 8 to 28 inches, black (5Y 2/1, wet) and dark reddish-brown (5YR 2/2, wet) peat; weak fine granular structure; very friable; contains many old decomposed plant remains.
3. 28 to 46 inches, black (2.5Y 2/0, wet) compact smooth silty peat; weak coarse blocky structure; contains a few discernible plant remains.
4. 46 to 66 inches, dark reddish-brown (5YR 2/2, wet) smooth finely divided peat; very friable and soft.

Alluvial soils

Alluvial soils develop on transported and relatively recently deposited alluvial and colluvial materials. There is little or no modification of the original material by soil-forming processes. Horizons of different character do appear in these soils, but they have resulted mostly from differences in alluvium and the manner in which it was deposited, from differences in the age of the material, differences in vegetation, or various combinations of these features.

The Alluvial soils in this county are the well drained Genesee, Ross, and Chagrin soils, the moderately well drained Eel and Lobdell soils, and the somewhat poorly drained Orrville, Shoals, and Algiers soils. The Ross soils have a dark-colored surface layer, and for this reason might be regarded as intergrades between Alluvial soils and Brunizems.

Profile of Genesee silt loam on 0 to 2 percent slopes in a cultivated field along Walnut Creek in the NW¼ sec. 34, T. 15 N., R. 20 W.:

1. 0 to 9 inches, dark grayish-brown (10YR 4/2, moist) silt loam; rather weak medium granular structure; very friable; pH 7.6.
2. 9 to 17 inches, dark-brown (10YR 4/3, moist) heavy silt loam; weak coarse granular structure; friable when moist, slightly hard when dry; pH 7.6.
3. 17 to 40 inches+, dark grayish-brown (10YR 4/2, moist) heavy silt loam; very weak medium subangular blocky structure; friable; pH 7.5+.

Sols Bruns Acides

The only Sols Bruns Acides in this county belong to the Muskingum series. Muskingum soils occur on rolling to steep relief, mostly in the unglaciated uplands. Some are in glaciated areas that received either no deposits of drift or very thin deposits that were later removed by erosion.

These soils are shallow over bedrock. The parent material varies. In some places it is loosely bonded acid sandstone and shale of relatively coarse texture; in others it is shale, siltstone, or sandstone; and in still others it is unconsolidated bedrock material that has moved down slopes. Some of the Muskingum soils have a thin capping of loess.

TABLE 7.—*Mechanical and chemical analyses of selected soils in Fairfield County, Ohio*

[Analyses by Ohio Agricultural Experiment Station under direction of Dr. N. Holowaychuk. Exchange capacities by Glen E. Bernath; mechanical analyses by James H. Petro]

Soil and depth of sample	Horizon	Reaction	Chemical analysis: Exchangeable cations: Hydrogen	Chemical analysis: Exchangeable cations: Calcium	Chemical analysis: Exchangeable cations: Magnesium	Chemical analysis: Base saturation	Mechanical analysis: Sand (2.0–0.05 mm.)	Mechanical analysis: Silt (0.05–0.002 mm.)	Mechanical analysis: Clay (Less than 0.002 mm.)	Texture class
		pH	*m. eq./100 g.*	*m. eq./100 g.*	*m. eq./100 g.*	*Percent*	*Percent*	*Percent*	*Percent*	
Bennington silt loam:										
0 to 2 inches [1]	A_1	5. 8	13. 2	8. 0	2. 1	44	17. 6	66. 6	15. 8	Silt loam.
2 to 6 inches	A_2	5. 2	11. 1	1. 3	. 6	16	15. 6	64. 2	20. 2	Silt loam.
6 to 10 inches	A_{3g}	4. 9	11. 8	1. 1	1. 2	17	10. 0	61. 3	28. 7	Silty clay loam.
10 to 16 inches	B_{1g}	5. 0	14. 8	3. 3	3. 7	33	8. 7	51. 1	40. 2	Silty clay.
16 to 24 inches	B_{21g}	5. 1	12. 2	5. 8	6. 2	50	11. 8	45. 9	42. 3	Silty clay.
24 to 30 inches	B_{22g}	6. 2	4. 0	10. 8	8. 3	83	18. 3	40. 3	41. 4	Silty clay.
Cardington silt loam:										
0 to 3 inches [1]	A_1	6. 5	3. 4	13. 5	1. 5	82	27. 1	60. 4	18. 5	Silt loam.
3 to 9 inches	A_2	6. 0	4. 4	5. 8	1. 0	62	21. 9	60. 0	18. 1	Silt loam.
9 to 13 inches	B_1	4. 5	8. 3	4. 6	1. 5	44	21. 1	51. 1	27. 8	Clay loam.
13 to 28 inches	B_{21} and B_{22}	4. 2	11. 2	3. 7	2. 2	36	20. 8	46. 6	32. 6	Clay loam.
28 to 36 inches	B_{23}	5. 3	5. 9	7. 2	5. 6	69	23. 8	40. 2	36. 0	Clay loam.
36 inches [2]	C_1	------	------	------	------	------	33. 2	44. 6	22. 2	Loam.
Hanover silt loam:										
0 to 8 inches	A_p	5. 4	5. 6	3. 8	. 9	47	12. 7	70. 9	16. 4	Silt loam.
8 to 11 inches	A_2	4. 9	6. 4	3. 7	1. 6	47	9. 8	67. 7	22. 5	Silt loam.
11 to 17 inches	B_1	4. 8	7. 3	3. 6	2. 0	45	10. 5	65. 8	23. 7	Silt loam.
17 to 23 inches	B_{21}	4. 8	8. 2	4. 0	3. 2	48	11. 6	61. 9	26. 5	Silt loam.
23 to 32 inches	B_{22}	4. 9	7. 0	3. 7	3. 4	52	21. 9	57. 1	21. 0	Silt loam.
32 to 46 inches	B_3 and C_1	5. 2	3. 4	2. 2	1. 6	54	51. 9	37. 4	10. 7	Fine sandy loam.
46 inches+	C_2	5. 4	3. 6	3. 0	2. 5	61	47. 7	36. 1	16. 2	Loam.
Marengo silty clay loam:										
0 to 7 inches [1]	A_{1p}	6. 7	5. 3	20. 2	5. 4	83	18. 9	53. 1	28. 0	Silty clay loam.
7 to 13 inches	B_{12}	6. 7	5. 4	16. 4	7. 9	82	17. 1	47. 4	35. 5	Silty clay loam.
13 to 36 inches	B_{21g}	7. 0	3. 3	13. 6	7. 2	86	23. 5	43. 9	32. 6	Clay loam.
36 to 70 inches	B_{22g}	7. 2	2. 8	9. 6	4. 3	84	29. 0	39. 7	31. 3	Clay loam.
70 inches+	C	------	------	------	------	------	31. 7	40. 1	28. 2	Clay loam.
70 inches+ [2]	C	------	------	------	------	------	31. 1	41. 2	27. 7	Clay loam.
Muskingum sandy loam:										
0 to 2 inches [1]	A_1	6. 0	5. 8	5. 9	. 9	55	69. 1	24. 3	6. 6	Sandy loam.
2 to 9 inches	A_2	4. 6	6. 2	2. 2	(3)	29	70. 4	22. 1	7. 5	Sandy loam.
9 to 20 inches	B	4. 2	4. 2	1. 5	(3)	29	68. 1	23. 5	8. 4	Sandy loam.
20 inches+	C	4. 3	3. 4	1. 6	(3)	35	70. 3	21. 2	8. 5	Sandy loam.
Wellston silt loam:										
0 to 9 inches [1]	A_1	4. 6	5. 4	2. 5	. 5	39	11. 5	76. 5	12. 0	Silt loam.
9 to 13 inches	A_2	4. 7	4. 9	2. 5	. 6	41	9. 1	77. 8	13. 1	Silt loam.
13 to 17 inches	B_1	4. 7	5. 8	3. 8	2. 1	52	10. 7	67. 0	22. 3	Silt loam.
17 to 22 inches	B_2	4. 8	7. 0	4. 5	3. 9	56	15. 6	57. 0	27. 4	Silty clay loam.
22 to 27 inches	B_3	4. 9	6. 0	3. 9	3. 8	50	29. 5	44. 7	25. 8	Loam.
27 to 35 inches	C_1	5. 1	7. 0	3. 2	3. 2	49	47. 0	25. 6	27. 4	Sandy clay loam.
35 inches+	C_2	5. 1	7. 0	3. 7	4. 8	56	55. 8	13. 3	30. 9	Sandy clay loam.

[1] Organic matter has been removed. [2] Carbonates have been removed. [3] Trace.

The moderately coarse textured Muskingum soils are most like the typical Sols Bruns Acides. They have distinct A_1 and A_2 horizons but do not have a distinctive concentration of clay in the B horizon. Some of the medium-textured Muskingum soils are like the Gray-Brown Podzolic soils. They have a moderately well developed concentration of clay in the B horizon; however, it is not so well developed as it would be in a typical Gray-Brown Podzolic soil. The base saturation is lower in the Muskingum soils than in Gray-Brown Podzolic soils. The subsoils are strongly colored. Some of the Muskingum profiles have characteristics of Red-Yellow Podzolic soils.

In the steeper and rockier areas of Muskingum soils, rapid runoff, slow infiltration, and rapid removal of soil material have prevented development of a distinct profile. In these areas, the Muskingum soils resemble members of the Lithosol great soil group, typical soils of which have an incomplete or weakly expressed profile.

Profile of Muskingum sandy loam, 18 to 25 percent slopes, under hardwood forest on a mildly rolling ridgetop in the NE¼ sec. 1, T. 13 N., R. 19 W.:

A_0 —½ to 0 inch, partly decomposed leaf litter and leaf mold.

A_1 0 to 2 inches, dark grayish-brown (10YR 4/2, moist) sandy loam; weak fine granular structure; very friable when moist; contains many fragments of fine-grained sandstone up to 5 inches in diameter; pH 6.0.

A_2 2 to 9 inches, grayish-brown (10YR 5/2, moist) to brown (10YR 5/3, moist) channery sandy loam; very weak medium granular structure; very friable when moist; contains many semirounded and flat stone fragments averaging 2 to 3 inches in diameter; pH 4.6.

B_2 9 to 20 inches, brownish-yellow (10YR 6/6, moist) channery sandy loam; weak medium subangular blocky structure; very friable when moist; numerous sandstone fragments averaging more than 3 inches in diameter; pH 4.2.

B and C 20 inches+, similar to B_2 horizon, except that sandstone fragments make up 60 to 70 percent of the soil volume; flat fragments are fresh and hard, semirounded fragments are softer and more weathered; pH 4.3; this horizon grades into bedrock.

Table 7 shows data obtained from mechanical and chemical analyses of this profile.

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Areas surveyed in Ohio: **Reconnaissance surveys shown by northwest-southeast hatching; crosshatching indicates areas covered by both detailed and reconnaissance surveys.**

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