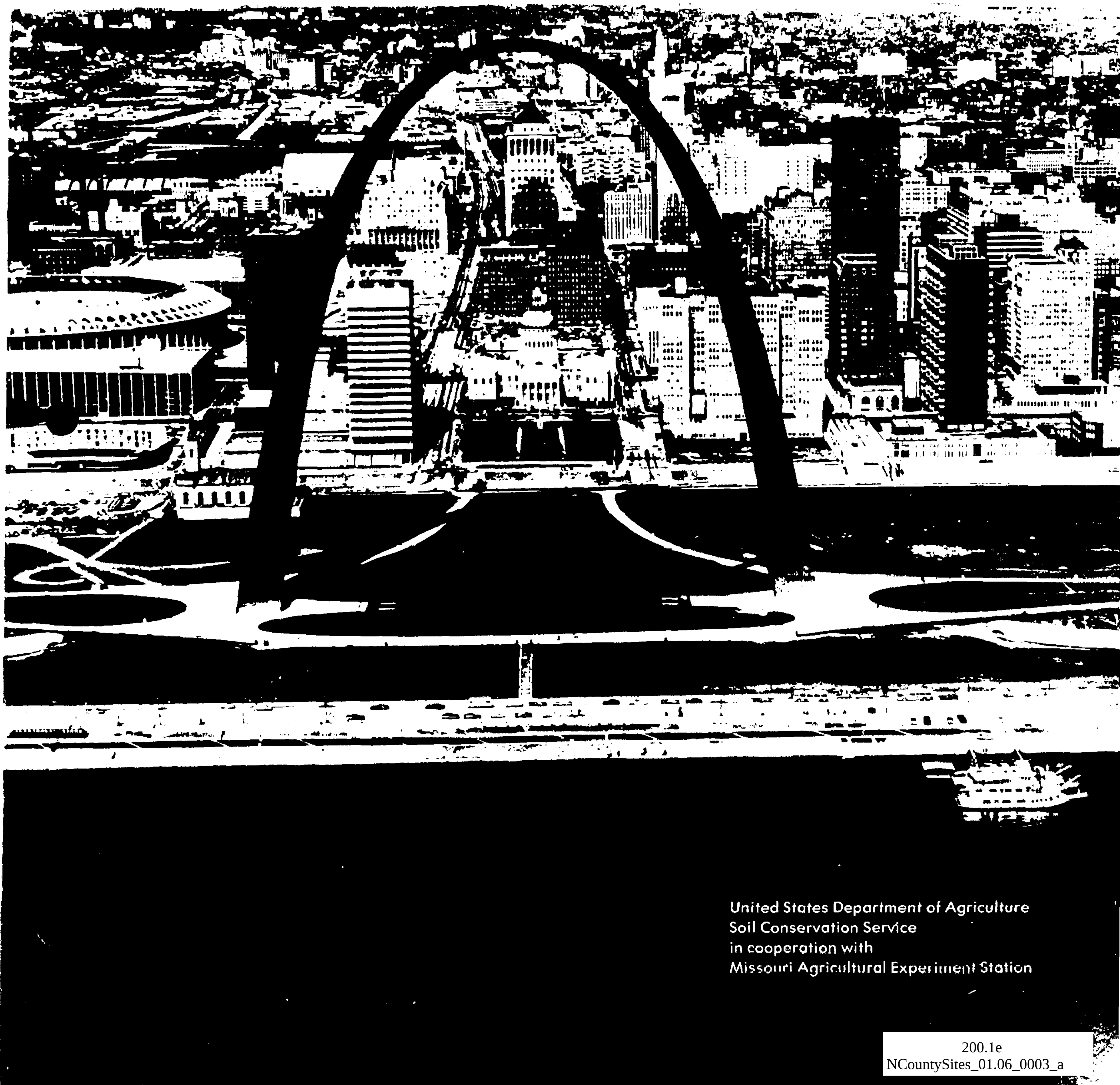
SOIL SURVEY OF ST. LOUIS COUNTY AND ST. LOUIS CITY, MISSOURI

Soil survey of

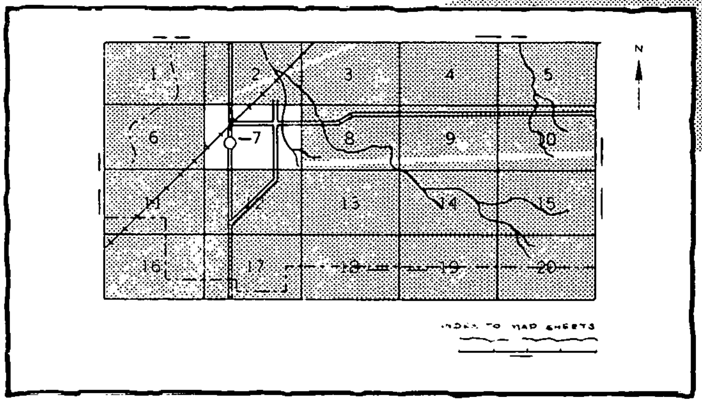
St. Louis County and St. Louis City, Missouri

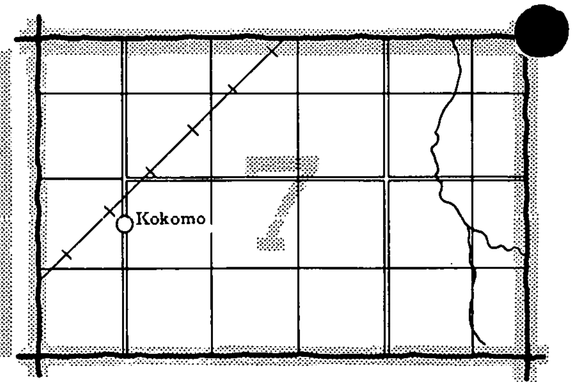


United States Department of Agriculture
Soil Conservation Service
in cooperation with
Missouri Agricultural Experiment Station

HOW TO USE

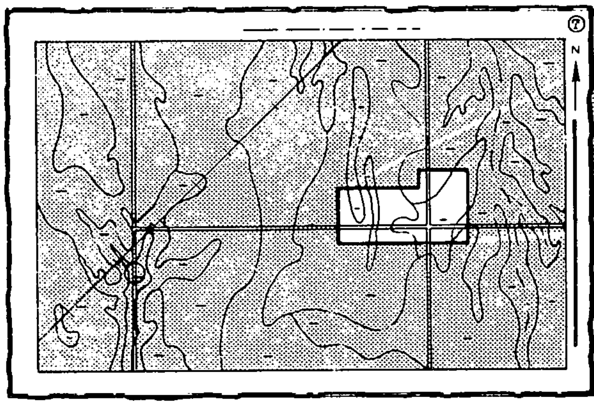
1. Locate your area of interest on the "Index to Map Sheets" (the last page of this publication).

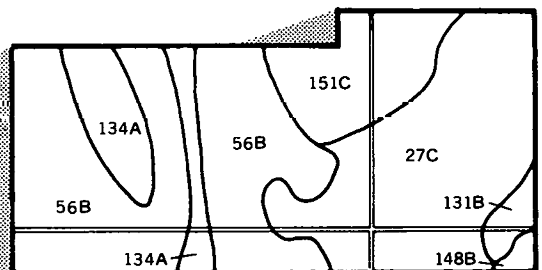




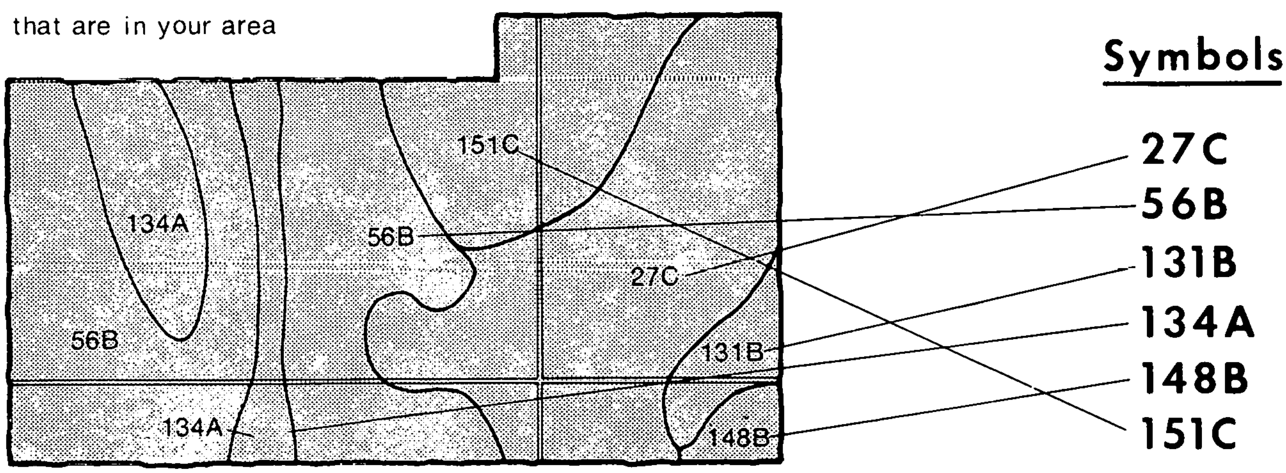
2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.



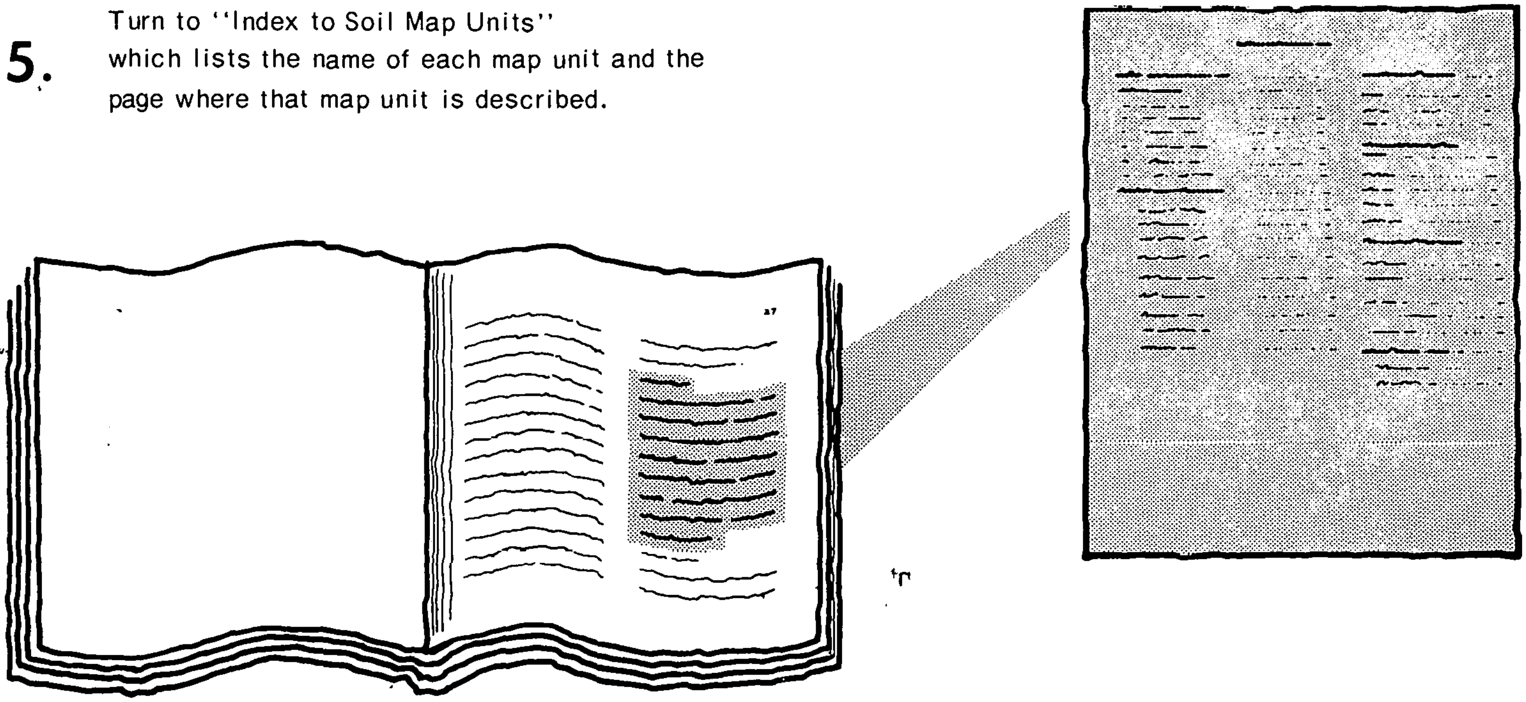


4. List the map unit symbols that are in your area

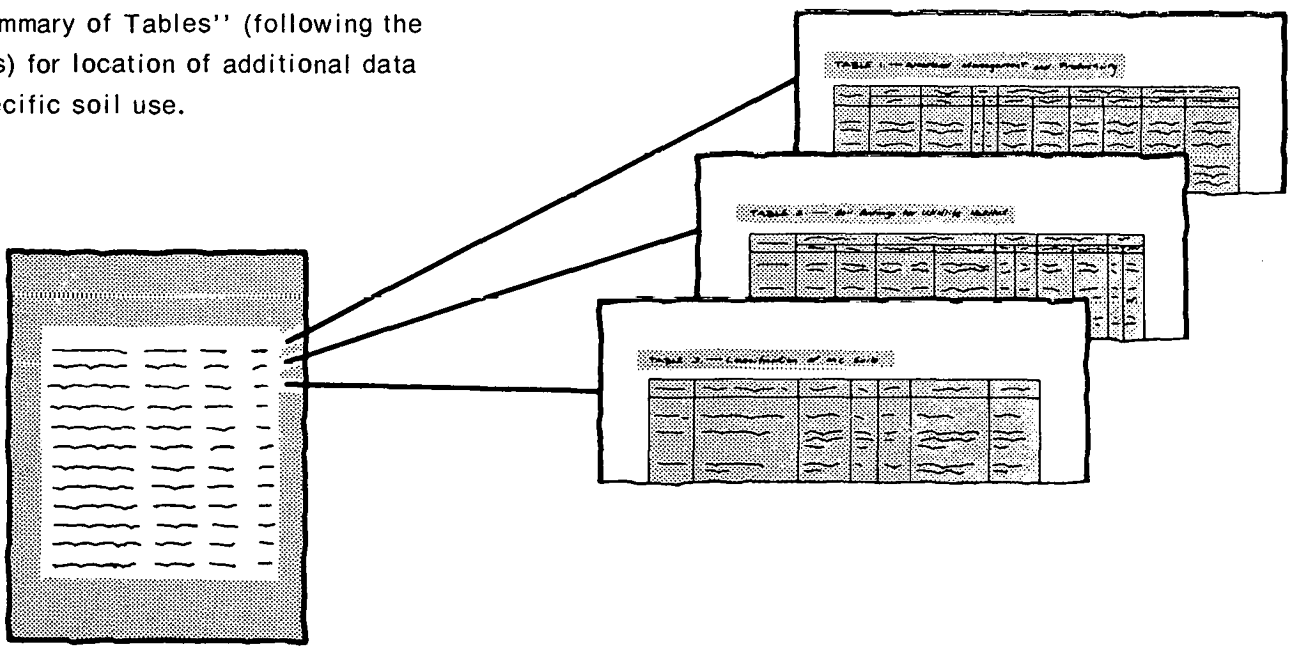


THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; for specialists in wildlife management, waste disposal, or pollution control.

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

This survey was made cooperatively by the Soil Conservation Service and the Missouri Agricultural Experiment Station. St. Louis County, through the Comprehensive Employment and Training Act (Ceta program) and county funds, provided personnel to assist with the fieldwork. The Missouri Department of Natural Resources contributed funds to assist with the map finishing. It is part of the technical assistance furnished to the Soil and Water Conservation District of St. Louis County and the city of St. Louis. Major fieldwork was performed in the period 1975 to 1978. Soil names and descriptions were approved in 1979. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1979.

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

Cover: The Gateway Arch is on the west bank of the Mississippi River in downtown St. Louis. Photo by Artega Photos, Ltd.

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Issued April 1982

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foreword

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

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

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

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

Kenneth G. McManus

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soil survey of
St. Louis County and St. Louis City, Missouri

By Ken E. Benham, Soil Conservation Service

Fieldwork by Ken E. Benham, Soil Conservation Service, and Keith D. Biermann, Alan H. Donges, and G. M. Flieg, St. Louis County Soil and Water Conservation District

United States Department of Agriculture, Soil Conservation Service in cooperation with Missouri Agricultural Experiment Station

ST. LOUIS COUNTY AND ST. LOUIS CITY are on the eastern border of Missouri, nearly centered between the north and south state lines (fig. 1). The boundaries of St. Louis City and St. Louis County join, but they do not overlap. The city of St. Louis covers 65 square miles, and St. Louis County covers 517 square miles. The total area is 582 square miles, or 372,480 acres. Clayton, the county seat of St. Louis County, is in the east-central part of the county.

In 1970, the population of Clayton was about 16,000. The population of St. Louis County was about 952,000, and the population of the city of St. Louis was about 622,000 (*9*). The total population of the survey area was about 1,574,000. The trend since 1950 has been a declining population in the city of St. Louis and a rapidly increasing population in St. Louis County. The projected 1980 population is about 1,052,000 for St. Louis County and about 540,000 for the city of St. Louis (*18*).

The survey area is bordered on the east by the Mississippi River, on the north by the Missouri River, on the south by Jefferson County and the Meramec River, and on the west by Franklin County. Most of the urbanized eastern part of the survey area is nearly level to moderately sloping. Most of the relatively unurbanized western part of the survey area is moderately sloping to steep. A primary divide separates all but the eastern few miles of the survey area into two drainage systems. The northern part drains into the Missouri River, and the southern part drains into the Meramec River.

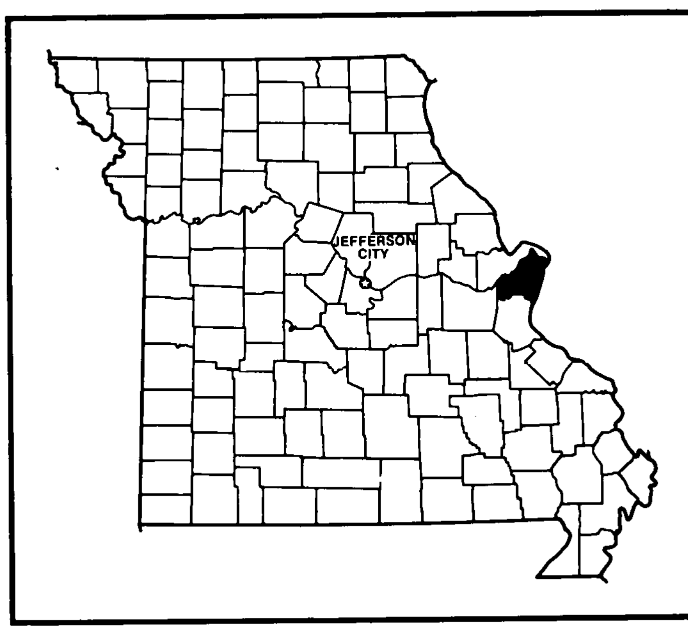

Figure 1.—Location of St. Louis County and St. Louis City in Missouri.

The survey area is dominantly urban. The economy of the area is based on manufacturing, retail business, and service facilities, such as food and recreation. Numerous large corporations are headquartered in St. Louis. Major auto manufacturers have assembly plants in the city or county.

Little farming is done on the upland, but most of the Missouri River and Meramec River bottoms and some of the tributary stream bottoms are used for cultivated crops. The major crops are soybeans, corn, and wheat. Smaller locally important crops are sod grasses and truck crops.

Soil scientists determined that there are about 24 different kinds of soil in the survey area. These soils range widely in texture, natural drainage, and other characteristics. Most soils on the uplands in the southern and southwestern parts of the survey area formed in residuum from cherty and chert-free limestone. Most of the remaining soils on the uplands formed in loess. Nearly all of the soils on uplands are used for urban development. Most of the soils on terraces and bottom lands are well suited to cultivated crops. The well drained to somewhat poorly drained soils on terraces are nearly level and gently sloping. The somewhat excessively drained to poorly drained soils on the flood plains are mainly nearly level.

An earlier soil survey of St. Louis County was published in 1923 (*19*). This present soil survey updates the first survey and provides additional interpretative information. It is on larger maps from aerial photography that show the soils in greater detail.

general nature of the survey area

This section gives general information about the survey area. Climate, history and development, and transportation are discussed.

climate

Prepared by the National Climatic Center, Asheville, North Carolina.

The consistent pattern of climate in St. Louis county is cold winters and long, hot summers. Heavy rains occur mainly in spring and early in summer, when moist air from the Gulf of Mexico interacts with drier continental air. The annual rainfall is normally adequate for corn, soybeans, and small grain.

Table 1 gives data on temperature and precipitation for the survey area as recorded at St. Louis in the period 1951 to 1976. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 33 degrees F, and the average daily minimum temperature is 24 degrees. The lowest temperature on record, which occurred at St. Louis on January 23, 1963, is -11 degrees. In summer the average temperature is 77 degrees, and the average daily maximum temperature is 87 degrees. The highest recorded temperature, which occurred at St. Louis on July 14, 1954, is 115 degrees.

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

The total annual precipitation is 33.8 inches. Of this, 20 inches, or 60 percent, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 16 inches. The heaviest 1-day rainfall during the period of record was 3.95 inches at St. Louis on June 14, 1957. Thunderstorms occur on about 50 days each year, and most occur in summer.

Average seasonal snowfall is 18 inches. The greatest snow depth at any one time during the period of record was 12 inches. On an average of 9 days, at least 1 inch of snow is on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 70 percent of the time possible in summer and 50 percent in winter. The prevailing wind is from the south. Average windspeed is highest, 12 miles per hour, in March.

history and development

The Mississippi River was the most important influence on the early development of the St. Louis area. It gave explorers and settlers access to the middle part of the continent. In 1541, just 50 years after the discovery of the new world by Columbus, Hernando De Soto discovered the Mississippi River and claimed the territory that extended northward from the mouth of the river for Spain (*7*). Probably the first Europeans to visit the confluence of the Missouri and Mississippi Rivers were two young Frenchmen, Radisson and Groseilliers, in 1654 or 1655 (*3*). The travels of Father Jacques Marquette and Louis Joliet down the Mississippi River in 1673 are much better chronicled. Shortly after this, numerous trappers and hunters began traversing the area. They encountered, at one time or another, Indians from a number of tribes, including the Pottawatomie, Miami, Kickapoo, Delaware, Shawnee, Iowa, Sauk and Fox, Illini, Osage, and Missouri. A large number of tribes used the area because the Missouri and Mississippi Rivers were primary transportation routes.

In 1682, Sieur de la Salle traveled past the St. Louis area and claimed the territory for France. It was more than 80 years before the first permanent French settlement was established on the west side of the Mississippi River. Auguste Chouteau and Pierre Linquest started building a trading post on February 15, 1764, which they named St. Louis in honor of the patron saint of the reigning French king, Louis XV. Spain regained control of the area in 1770, and in 1803 it became United States territory.

The city of St. Louis was officially incorporated on November 9, 1809. St. Louis County was organized 12 years before Missouri became a state, on October 1, 1812, with St. Louis as the county seat. In 1876, the city of St. Louis was separated from St. Louis County. The following year the county seat was moved to Clayton.

Gold was discovered in the California territory in 1849, and St. Louis very soon became a major outfitting center for people moving west. Thus, St. Louis became known as "the gateway to the west."

transportation

The St. Louis area is served by a number of major local, state, and federal highways. These include Interstates 44, 55, 70, and 270, U.S. Routes 40, 50, 61, and 67, plus many state and local highways.

Six railroads cross the St. Louis area.

Lambert-St. Louis International Airport, in St. Louis County, is served by several major airlines. Scott Air Force Base, a major military airfield, is a few miles east of the city of St. Louis in Illinois. Local air traffic is handled by six smaller airports in the St. Louis area.

The Missouri and Mississippi Rivers carry a large volume of barge traffic. St. Louis is an important barge terminal because of its strategic location along the inland waterway system.

how this survey was made

Soil scientists made this survey to learn what soils are in the survey area, where they are, and how they can be used. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; and the kinds of rock. They dug many holes to study soil profiles. A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material, which has been changed very little by leaching or by plant roots.

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby counties and in more distant places. They classified and named the soils according to nationwide uniform procedures. They drew the boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs.

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "General soil map units" and "Detailed map units."

While a soil survey is in progress, samples of some soils are taken for laboratory measurements and for engineering tests. All soils are field tested to determine their characteristics. Interpretations of those characteristics may be modified during the survey. Data are assembled from other sources, such as test results, records, field experience, and state and local specialists. For example, data on crop yields under defined management are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it can be used by farmers, engineers, planners, developers and builders, home buyers, and others.

general soil map units

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

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

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

1. Blake-Eudora-Waldron association

Nearly level, somewhat poorly drained and well drained, deep soils formed in alluvial sediment; on flood plains

This association consists of broad bottom lands on flood plains of the Missouri and Mississippi Rivers. Slope is generally less than 2 percent.

This association makes up about 9 percent of the survey area. It is about 43 percent Blake soils, 23 percent Eudora soils, 18 percent Waldron soils, and 16 percent soils of minor extent.

The Blake soils are somewhat poorly drained. They are on intermediate positions between the higher Eudora soils and the lower Waldron soils. The surface and subsurface layers are very dark grayish brown silty clay loam, and the substratum is multicolored, stratified silty clay loam and very fine sandy loam.

The Eudora soils are well drained. They are mainly on low ridges or natural levees on the highest positions of the flood plain. The surface layer is very dark grayish brown silt loam, and the substratum is stratified, multicolored silt loam, loam, and very fine sandy loam.

The Waldron soils are somewhat poorly drained. They are in low lying slackwater areas and old slough channels. The surface layer is very dark grayish brown silty clay, and the substratum is multicolored, stratified silty clay, clay, silty clay loam, and silt loam.

Of minor extent in this association are the poorly drained Booker soils in low lying slackwater areas, the excessively drained Sarpy soils adjacent to stream channels, and, in a few areas, the somewhat poorly drained Parkville soils adjacent to Waldron and Booker soils.

About 80 percent of the acreage of this association has been cleared. Corn, soybeans, and wheat are the main crops. A small acreage is used for truck crops and hay crops. Trees in the forested areas are primarily cottonwoods and soft maples. Most of the cleared areas are protected from frequent flooding by levees. The rarely occurring floods are quite damaging.

The soils in this association are well suited to cultivated crops, except for the sandy Sarpy soils. The primary management need is drainage in backswamp areas.

This association is poorly suited to building sites and sanitary facilities. The main hazard is flooding, because many areas are not sufficiently protected by levees. Onsite investigation is needed in areas that are being considered for building sites.

2. Wilbur-Haymond-Elsah association

Nearly level and gently sloping, moderately well drained to somewhat excessively drained, deep soils formed in alluvial sediment; on flood plains

This association consists of bottom lands on flood plains of the Meramec River and smaller streams. Slope is generally less than 2 percent.

This association makes up about 3 percent of the survey area. It is about 46 percent Wilbur soils, 27 percent Haymond soils, and 19 percent Elsah soils. It is about 8 percent water areas, primarily the Meramec River.

The Wilbur soils are moderately well drained. They are in nearly level or slightly depressional areas on the flood plains. The surface layer is dark grayish brown and brown silt loam. The substratum is brown and grayish brown, mottled silt loam.

The Haymond soils are well drained. They are on first bottoms near streams. The surface layer is brown silt loam. The substratum is brown silt loam in the upper part and brown, mottled silt loam in the lower part.

The Elsah soils are somewhat excessively drained. They are in nearly level and gently sloping areas on the flood plains. The surface layer is dark brown silt loam. The substratum is brown, very cherty silt loam and very cherty loam.

About 70 percent of the acreage of this association has been cleared. Wheat and grasses and legumes for pasture and hay are the main crops. Some wide bottom land areas are used for corn and soybeans. Many areas along the narrower streams and some areas bordering the large streams are in mixed hardwoods, brush, and weeds.

The larger areas in this association are well suited to cultivated crops, except where excessive chert or gravel in the surface layer affects tillage operations. Flooding is a serious hazard, but construction of levees is generally impractical, because the bottom land areas are narrow. In places, diversions are needed on adjoining slopes to keep runoff from the bottom land. A few areas need surface drainage.

This association generally is not suited to building sites and sanitary facilities. The main hazard is frequent flooding.

3. Freeburg-Ashton-Weller association

Nearly level and gently sloping, somewhat poorly drained to well drained, deep soils formed in loess and alluvial sediment; on terraces

This association consists of stream terraces along the Meramec River, some terraces along smaller streams, and a few terraces along the Missouri River (fig 2). Slope ranges from 0 to 5 percent.

This association makes up about 4 percent of the survey area. It is about 47 percent Freeburg soils, 38 percent Ashton soils, 6 percent Weller soils, and 2 percent soils of minor extent. It is about 2 percent water areas and 5 percent Pits, sand and gravel, primarily along the Meramec River.

The Freeburg soils are somewhat poorly drained and nearly level or gently sloping. These soils are at elevations between Ashton and Weller soils on terraces. The surface layer is dark grayish brown silt loam, and the subsurface layer is pale brown silt loam. The subsoil is multicolored silty clay loam.

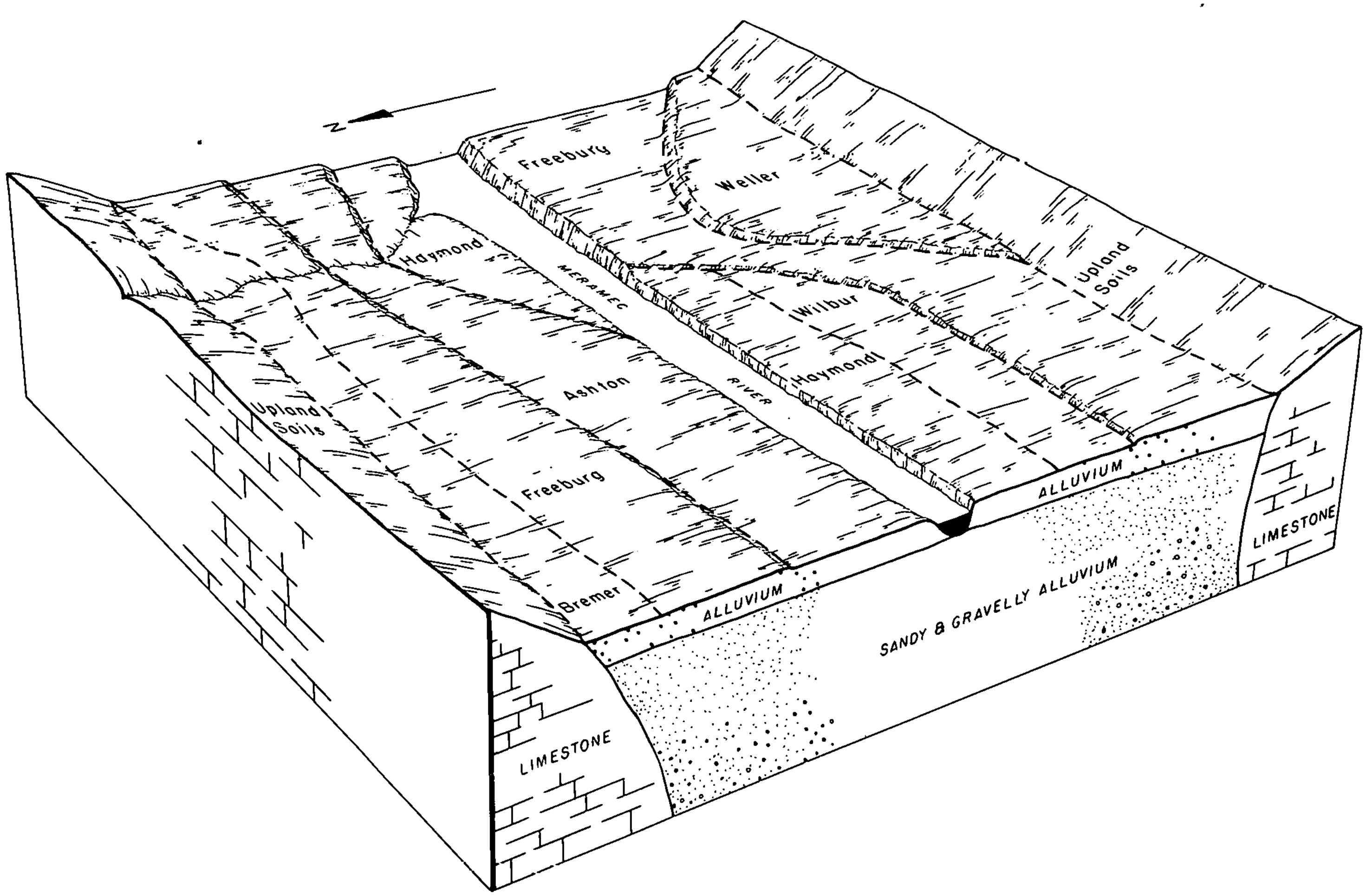

Figure 2.—Typical pattern of soils and parent material in the Freeburg-Ashton-Weller association.

The Ashton soils are well drained and nearly level or gently sloping. These soils are on low positions on terraces. The surface layer is very dark grayish brown silt loam, and the subsoil is brown silty clay loam. The substratum is brown silt loam.

The Weller soils are moderately well drained and nearly level or gently sloping. These soils are on the high positions on terraces along the Meramec River. The surface layer is dark grayish brown silt loam. The subsurface layer is grayish brown and brown silt loam. The subsoil is brown silty clay loam in the upper part; yellowish brown, mottled silty clay in the middle part; and grayish brown, mottled silty clay loam in the lower part.

Of minor extent in this association are the Bremer soils. These soils are adjacent to steep uplands that are shallow to limestone rock.

About 85 percent of the acreage of this association has been cleared. Wheat and soybeans are the most extensive crops; corn, pasture, and hay crops are also important. A few areas are in mixed hardwoods and brush.

These soils are well suited to cultivated crops, although wetness hinders tillage operations in places during some years. Diversion terraces are needed on the adjoining slopes to divert runoff from some areas of this association. A few areas need surface drainage.

The Weller soils can be used for building sites and sanitary facilities; however, the wetness and shrink-swell potential are severe limitations. The Freeburg and Ashton soils generally are not suited to building sites and sanitary facilities because of rare or occasional flooding. Onsite investigation is needed in areas that are being considered for building site development.

4. Menfro-Winfield-Urban land association

Gently sloping to very steep, well drained and moderately well drained, deep soils formed in loess, and Urban land; on uplands

This association consists of narrow drainageways and dissected, loess-capped ridges and side slopes on uplands. Limestone sinks are in some areas. Slope ranges from 2 to 45 percent.

This association makes up about 29 percent of the survey area. It is about 64 percent Menfro soils, 24 percent Winfield soils, 8 percent Urban land, and 4 percent soils of minor extent.

The Menfro soils are well drained and moderately sloping to very steep. They occupy the highly dissected uplands that extend several miles back from the Missouri River bluffs. They also occupy dominantly east- and north-facing slopes along the Meramec River. Menfro soils are in a complex with Urban land in some older, urban areas. The surface and subsurface layers are brown silt loam, and the subsoil is brown silty clay loam. The substratum is yellowish brown silt loam.

The Winfield soils are moderately well drained and gently sloping to strongly sloping. They occupy ridgetops and upper side slopes on uplands. Winfield soils are in a complex with Urban land in some older, urban areas. The surface layer is brown silt loam, and the subsurface layer is dark yellowish brown silt loam. The subsoil is brown silt loam and silty clay loam in the upper part and brown, mottled, silty clay loam in the lower part. The substratum is mixed, dark yellowish brown and light brownish gray silt loam.

Urban land is occupied by structures and pavements and is in complexes with Menfro, Winfield, or Iva soils. It makes up about 35 percent of the complexes.

Of minor extent in this association are the moderately well drained Iva soils on the broad primary divides, the well drained Menfro, karst, soils in several parts of the county, and the manmade Harvester soils in the Urban land areas. The Dumps-Orthents complex areas are active landfill sites.

About 70 percent of the acreage of this association has been cleared. About 60 percent of the cleared land is used for urban development, primarily residential areas, parks, and cemeteries. Part of the remaining cleared land is used for wheat, and part is used for grasses and legumes for hay and pasture. The remaining cleared land is idle. Trees in the forested parts of this association are mixed, mainly oaks and hickories. Slope and the hazard of erosion are the main limitations for farming.

This association is suitable for building sites and sanitary facilities. Slope and shrink-swell potential are the main limitations to urban development.

5. Nevin-Urban land association

Nearly level, somewhat poorly drained, deep soils formed in loess or lacustrine sediment, and Urban land; on depressional uplands

This association consists of former shallow lakes. The largest area is in the Florissant basin in northern St. Louis County. Smaller areas are in the city of St. Louis in Tower Grove Park and at several other locations. Slope is generally less than 2 percent.

This association makes up about 2 percent of the survey area. It is about 55 percent Nevin soils, 40 percent Urban land, and 5 percent Harvester soils.

The Nevin soils have a very dark gray silt loam surface layer and subsurface layer and a multicolored silty clay loam subsoil. The substratum is light brownish gray, mottled silt loam.

The Urban land consists of areas that are occupied by structures and pavements.

Areas of this association originally were prairie. They were used for crops, primarily corn, soybeans, wheat, and vegetable crops, before residential development began. The nearly level topography has favored rapid urban development.

The main limitations and hazards to urban development in areas of this association are wetness, shrink-swell potential, and poor surface drainage. To improve the surface drainage on many sites, the soil removed from basements is used to create a terrace adjacent to the houses.

6. Urban land-Harvester-Fishpot association

Urban land and nearly level to moderately steep, moderately well drained and somewhat poorly drained, deep soils formed in silty fill material, loess, and alluvium; on uplands, terraces, and bottom lands

This association occupies nearly all of the city of St. Louis and much of the eastern part of St. Louis County. It consists of areas on uplands, terraces, and bottom lands. Limestone sinks are in some areas. Slope ranges from 0 to 20 percent.

This association makes up about 41 percent of the survey area. It is about 64 percent Urban land, 22 percent Harvester soils, 6 percent Fishpot soils, and 8 percent soils of minor extent.

Urban land consists of areas that are occupied by structures and pavements. It covers much of downtown St. Louis and smaller areas in St. Louis County, such as shopping centers and industrial parks. Urban land is also in a complex, in this association, with Harvester, Fishpot, and Goss soils.

The Harvester soils were formed by cutting, filling, and reworking deep, silty, upland soils during urban development. Slopes were originally nearly level to steep. Those landscapes that were rolling and steep are now benched, and those that were gently rolling and gently undulating have been leveled to some extent. These soils have a brown silt loam surface layer. The substratum is multicolored silt loam and silty clay loam containing fragments of brick, glass, cinders, and other manmade materials. Below this is the lower part of the dark yellowish brown, silty clay loam original subsoil.

The Fishpot soils occupy landscape positions that were formerly bottom lands and terraces. Areas are long, relatively narrow strips along streams and small drainageways in urbanized parts of St. Louis County and the city of St. Louis. Many of these areas have been covered by fill material to reduce the hazard of flooding. These soils have a very dark grayish brown silt loam surface layer. The substratum is multicolored silt loam with fragments of glass and other manmade materials. Below this is the original, mottled, grayish brown, brown, and dark yellowish brown silt loam substratum.

Of minor extent in this association are the Goss soils. These soils are in a complex with Urban land in areas that have cherty or stony limestone residuum on or near the surface. These areas were formed by cutting through the loess cap on uplands during land reshaping for urban development. Other soils of minor extent are the Menfro, Winfield, and Iva soils in parks, vacant lots, and scattered areas that are not reworked.

The major limitations and hazards to urban development on soils in this association are wetness and shrink-swell potential. Some low-lying, nearly level areas are subject to poor surface drainage and to rare, short-duration flooding.

7. Goss-Gasconade-Menfro association

Moderately sloping to very steep, well drained and somewhat excessively drained, deep and shallow soils formed in limestone residuum and loess; on uplands

This association consists of narrow upland ridges and the adjacent steep to very steep side slopes (fig. 3). Slope ranges from 5 to 50 percent.

This association makes up about 12 percent of the survey area. It is about 31 percent Goss soils, 24 percent Gasconade soils closely intermingled with rock outcrops, 17 percent Menfro soils, and 28 percent soils of minor extent.

The Goss soils are well drained and steep or very steep. They are on south- and west-facing slopes and on narrow twisting ridgetops in strongly dissected areas. The surface layer is dark grayish brown cherty silt loam, and the subsurface layer is light yellowish brown cherty silt loam. The subsoil is multicolored very cherty silty clay loam, cherty silty clay, cherty clay, and clay.

The Gasconade soils are shallow, somewhat excessively drained, and moderately sloping to very steep. They are in a complex with Rock outcrop on south- and west-facing slopes below areas of Goss soils. The surface layer is very dark brown flaggy silty clay loam, and the subsoil is dark brown flaggy silty clay loam and clay.

The Menfro soils are well drained and steep or very steep. They are on north- and east-facing slopes and on some ridgetops in strongly dissected areas. The surface and subsurface layers are brown silt loam, and the subsoil is brown silty clay loam. The substratum is yellowish brown silt loam.

Of minor extent in this association are the somewhat excessively drained Clarksville soils on steep and very steep, south- and west-facing slopes and narrow twisting ridgetops; the deep, well drained Crider soils on ridge points and side slopes below the Goss soils; and the Union soils on rounded ridgetops and upper side slopes. The Union soils have a cherty fragipan. Several limestone quarries are in areas of this association.

About 20 percent of the acreage of this association has been cleared. These cleared areas are mainly on narrow ridgetops and the moderately steep, north- and east-facing side slopes. Most of the cleared areas are used for pasture, and the rest is idle land. The forested areas are in mixed hardwoods, primarily oak and hickory.

The soils in this association are suitable for trees; however, tree growth is much better on north- and east-facing exposures than it is on other exposures. The steep slopes limit accessibility to areas. Trails on the chert-free side slopes are subject to erosion.

This association is poorly suited to building sites and sanitary facilities. The steep slopes and shallow depth to bedrock are the main limitations. The cherty Goss and Clarksville soils provide fair to good fill material.

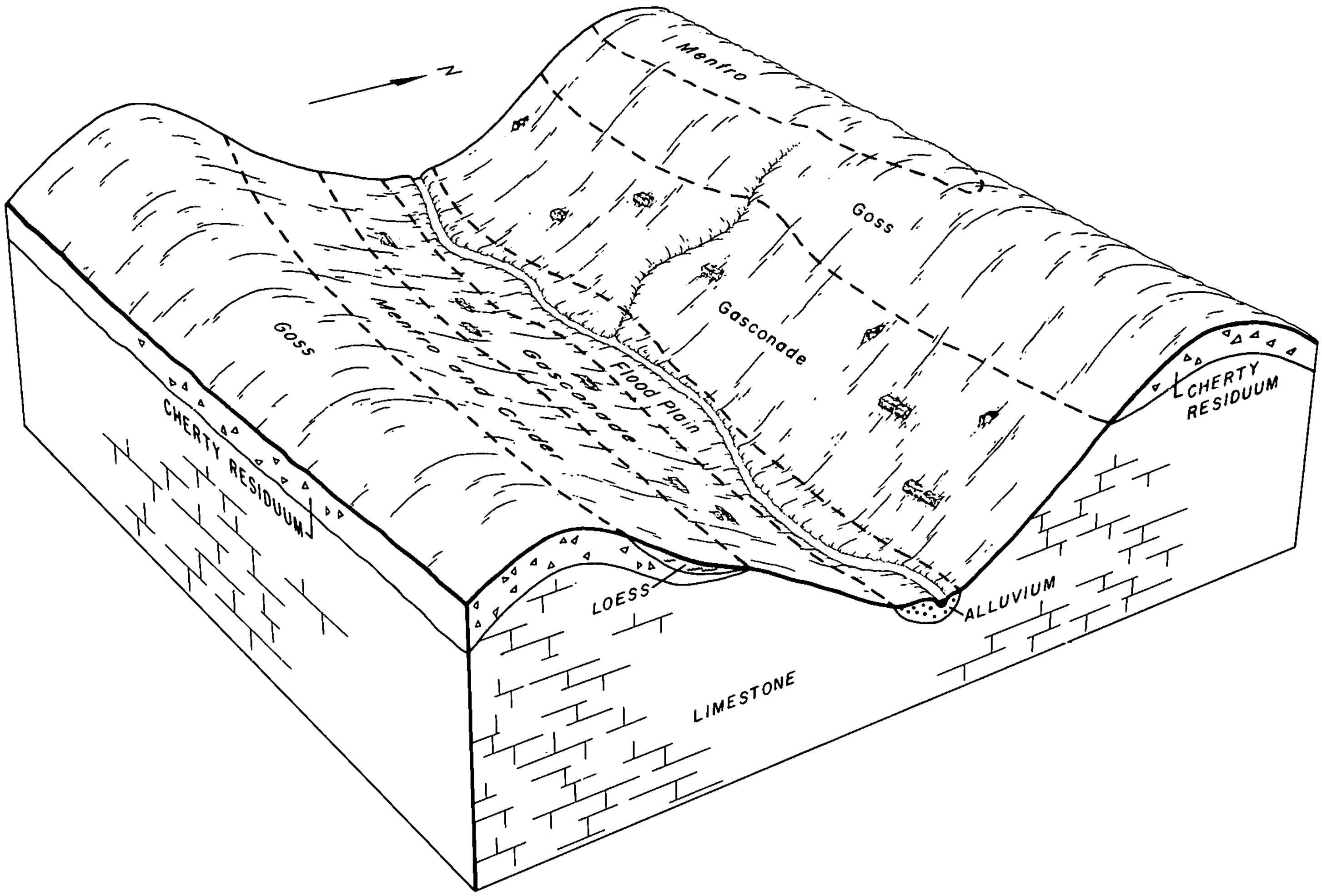

Figure 3.—Typical pattern of soils and parent material in the Goss-Gasconade-Menfro association.

detailed soil map units

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

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

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

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

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Menfro silt loam, 5 to 9 percent slopes, is one of several phases in the Menfro series.

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

A *soil complex* consists of two or more soils that occur as areas so intricately mixed or so small that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Crider-Menfro silt loams, 5 to 14 percent slopes is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. These dissimiliar soils are described in each map unit. Also, some of the more unusual or strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes some *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Pits, quarry is an example. Some miscellaneous areas are large enough to be delineated on the soil maps. Some that are too small to be delineated are identified by a special symbol on the soil maps.

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

1B—Winfield silt loam, 2 to 5 percent slopes. This gently sloping, moderately well drained soil is on ridgetops and the upper part of side slopes. Individual areas are wide and irregular in shape and range from 10 to 300 acres.

Typically, the surface layer is brown silt loam about 8 inches thick. The subsurface layer is yellowish brown silt loam about 2 inches thick. The subsoil is about 46 inches thick. It is brown silty clay loam and has light brownish gray mottles in the lower part. The substratum to a depth of about 60 inches is brown, mottled silt loam. In places, the upper part of the subsoil has gray mottles.

Permeability is moderate, and surface runoff is medium. Reaction ranges from medium acid to very strongly acid in the subsoil. In the surface layer it is medium acid to neutral, depending on local liming practices. The natural fertility is medium, and organic matter content is moderately low. Available water capacity is very high. A seasonal water table is at a depth of 2.5 to 4 feet during winter and early in spring. The surface layer is friable and is easily tilled through a fairly wide range of soil moisture.

Most areas of this soil are in cropland or pasture. They are suited to corn, soybeans, small grain, and grasses and legumes. The erosion hazard is moderate for cultivated crops. Minimum tillage, leaving large amounts of crop residue on the surface, and installing terraces and waterways in places help control erosion, maintain organic matter content, improve tilth, increase water infiltration, and reduce fertility losses. Proper stocking rates, pasture rotation, and restricted use during wet periods help keep the pasture and soil in good condition. Areas are also suited to lawn grasses, shade trees, ornamental trees, shrubs, vines, and vegetable gardens (fig. 4).

Figure 4.—Nursery stock in an area of Winfield silt loam, 2 to 5 percent slopes.

This Winfield soil is suitable for most recreation uses, such as playgrounds, camping and picnic areas, golf fairways, and paths and trails. To prevent erosion, playgrounds need to be leveled and paths and trails built on the contour or resurfaced with suitable material.

This soil is suitable for building sites and onsite waste disposal. Proper design of structures and extra reinforcement in footings and foundations are needed to prevent damage caused by shrinking and swelling. Drain tile around footings and foundations helps prevent damage caused by excessive wetness. Mechanical compaction of the basin area below the waterline is needed to seal sewage lagoons or other water impoundments. A mechanically aided aeration septic system is an alternative to sewage lagoons. For construction of local roads and streets, adequate base material and proper drainage with side ditches and culverts are needed to prevent damage caused by low strength and frost action.

This soil is in capability subclass IIe.

1C—Winfield silt loam, 5 to 9 percent slopes. This moderately sloping, moderately well drained soil is on ridgetops and side slopes. Individual areas are irregular in shape and range from 5 to 100 acres.

Typically, the surface layer is brown silt loam about 5 inches thick. The subsurface layer is dark yellowish brown silt loam about 4 inches thick. The subsoil is about 40 inches thick. It is brown, friable silt loam and firm silty clay loam in the upper part and brown, mottled, firm silty clay loam in the lower part. The substratum to a depth of about 60 inches is mottled, dark yellowish brown and light brownish gray, firm silt loam. In places, the subsoil does not have gray mottles. Also in places, the surface layer is silty clay loam because plowing has mixed the upper part of the subsoil with the surface soil.

Permeability is moderate, and surface runoff is medium. The natural fertility is medium, and organic matter content is moderately low. Available water capacity is very high. A seasonal water table is at a depth of 2.5 to 4 feet during winter and early in spring. The surface layer is friable and is easily tilled through a fairly wide range of soil moisture.

Most areas of this soil are in cropland or pasture. They are suited to corn, soybeans, small grain, and grasses and legumes. The erosion hazard is severe for cultivated crops. Installing terraces and waterways, using minimum tillage, and leaving large amounts of crop residue on the surface help control erosion, maintain organic matter content, improve tilth, increase water infiltration, and reduce fertility losses. Proper stocking rates, pasture rotation, and restricted use during wet periods help keep the pasture and soil in good condition (fig. 5). Areas are also suited to lawn grasses, shade trees, ornamental trees, shrubs, vines, and vegetable gardens.

This soil is suitable for camping and picnic areas, golf fairways, and paths and trails if the recreation uses are carefully designed. Paths and trails need to be on the contour and resurfaced with suitable material to prevent severe erosion.

This Winfield soil is suitable for building sites and onsite waste disposal. Proper design of structures and extra reinforcement in footings and foundations are needed to prevent damage caused by shrinking and swelling. Drain tile around foundations and footings helps overcome excessive wetness. In urban development, reshaping of the landscape is common on tracts of this soil. If the cuts are so deep that bedrock is exposed, providing underground utilities and revegetation on shallow areas are difficult. Mechanical compaction of the basin area below the waterline is needed to seal sewage lagoons and other water impoundments. A mechanically aided aeration septic system is an alternative to sewage

Figure 5.—Pasture on Winfield silt loam, 5 to 9 percent slopes, is in foreground. Ashton silt loam, 0 to 2 percent slopes, is in the near background, and Gasconade-Rock outcrop complex, 14 to 50 percent slopes, is on the hillside in the far background.

lagoons. Providing adequate base material for local roads and streets and proper drainage with side ditches and culverts help prevent damage caused by low strength and frost action.

This soil is in capability subclass IIIe.

1D—Winfield silt loam, 9 to 14 percent slopes. This strongly sloping, moderately well drained soil is on side slopes along small drainageways and on narrow ridgetops. Individual areas are irregular in shape and range from 10 to 80 acres.

Typically, the surface layer is brown silt loam about 3 inches thick. The subsurface layer is brown silt loam about 7 inches thick. The subsoil is about 34 inches thick. It is dark yellowish brown silty clay loam and has light brownish gray mottles in the lower part. The substratum to a depth of about 60 inches is dark yellowish brown, mottled silt loam. In places, the subsoil does not have gray mottles. Also in places, the surface layer is silty clay loam because plowing has mixed the upper part of the subsoil with the surface soil.

Included with this soil in mapping and making up 5 to 15 percent of the mapped areas are small areas of Union soils. The Union soils have a cherty fragipan in the lower part of the subsoil. They are on ridge points and south- and west-facing side slopes.

Permeability is moderate, and surface runoff is rapid. The natural fertility is medium, and organic matter content is moderately low. Available water capacity is very high. A seasonal water table is at a depth of 2.5 to 4 feet during winter and early in spring. The surface layer is friable and is easily tilled through a fairly wide range of soil moisture.

Most areas of this soil are in pasture and hayland, are cultivated for wheat, or are idle. They are suited to row crops but are subject to severe erosion. Installing terraces and waterways, using minimum tillage, and leaving large amounts of crop residue on the surface help reduce erosion, maintain organic matter content, improve tilth, and increase water infiltration. Proper stocking rates, pasture rotation, and restricted use during wet periods help keep the pasture and soil in good condition. The areas are also suited to lawn grasses, shade trees, ornamental trees, shrubs, and vines. Gardens should be planted on the contour.

This Winfield soil is suitable for camp and picnic areas and golf fairways but has moderate limitations because of slope. Some shaping and leveling are necessary for tent sites and parking areas. Areas of heavy foot traffic need resurfacing with suitable material to prevent erosion.

This soil is suitable for building sites and onsite waste disposal. Proper design of structures and extra reinforcement in footings and foundations are needed to prevent damage caused by shrinking and swelling. Tile drains around foundations and footings help overcome excessive wetness.

Reshaping of the landscape by cutting and filling is common on sites used for medium and high density urban developments. If areas of chert or limestone bedrock are exposed in cuts, installation of underground utilities and revegetation on these shallow soils are difficult. Seepage zones are common during wet seasons at the base of cuts near bedrock. Reshaping of the landscape is needed in places for sewage lagoons. Mechanical compaction of the basin area below the waterline is needed to seal sewage lagoons or other water impoundments. A mechanically aided aeration septic system is an alternative to sewage lagoons. Providing adequate base material for local roads and streets and proper drainage with side ditches and culverts help prevent damage caused by low strength and frost action. Detailed onsite investigations are needed on sites being considered for medium or high density development.

This soil is in capability subclass IIIe.

2B—Menfro silt loam, 2 to 5 percent slopes. This gently sloping, well drained soil is on ridgetops and the upper part of side slopes. Individual areas are wide and irregular in shape and range from 10 to 100 acres.

Typically, the surface layer is dark grayish brown silt loam about 4 inches thick. The subsurface layer is yellowish brown silt loam about 7 inches thick. The subsoil is about 45 inches thick. It is brown silty clay loam and has gray silt coatings on faces of peds in the upper part. The substratum to a depth of about 60 inches is yellowish brown silt loam. In places, the lower part of the subsoil has light brownish gray mottles.

Permeability is moderate, and surface runoff is medium. Reaction ranges from strongly acid to slightly acid in the subsoil. In the surface layer it is medium acid to neutral, depending on local liming practices. The natural fertility is medium, and organic matter content is moderately low. Available water capacity is very high. The surface layer is friable and is easily tilled through a fairly wide range of soil moisture.

Most areas of this soil are in cropland or pasture. They are suited to corn, soybeans, small grain, and grasses and legumes. The erosion hazard is moderate for cultivated crops. Using minimum tillage, leaving large amounts of crop residue on the surface, and in places installing terraces and waterways help control erosion, maintain organic matter content, improve tilth, increase water infiltration, and reduce fertility losses. Proper stocking rates, pasture rotation, and restricted use during wet periods help keep the pasture and soil in good condition. Areas are also suited to lawn grasses, shade trees, ornamental trees, shrubs, vines, and vegetable gardens.

This Menfro soil is suitable for most recreation uses, such as playgrounds, camping and picnic areas, golf fairways, and paths and trails. To prevent erosion, playgrounds need to be leveled and paths and trails built on the contour or resurfaced with a suitable material.

This soil is suitable for building sites and onsite waste disposal. Proper design of structures and extra reinforcement in footings and foundations help prevent damage caused by shrinking and swelling. Tile drains around foundations and footings help overcome excessive wetness. Conventional septic systems are suited if the site is large enough to accommodate an absorption field of adequate size. Mechanical compaction of the basin area below the waterline is needed to seal sewage lagoons or other water impoundments. Providing adequate base material for local roads and streets and proper drainage with side ditches and culverts help prevent damage caused by low strength and frost action.

This soil is in capability subclass IIe.

2C—Menfro silt loam, 5 to 9 percent slopes. This moderately sloping, well drained soil is on ridgetops and side slopes. Individual areas are irregular in shape and range from 10 to 300 acres.

Typically, the surface layer is brown silt loam about 7 inches thick. The subsurface layer is brown silt loam about 6 inches thick. The subsoil is brown silty clay loam about 42 inches thick. The substratum to a depth of about 60 inches is yellowish brown silt loam. In some areas, the surface layer is silty clay loam because plowing has mixed the upper part of the subsoil with the surface layer. Also in areas, the lower part of the subsoil has light brownish gray mottles.

Permeability is moderate, and surface runoff is medium. The natural fertility is medium, and organic matter content is moderately low. Available water capacity is very high. The surface layer is friable and is easily tilled through a fairly wide range of soil moisture.

Most areas of this soil are in cropland or pasture. They are suited to corn, soybeans, small grain, and grasses and legumes. The erosion hazard is severe for cultivated crops. Installing terraces and waterways, using minimum tillage, and leaving large amounts of crop residue on the surface help control erosion, maintain organic matter content, improve tilth, increase water infiltration, and reduce fertility losses. Proper stocking rates, pasture rotation, and restricted use during wet periods help keep the pasture and soil in good condition. Areas are also suited to lawn grasses, shade trees, ornamental trees, shrubs, vines, and vegetable gardens.

This Menfro soil is suitable for such recreation uses as camping and picnic areas, golf fairways, and paths and trails if these uses are carefully designed. Paths and trails should be on the contour and resurfaced with suitable material to prevent erosion.

This soil is suitable for building sites and onsite waste disposal. Proper design of structures and extra reinforcement in footings and foundations are needed to prevent damage caused by shrinking and swelling. Tile drains around foundations and footings help overcome excessive wetness. Conventional septic systems are suited if the site is large enough to accommodate an absorption field of adequate size. Mechanical compaction of the basin area below the waterline is needed to seal sewage lagoons or other water impoundments. Reshaping of the landscape is common in areas of urban development. If cuts are so deep that bedrock is exposed, installation of underground utilities and the revegetation of the shallow areas are difficult. Providing adequate base material for local roads and streets and proper drainage with side ditches and culverts are needed to prevent damage caused by low strength and frost action.

This soil is in capability subclass IIIe.

2D—Menfro silt loam, 9 to 14 percent slopes. This strongly sloping, well drained soil is on side slopes along small drainageways and on narrow ridgetops. Individual areas are irregular in shape and range from 10 to 200 acres.

Typically, the surface layer is brown silt loam about 8 inches thick. The subsurface layer is brown silt loam about 4 inches thick. The subsoil is brown silty clay loam about 37 inches thick. The substratum to a depth of about 60 inches is brown silt loam. In some areas, the surface layer is silty clay loam because plowing has mixed the upper part of the subsoil with the surface layer. Also in areas, the lower part of the subsoil has light brownish gray mottles.

Included with this soil in mapping and making up 5 to 10 percent of mapped areas are small areas of Union soils. The Union soils have a cherty fragipan in the lower part of the subsoil. They are on narrow ridgetops.

Permeability is moderate, and surface runoff is rapid. The natural fertility is medium, and the organic matter content is moderately low. Available water capacity is very high. The surface layer is friable and is easily tilled through a fairly wide range of soil moisture.

Most areas of this soil are in pasture and hayland, cropland for wheat, woodland, or are idle. Areas are suited to row crops, but the erosion hazard is severe. Installing terraces and waterways, using minimum tillage, and leaving large amounts of crop residue on the surface help reduce erosion, maintain organic matter content, improve tilth, and increase water infiltration. Proper stocking rates, pasture rotation, and restricted use during wet periods help keep the pasture and soil in good condition. Areas are also suited to lawn grasses, shade trees, ornamental trees, shrubs, and vines. Gardens should be planted on the contour.

This Menfro soil is suitable for camp and picnic areas and golf fairways but has moderate limitations because of slope. Shaping and leveling of tent and parking areas are necessary in places. The hazard of erosion is severe for paths and trails They should be resurfaced with suitable material to prevent erosion.

This soil is suitable for building sites and onsite waste disposal. Proper design of structures and extra reinforcement in footings and foundations are needed to prevent damage from shrinking and swelling. Tile drains around foundations and footings help overcome excessive wetness. This soil is suited to conventional septic systems if the system can be designed to fit the natural slope or if the soil can be reshaped to fit the system.

Reshaping of the landscape by cutting and filling is common on sites used for medium and high density urban developments. If areas of chert or limestone bedrock are exposed in cuts, the installation of underground utilities and revegetation of these shallow soils are difficult. Seepage zones commonly occur during wet seasons at the base of some cuts near bedrock. Piers or wider than normal footings give additional support for buildings and help compensate for the low bearing strength in fill areas. Mechanical compaction of the basin area below the waterline is needed to seal water impoundments. Providing adequate base material for local roads and streets and proper drainage with side ditches and culverts help prevent damage caused by low strength and frost action. Detailed onsite investigations are needed on areas that are being considered for medium or high density developments.

This soil is in capability subclass IIIe.

2E—Menfro silt loam, 14 to 20 percent slopes. This moderately steep, well drained soil is on side slopes of valleys. Individual areas are irregular in shape and range from 10 to 200 acres.

Typically, the surface layer is dark grayish brown silt loam about 4 inches thick. The subsurface layer is brown silt loam about 3 inches thick. The subsoil is yellowish brown silty clay loam about 38 inches thick. The substratum to a depth of about 60 inches is strong brown silt loam. In places, the surface layer is silty clay loam because plowing has mixed the upper part of the subsoil with the surface soil. Also in places, the lower part of the subsoil has light brownish gray mottles, or the lower part of the subsoil is red silty clay loam.

Included with this soil in mapping and making up 5 to 10 percent of the mapped areas are areas of Goss silt loam that is cherty below a depth of 20 to 40 inches. The Goss soil is mainly on south- and west-facing side slopes.

Permeability is moderate, and surface runoff is rapid. The natural fertility is medium, and organic matter content is moderately low. Available water capacity is very high. The surface layer is friable.

Most areas of this soil are in pasture and hayland, cropland for wheat, woodland, or are idle. Areas are generally not suited to cultivated crops because of the severe erosion hazard. Terraces are not very satisfactory because of the steep slopes. Areas are suited to hay and pasture. Proper stocking rates, pasture rotation, and restricted use during wet periods help keep the pasture and soil in good condition and help prevent paths, up and down the slope, from eroding into ditches. Areas are also suited to shade and ornamental trees, shrubs and vines, and lawn grasses. Mowing is relatively difficult on these slopes.

This Menfro soil has severe limitations for most recreation uses because of steepness. Onsite investigation is needed if the areas are to be developed for recreation. The forested parts are suitable for natural recreation areas containing hiking trails.

This soil occupies landscape that generally has high esthetic value for low density building sites. It is suitable for this type of development, but a mechanically aided aeration septic system generally is needed because of the steep slopes. Construction of medium and high density urban developments nearly always requires a large amount of earthmoving and reshaping of the land. Piers or wider than normal footings help provide additional support for buildings and help compensate for the low strength in fill areas. Providing adequate base material for local roads and streets and proper drainage with side ditches and culverts help prevent damage caused by low strength and frost action. Extra cuts and fills are needed in places because of the steep slopes. Detailed onsite soil and geologic investigations are needed in areas being considered for building sites.

This soil is in capability subclass IVe.

2F—Menfro silt loam, 20 to 45 percent slopes. This steep and very steep, well drained soil is on the side slopes of valleys. Individual areas are irregular in shape and range from 20 to 300 acres.

Typically, the surface layer is dark brown silt loam about 2 inches thick. The subsurface layer is yellowish brown silt loam about 5 inches thick. The subsoil is about 50 inches thick. It is brown and dark yellowish brown silty clay loam. The substratum to a depth of about 60 inches is brown silt loam. In a few places, the surface layer is silty clay loam because plowing has mixed the upper part of the subsoil with the surface soil. Also in places, the lower part of the subsoil has light brownish gray mottles, or the lower part of the subsoil is red silty clay loam.

Included with this soil in mapping and making up 10 to 15 percent of the mapped areas are small areas of Clarksville, Gasconade, and Goss soils and Rock outcrop. The Goss soils are cherty below a depth of 20 to 40 inches. The cherty Clarksville and Goss soils are mainly on south- and west-facing side slopes. The shallow Gasconade soils are along small side slope drainageways and very steep bluffs. Rock outcrop is generally the vertical part of bluffs.

Permeability is moderate, and surface runoff is very rapid. The natural fertility is medium, and organic matter content is moderately low. Available water capacity is very high. The surface layer is friable.

Most areas of this soil are in woodland. They are suited to shade and ornamental trees, shrubs and vines, and lawn grasses. Mowing is difficult on the steep slopes.

The slopes are too steep for most recreation uses on this soil. The forested parts are suitable for natural recreation areas if the hiking trails are well designed.

This Menfro soil occupies landscape that generally has high esthetic value for low density building sites. It has some suitability for this type of development, but a mechanically aided aeration septic system commonly is needed because of the steep slopes. In places, piers or wider than normal footings are needed to provide additional support for buildings and compensate for the low strength in fill areas. Providing adequate base material for local roads and proper drainage with side ditches and culverts help prevent damage caused by low strength and frost action. Extra cutting and filling is necessary in places because of the steep slopes. Detailed onsite soil and geologic investigations are needed in areas being considered for building sites.

This soil is in capability subclass VIe.

3D—Clarksville cherty silt loam, 5 to 14 percent slopes. This moderately sloping and strongly sloping, somewhat excessively drained soil is on narrow, rounded ridgetops in steep, dissected areas. Individual areas are generally elongated and range from 5 to 100 acres.

Typically, the surface layer is very dark brown cherty silt loam about 6 inches thick. The subsurface layer is light yellowish brown cherty silt loam about 26 inches thick. The subsoil is more than 40 inches thick. It is yellowish brown and strong brown very cherty silt loam. In some areas, a fragipan is at a depth of 30 to 50 inches. In a few places, the top 6 to 10 inches of the soil has less than 10 percent chert.

Included with this soil in mapping and making up 10 to 15 percent of mapped areas are small areas of Union soils. The Union soils have a cherty fragipan in the lower part of the subsoil and are on the wider parts of the narrow, rounded ridgetops.

Permeability is moderately rapid, and surface runoff is rapid. The natural fertility, organic matter content, and available water capacity are low. The surface layer is friable through a fairly wide range of soil moisture, but the presence of chert fragments makes tillage rather difficult.

Most areas of this soil are in woodland. A few areas have been cleared and seeded to pasture. This soil is suited to lawn grasses, shade trees, ornamental trees, and most shrubs and vines but droughtiness, low fertility, and the high chert content limit plant growth. Irrigation may be needed during summer for lawn and garden plants.

This Clarksville soil has severe limitations for most recreation uses because of the high chert content. A detailed onsite investigation is needed to determine if recreation uses are feasible.

This soil occupies landscape that generally has high esthetic value for low density residential development. It is suitable for this use. Septic tank absorption fields function well if properly designed and constructed to fit the natural slope. Mechanically aided aeration septic systems are needed in places to overcome slope and the small size of the available absorption field. Local roads and streets are generally built on this soil because slopes are less steep than on the surrounding landscape. Roads and streets need to be properly drained with side ditches and culverts to prevent damage caused by frost action. Detailed onsite investigations are needed in areas being considered for building sites.

This soil is in capability subclass VIs.

3F—Clarksville cherty silt loam, 14 to 50 percent slopes. This moderately steep to very steep, somewhat excessively drained soil is on the side slopes of valleys in steeply dissected uplands. Individual areas are generally long and narrow and range from 20 to 600 acres.

Typically, the surface layer is black cherty silt loam about 1 inch thick. The subsurface layer is light yellowish brown cherty silt loam about 5 inches thick. The subsoil is more than 60 inches thick. The upper part is pale brown, friable cherty silt loam; below this is light yellowish brown, friable very cherty silt loam; and the lower part is multicolored, friable very cherty silt loam. In a few places, the top 6 to 10 inches of the soil has less than 10 percent chert.

Included with this soil in mapping are outcrops of chert and limestone on south- and west-facing slopes. Also included are areas of shallow Gasconade soils along the lower edge of mapped areas. The included soils and outcrops make up about 10 percent of mapped areas.

Permeability is moderately rapid, and surface runoff is very rapid. The natural fertility, organic matter content, and available water capacity are low.

Nearly all areas of this soil are wooded. Areas on north- and east-facing slopes are better suited to lawn grasses, shade and ornamental trees, and most shrubs and vines than areas on the hotter, drier south- and west-facing slopes. Areas are generally not suited to vegetable gardens because of steep slopes, droughtiness, and the amount of chert in the upper part of the soil.

This Clarksville soil commonly occupies landscape positions that have high esthetic value, but generally are not suitable for low density residential development because of the steep slopes.

This soil is in capability subclass VIIs.

4D—Union silt loam, 9 to 14 percent slopes. This strongly sloping, moderately well drained soil is on relatively narrow, rounded ridgetops and the upper part of side slopes. Individual areas are irregular in shape and range from 10 to 100 acres.

Typically, the surface layer is very dark grayish brown silt loam about 2 inches thick. The subsurface layer is yellowish brown silt loam about 3 inches thick. The subsoil above the fragipan is about 30 inches thick. It is brown and strong brown, firm silty clay loam. The fragipan is brown, mottled, very firm and extremely firm very cherty silty clay loam. It is more than 25 inches thick. In places, the surface layer is silty clay loam because plowing has mixed the upper part of the subsoil with the surface soil. Also in a few places, the surface layer contains chert fragments.

Included with this soil in mapping and making up 10 to 15 percent of mapped areas are small areas of Clarksville, Goss, Menfro, and Winfield soils. The Clarksville and Goss soils are cherty throughout and are on south- and west-facing slopes. The Menfro and Winfield soils are deeper to chert fragments than this Union soil and are on the center of broad ridgetops.

Permeability is slow, and surface runoff is rapid. The natural fertility, organic matter content, and available water capacity are low. A perched water table is at a depth of 1.5 to 3 feet during winter and early in spring. The surface layer is friable and is easily tilled through a fairly wide range of soil moisture.

Most areas of this soil are in pasture or woodland or are idle. Areas are suited to small grain, hay, and pasture. The erosion hazard is severe for cultivated crops. Installing terraces and waterways, using minimum tillage, and leaving large amounts of crop residue on the surface help control erosion, maintain organic matter content, improve tilth, increase water infiltration, and reduce fertility losses. Proper stocking rates, pasture rotation, and restricted use during wet periods help keep the pasture and soil in good condition. If supplemental irrigation is available during summer, areas are also suited to lawn grasses, shallow-rooted shade and ornamental trees, shrubs, vines, and vegetable gardens.

This Union soil is suitable for recreation uses, such as camping and picnic areas and golf fairways. Some shaping and leveling is necessary for tent and parking areas. Tent areas need good surface drainage to overcome wetness, and areas of heavy foot traffic need resurfacing with suitable material to prevent surface wetness and erosion.

This soil is suitable for building sites and onsite waste disposal. Proper design of structures and extra reinforcement in footings and foundations are needed to prevent damage caused by shrinking and swelling. Tile drains around footings and foundations help overcome excessive wetness. Sewage lagoons function if areas are reshaped to modify the slope or sewage is piped to lagoons constructed on less sloping areas. A mechanically aided aeration septic system is an alternative to sewage lagoons.

If medium and high density urban developments are planned on tracts of this soil, reshaping of the landscape by cutting and filling is common. Cuts of 30 inches or more expose the cherty fragipan or stony soil material. Revegetating these exposed cherty and stony areas is difficult, and constructing underground utilities across them is costly. Low density development seldom requires much reshaping of the landscape. This soil is suitable for water impoundments if excavation is not below the fragipan. The soil material below the fragipan is commonly subject to excessive seepage. Adequate base material should be used in construction of local roads and streets to prevent damage caused by low strength. Detailed onsite investigation is needed on areas being considered for medium or high density development.

This soil is in capability subclass IVe.

5A—Iva silt loam, 1 to 3 percent slopes. This gently sloping, somewhat poorly drained soil is on wide divides on uplands. Individual areas are wide and irregular in shape and range from 20 to 250 acres.

Typically, the surface layer is dark grayish brown, very friable silt loam about 9 inches thick. The subsurface layer is brown, friable silt loam about 4 inches thick. The subsoil is about 42 inches thick. It is multicolored brown and gray, firm silty clay loam. The substratum is multicolored, firm silt loam to a depth of about 60 inches. In places, the upper part of the subsoil does not have gray mottles.

Permeability is moderate, and surface runoff is slow. Reaction ranges from medium acid to strongly acid in the subsoil. In the surface layer it is medium acid to neutral, depending on local liming practices. The natural fertility and organic matter content are low. Available water capacity is high. A perched water table is at a depth of 1 foot to 3 feet during winter and early in spring. The surface layer is friable and is easily tilled through a fairly wide range of soil moisture.

Most areas of this soil are in cropland or pasture. They are suited to corn, soybeans, small grain, and grasses and legumes. Erosion is a slight hazard if cultivated crops are grown. Using minimum tillage and leaving large amounts of crop residue on the surface help control erosion, maintain organic matter content, improve tilth, increase water infiltration, and reduce fertility losses. Proper stocking rates, pasture rotation, and restricted use during wet periods help keep the pasture and soil in good condition. Areas are also suited to lawn grasses, shade and ornamental trees, shrubs, vines, and vegetable gardens.

This Iva soil is suitable for picnic areas and golf fairways. Picnic areas need to be graded for good surface drainage, and paths need to be resurfaced with suitable material to overcome moderate wetness.

This soil is suitable for building sites and onsite waste disposal. Drain tile around footings and foundations help overcome excessive wetness. Mechanical compaction of the basin area below the waterline helps to seal sewage lagoons or other water impoundments. A mechanically aided aeration septic system with a properly constructed mound filter field is an alternative to sewage lagoons. Providing adequate base material to local roads and streets and proper drainage with side ditches and culverts help prevent damage caused by low strength, frost action, and wetness.

This soil is in capability subclass IIw.

6A—Urban land, bottom land, 0 to 3 percent slopes. This map unit consists of areas in which more than 85 percent of the surface is covered by asphalt, concrete, buildings, or other impervious materials. Parking lots, shopping and business centers, railroad yards, and industrial parks are examples. They occur throughout the survey area, except the western part. Most areas are small; the largest are in the city of St. Louis near the Mississippi River and along the Meramec River upstream from the city of Fenton. The areas originally were bottom land or terrace land. Many of them have been built up with fill material to elevate them above normal flood levels. However, they are subject to inundation for short periods by local flooding, and extremely large floods cover some areas of this unit for long periods. Individual areas generally range from 30 to 500 acres.

Composition of the soil material capable of supporting vegetation is quite variable. The vegetation is primarily ornamental trees, shrubs, and lawn grasses.

The amount of fill in areas of this unit ranges from none on some terrace positions at a higher elevation to more than 20 feet on former swampy areas near the Mississippi River in the northern part of the city of St. Louis. Identification of the soils and soil-like materials in this unit is impractical because of variability. Detailed onsite investigation is needed in all areas prior to changes in the kind or intensity of use.

This map unit is not assigned to a capability subclass.

7B—Urban land, upland, 0 to 5 percent slopes. This map unit consists of areas in which more than 85 percent of the surface is covered by asphalt, concrete, buildings, or other impervious materials. Parking lots, shopping and business centers, railroad yards, and industrial parks are examples. They occur throughout the survey area, except the western part. The largest areas are the central business districts of the cities of St. Louis and Clayton, and the smaller areas are industrial parks and shopping malls. These areas are on uplands. Most of them are on land that has been extensively reshaped by cutting and filling to achieve a nearly level surface over the whole area, or to produce several different elevations or levels within an area. Individual areas generally range from 30 to 2,500 acres.

Composition of the soil material capable of supporting vegetation is quite variable. The vegetation is primarily ornamental trees, shrubs, and lawn grasses.

The depth of cuts and fills in areas of this unit ranges from less than 6 feet on some of the flatter landscapes to more than 30 feet on the more strongly sloping landscapes. Identification of the soils and soil-like materials is impractical because of variability. Detailed onsite investigation is needed in all areas prior to changes in the kind or intensity of use.

This map unit is not assigned to a capability subclass.

8E—Goss silt loam, 14 to 20 percent slopes. This moderately steep, well drained soil is on side slopes, mainly north- and east-facing slopes. Individual areas are irregular in shape and range from 10 to 100 acres.

Typically, the surface layer is dark grayish brown silt loam about 4 inches thick. The subsurface layer is brown silt loam about 5 inches thick. The subsoil above the cherty residuum is about 11 inches thick. It is yellowish brown silt loam and silty clay loam and some fragments of chert. The subsoil in the cherty residuum is about 36 inches thick. It is strong brown very cherty silty clay loam and yellowish red, mottled very cherty clay. The substratum is dark red, mottled, firm very cherty clay. In places, the surface layer is silty clay loam because cultivation has mixed the upper part of the subsoil with the surface soil. Also in places, a few chert fragments are on or just below the surface of the soil.

Included with this soil in mapping and making up 10 to 15 percent of mapped areas are small areas of Clarksville cherty silt loam, Goss cherty silt loam, and Menfro soils. The cherty Clarksville and Goss soils are on south- and west-facing slopes. The Menfro soils are more than 60 inches deep to cherty material and are on north- and east-facing slopes.

Permeability is moderate, and surface runoff is rapid. The natural fertility, organic matter content, and available water capacity are low. The surface layer is friable.

Most areas of this soil are in pasture, woodland, or are idle. The areas generally are not suitable for cultivated crops because of the severe erosion hazard. Proper stocking rates, pasture rotation, and restricted use during wet periods help keep the pasture and soil in good condition and help prevent paths, up and down the slope, from eroding into ditches. Areas are also suited to shade and ornamental trees, shrubs and vines, and lawn grasses. Mowing is relatively difficult on these slopes.

This Goss soil is generally not suitable for most recreation uses because of steep slopes. The forested parts are suitable for natural recreation areas containing hiking trails.

This soil occupies landscape that generally has high esthetic value for low density urban development. It has some suitability for this type of development, but a mechanically aided aeration septic system is commonly needed because of steep slopes. This soil is generally not suitable for medium and high density urban developments because of slope and the relatively shallow depth to cherty material and bedrock. Detailed onsite soil and geologic investigations are needed on areas being considered for building sites.

This soil is in capability subclass VIe.

10D—Gasconade-Rock outcrop complex, 5 to 14 percent slopes. This complex consists of moderately sloping and strongly sloping, somewhat excessively drained Gasconade soils and areas of Rock outcrop. It is on narrow rounded ridgetops and ridge points on steep, dissected upland. Individual areas are elongated and range from 5 to 20 acres. They are 55 to 85 percent Gasconade soils and 10 to 40 percent Rock outcrop. The Gasconade soils and Rock outcrop are so intermingled or in such an intricate pattern that to separate them in mapping was not practical.

Typically, the surface layer of the Gasconade soil is very dark brown flaggy silty clay loam about 6 inches thick. The subsoil is dark brown flaggy silty clay about 8 inches thick. Fractured limestone bedrock is at a depth of about 14 inches. In a few places, the depth to bedrock is 20 to 40 inches and the subsoil is dark reddish brown.

The Rock outcrop part of this unit consists of vertical ledges and nearly horizontal exposures of bedrock. The horizontal areas range from less than one square yard to several square yards. The ledges are a few feet to 100 feet or more in length.

Included with this complex in mapping and making up about 5 percent of mapped areas are small areas of deep cherty Goss soils. They primarily occupy the higher points on the Gasconade covered ridges, where a few feet of the cherty and clayey overburden is still present.

Permeability is moderately slow in the Gasconade soils. The complex has rapid surface runoff and very low available water capacity. Reaction is neutral. The natural fertility is medium, and organic matter content is moderate. The root zone extends to bedrock, although a few roots may enter the cracks in the bedrock.

Areas of this complex are in low quality woodland, mainly cedars and oaks. Areas generally are suitable only for drought tolerant shrubs and smaller plants. They support plant species, such as cacti, that rarely grow on other soils in the survey area.

The relatively narrow shape of areas and the high stone content of the soils are generally not suited to recreation uses.

This complex occupies landscape positions that commonly have high esthetic value for low density development. Limitations are severe because of the shallow depth to bedrock. Extensive site preparation by blasting is generally needed to establish dwelling sites. Because the soil is shallow, a suitable waste disposal system must be tailored to individual sites. A mechanically aided aeration system generally can be used in conjunction with a properly constructed, built-up mound filter field. The filter field needs to be constructed from silty or loamy material from other areas. Detailed onsite geologic investigations are needed on areas being considered for building sites.

This complex is in capability subclass VIIs.

10F—Gasconade-Rock outcrop complex, 14 to 50 percent slopes. This complex consists of moderately steep to very steep, somewhat excessively drained Gasconade soils and areas of Rock outcrop. It is on the side slopes of valleys in steep, dissected uplands. Individual areas are generally irregular in shape and range from 25 to 500 acres. They are 50 to 80 percent Gasconade soils and 10 to 40 percent Rock outcrop. The Gasconade soils and Rock outcrop are so intermingled or in such an intricate pattern that to separate them in mapping was not practical.

Typically, the surface layer of the Gasconade soil is very dark brown flaggy silty clay loam about 5 inches thick. The subsoil is about 12 inches thick. It is dark brown, flaggy, firm silty clay loam and clay. Fractured limestone bedrock is at a depth of about 17 inches. In places, the depth to bedrock is 20 to 50 inches and the subsoil is dark reddish brown.

The Rock outcrop part of the unit consists of vertical ledges and nearly horizontal exposures of bedrock. The horizontal areas range from part of a square yard to several square yards. The ledges are several feet to several hundred feet in length.

Included with this complex in mapping and making up about 10 percent of mapped areas are small areas of deep Crider and Menfro soils. These soils are on north- and east-facing slopes.

Permeability is moderately slow in the Gasconade soils. The complex has very rapid surface runoff and very low available water capacity. Reaction is neutral. The natural fertility is medium, and organic matter content is moderate. The root zone extends to bedrock, although a few roots may enter the cracks in the bedrock.

Areas of this complex are in low quality woodland or in grassland. Vegetation is mainly cedars, oaks, and short-stemmed native grasses. Areas generally are suitable only for drought tolerant shrubs and smaller plants; however, under natural conditions, they support a rather large variety of plant species because of the different microclimates within the complex.

This complex occupies landscape positions that have relatively high esthetic value but generally are not suitable for building sites because of the steep slopes and shallow depth to bedrock.

This complex is in capability subclass VIIs.

12—Nevin silt loam. This nearly level, somewhat poorly drained soil is in moderately wide to wide basins on uplands. Individual areas are irregular in shape and range from 10 to 100 acres.

Typically, the surface layer is very dark gray, friable silt loam about 11 inches thick. The subsurface layer is very dark gray, friable silt loam about 13 inches thick. The subsoil is multicolored, firm silty clay loam about 21 inches thick. The substratum to a depth of about 60 inches is light brownish gray, mottled, friable silt loam. In a few places along the border of areas, the subsoil and substratum are strong brown in color, and the internal drainage is better.

Permeability is moderate, surface runoff is slow, and available water capacity is very high. Reaction is acid or slightly acid in the surface layer and upper part of the subsoil and slightly acid to neutral in the lower part. The natural fertility is medium, and organic matter content is moderate. A seasonal water table is at a depth of 2 to 4 feet during winter and early in spring. The surface layer is friable and is easily tilled through a fairly wide range of soil moisture.

Most areas of this soil are in cropland. They are suited to corn, soybeans, truck crops, small grain, and grasses and legumes. In some areas, a diversion terrace adjacent to the surrounding upland is beneficial in preventing additional surface water from running onto this soil. Proper stocking rates, pasture rotation, and restricted use during wet periods help keep the pasture and soil in good condition. Areas are also suited to lawn grasses, shade trees, ornamental trees, shrubs, vines, and vegetable gardens.

This soil is suitable for most recreation uses, such as playgrounds, camping and picnic areas, golf fairways, and athletic fields. Surface drainage and resurfacing in areas of heavy foot traffic are required to overcome wetness.

This Nevin soil is suitable for buildings without basements. It is poorly suited to buildings with basements because of the high water table late in winter and early in spring. Basements are commonly set only half as deep as standard, and the material from the excavation is used as fill to build up the yard adjacent to the dwelling. This partially alleviates the limitations caused by the high water table. Footings and foundations should be designed and reinforced to prevent damage from shrinking and swelling. Tile drains around footings and foundations help overcome excessive wetness. A mechanically aided aeration septic system with a built-up mound filter field or community sewers is needed if sewage lagoons are not practical. Mechanical compaction of the basin area below the waterline is needed to seal sewage lagoons. Providing adequate base material to local roads and streets and proper drainage with side ditches and culverts help prevent damage caused by low strength and frost action.

This soil is in capability class I.

13D—Goss cherty silt loam, 5 to 14 percent slopes. This moderately sloping and strongly sloping, well drained soil is on narrow rounded ridgetops in steep, dissected areas. Individual areas are generally elongated and range from 5 to 80 acres.

Typically, the surface layer is brown cherty silt loam about 4 inches thick. The subsurface layer is light brown very cherty silt loam about 16 inches thick. The subsoil is more than 40 inches thick. It is strong brown, yellowish red, and mottled red and brown very cherty silty clay loam to cherty clay. In a few places, the top 6 to 20 inches of the soil contains less than 10 percent chert.

Permeability is moderate, and surface runoff is rapid. The natural fertility, organic matter content, and available water capacity are low. The surface layer is friable through a fairly wide range of soil moisture, but the presence of chert fragments makes tillage difficult.

Most areas of this soil are in trees. A few areas have been cleared for pasture. Areas are suited to vegetable gardens, lawn grasses, shrubs and vines, and shade and ornamental trees. Supplemental irrigation may be needed during summer because of droughtiness.

The relatively narrow areas and the high chert content generally make this soil unsuitable for most recreation uses; however, areas are commonly used for paths and trails because this soil is less steep than most of the adjacent soils.

This Goss soil occupies landscape positions that generally have high esthetic value for low density urban development and is suitable for this use. Footings and foundations should be designed and constructed with extra reinforcement to prevent damage from shrinking and swelling. A mechanically aided aeration septic system with a larger than standard absorption field is needed in most places because of the slope and slow permeability. Local roads and streets are generally built on this soil because it is less steep than the adjacent soils. Providing adequate base material to local roads and streets and proper drainage with side ditches and culverts help prevent damage caused by low strength and frost action. Detailed onsite investigation is needed on areas being considered for medium or high density development.

This soil is in capability subclass VIs.

13F—Goss cherty silt loam, 14 to 45 percent slopes. This moderately steep to very steep, well drained soil is on the side slopes of valleys in steep, dissected uplands. Individual areas are generally long and narrow and range from 20 to 250 acres.

Typically, the surface layer is dark grayish brown, very friable cherty silt loam about 2 inches thick. The subsurface layer is light yellowish brown, friable cherty silt loam about 14 inches thick. The subsoil is more than 44 inches thick. It is strong brown, friable very cherty silty clay loam in the upper part; brown, mottled, firm cherty silty clay and red, mottled, firm cherty clay in the next part; and reddish brown and brownish yellow, firm clay in the lower part. In places, the top 6 to 20 inches of the soil contains less than 10 percent chert.

Included with this soil in mapping are small areas of Goss silt loam, small outcrops of limestone bedrock on south- and west-facing slopes, and shallow Gasconade soils along the lower edge of some areas. The included soils make up about 15 percent of mapped areas.

Permeability is moderate, and surface runoff is very rapid. The natural fertility, organic matter content, and available water capacity are low.

Most areas of this soil are in woodland. Areas on north- and east-facing slopes are better suited to lawn grasses, shade and ornamental trees, and most shrubs and vines than areas on south- and west-facing slopes. Areas are generally not suitable for vegetable gardens because of slope, droughtiness, and the presence of chert in the upper part of this soil.

This Goss soil occupies landscape positions that generally have high esthetic value; however, it is generally not suitable even for low density development. Extensive site preparation is commonly needed because of the steep slopes. Detailed onsite investigation is needed on areas being considered for building sites.

This soil is in capability subclass VIIs.

14C—Menfro silt loam, karst, 2 to 14 percent slopes. This well drained soil is on gently undulating to rolling uplands that contain circular and elongated limestone sinks. The individual sinks range from a fraction of an acre to about 2 acres and make up about 15 to 60 percent of the individual areas. Individual areas are irregular in shape and range from 50 to 300 acres.

Typically, the surface and subsurface layers are dark yellowish brown silt loam. Each are about 6 inches thick. The subsoil is dark yellowish brown silty clay loam about 32 inches thick. The substratum to a depth of about 60 inches is dark yellowish brown silt loam that has pale brown mottles. In some areas, the surface layer is silty clay loam because plowing has mixed the upper part of the subsoil with the surface soil. Also in places, the lower part of the subsoil has light brownish gray mottles.

Included with this soil in mapping are areas of Urban land. The Urban land makes up 10 to 15 percent of mapped areas. Fifteen to 50 percent of the Urban land is covered by buildings, streets, and parking lots.

Permeability is moderate, and surface runoff is medium. The natural fertility is medium, and organic matter content is moderately low. Available water capacity is very high. The surface layer is friable and is easily tilled through a fairly wide range of soil moisture.

Most areas of this soil are in cropland, pasture, or are idle. The areas are generally not suited to row crops because of slopes and the severe hazard of erosion. Terraces or other erosion control practices are not feasible on this soil because of the nature of the slopes. Minimum tillage and leaving large amounts of residue on the surface help reduce erosion, maintain organic matter content, improve tilth, increase water infiltration, and reduce fertility losses. Proper stocking rates, pasture rotation, and restricted use during wet periods help keep pasture and the soil in good condition. Areas are also suited to lawn grasses, shade trees, ornamental trees, shrubs, vines, and vegetable gardens.

This Menfro soil is suitable for recreation uses, such as camping and picnic areas, golf fairways, and paths and trails. Uses need to be designed to overcome the moderate limitations of slope. Paths and trails should be constructed on the contour and resurfaced with suitable material to prevent erosion.

This soil is suitable for building sites, but a mechanically aided aeration septic system generally is needed because of slope and the presence of limestone sinks. The sinks limit filter field size and efficiency. Sewage effluent that is released into the sinks can contaminate the underground water supply. The ridges between the sinks are generally suitable for building sites. The sides and bottoms of the sinks are not so suitable, because the soils on the sides are generally not stable; also, the sinks can become plugged, resulting in a marshy condition or a shallow water impoundment. Because of the sinks, these soil areas are suitable for only medium or low density development, depending on the percentage of the mapped areas that are sinks. Piers or wider than normal footings help provide additional support for buildings and compensate for the low strength in fill areas.

The karst areas are generally not suitable for manmade water impoundments. Little drainage flows out of these areas because nearly all of the surface water flows into sinks, then out the bottom into the subterranean water system. It is difficult to plug a sink to form a water impoundment, and the chance of failure is relatively high. Occasionally, a sink becomes plugged by natural processes, and water is impounded. A detailed onsite investigation is needed to locate suitable building sites.

This soil is in capability subclass IIIe.

14E—Menfro silt loam, karst, 9 to 30 percent slopes. This well drained soil is on rolling to steep uplands that contain many circular and a few elongated limestone sinks. Many sinks are 50 to 100 feet deep and have slopes around their rim that drop 20 feet to 50 feet or more in 100 feet of distance. Sinks mainly range from less than 1 acre to about 3 acres and make up about 25 to 75 percent of the individual areas. Individual areas are irregular in shape and range from 20 to 500 acres.

Typically, the surface layer is dark grayish brown silt loam about 4 inches thick. The subsurface layer is brown silt loam about 7 inches thick. The subsoil is about 35 inches thick. It is brown silty clay loam and has light brownish gray silt coatings on some ped surfaces in the lower part. The substratum to a depth of about 60 inches is yellowish brown silt loam. In some areas, the surface layer is silty clay loam because cultivation has mixed the upper part of the subsoil with the surface soil. Also in areas, the lower part of the subsoil has light brownish gray mottles.

Included with this soil in mapping are areas of Urban land. The Urban land makes up about 5 percent of mapped areas. Fifteen to 50 percent of the Urban land is covered by buildings, streets, and parking lots. In places along the steep sides of sinks, limestone bedrock is at a depth of 20 to 60 inches.

Permeability is moderate, and surface runoff is very rapid. The natural fertility is medium, and organic matter content is moderately low. Available water capacity is very high. The surface layer is friable.

Most areas of this soil are in woodland. Areas on the ridges between the sinks are cleared. The cleared areas are in pasture or are idle, and a few are used for wheat. The areas are suited to cultivated crops, but tillage is difficult because of the narrow, steep sided, undulating ridges between the sinks. The erosion hazard is severe. For small grain production, minimum tillage and leaving large amounts of residue on the surface help reduce erosion, maintain organic matter content, improve tilth, increase water infiltration, and reduce fertility losses. Areas are suited to grasses and legumes for hay and pasture. Proper stocking rates, pasture rotation, and restricted use during wet periods help keep the pasture and soil in good condition. Areas are also suited to shade and ornamental trees, shrubs and vines, and lawn grasses. Mowing is difficult on the steep slopes. Gardens should be on the least sloping part of the landscape.

This Menfro soil is generally not suitable for most kinds of recreation uses because of the steep slope. The karst topography offers a good site for scenic trails, but the hazard of erosion is a severe limitation. Trails should be on the contour and resurfaced with suitable material in problem areas to prevent erosion.

This soil occupies landscape that generally has high esthetic value for low density urban development. It has some suitability for this use. A mechanically aided aeration septic system generally is needed because of steep slopes and the presence of limestone sinks. The sinks limit filter field size and efficiency. Sewage effluent that is released into the sinks can contaminate the underground water supply. The ridges between the sinks are the most suitable building sites. The sides of the sinks are generally too steep for good building sites. The bottom of the sinks could become plugged, resulting in a marshy condition or a shallow water impoundment in the sink. Piers or wider than normal footings help provide additional support for buildings and compensate for the low strength in fill areas.

The karst areas are generally not suitable for manmade water impoundments. It is difficult to plug a sink to form a water impoundment, and the chance of failure is relatively high. Occasionally, a sink becomes plugged by natural processes, and water is impounded. Detailed onsite soil and geologic investigations are needed to locate suitable building sites.

This soil is in capability subclass VIe.

16C—Urban land-Harvester complex, karst, 2 to 9 percent slopes. This complex consists of Urban land and the intermingled areas of moderately well drained Harvester soils on gently undulating and gently rolling uplands. Prior to urban development, areas contained circular and elongated limestone sinks. Many sinks have been filled or so altered during urban development that they are not easily recognizable. Individual areas are irregular in shape and range from 40 to 160 acres. They are about 55 to 60 percent Urban land and 25 to 30 percent Harvester soils. The Urban land and Harvester soils are so intermingled or in such an intricate pattern that to separate them in mapping was not practical.

The Urban land part of this complex is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification of the series is not feasible.

Typically, the surface layer of the Harvester soil is brown silt loam about 3 inches thick. The next layer, to a depth of about 17 inches, consists of brown silt loam and silty clay loam fill material. Below the reworked fill material to a depth of about 60 inches is the lower part of a buried soil. It is dark yellowish brown silt loam in the upper part and mottled dark yellowish brown, light brownish gray, and yellowish red silt loam in the lower part. In places, the fill material is more than 40 inches thick, and in places all of the original soil has been removed during land reshaping. In a few places, the surface layer is silty clay loam.

Included with this complex in mapping and making up about 15 percent of mapped areas are small areas of well drained Menfro soils and moderately well drained Winfield soils. These soils are around the few unaltered sinks and in parks, playgrounds, and a few open spaces between buildings.

The Urban land is impervious to water. Permeability is moderately slow in the Harvester soil, natural fertility is medium, and organic matter content is very low. The surface layer of the Harvester soil is friable. Surface runoff is medium or rapid in this complex.

The Harvester soil in this complex is in yards, open spaces between buildings, parks, playgrounds, gardens, and undeveloped random tracts. Recreation uses are suitable if they can be adapted to the limited size and shape of the open spaces and the slope. Onsite investigation is needed in areas that are considered for recreation.

Waste commonly is disposed of by community sewers. Proper design of structures and extra reinforcement in footings and foundations are needed to prevent damage caused by shrinking and swelling. Providing adequate base material for local roads and streets and proper drainage with side ditches and culverts, or tile drains and storm sewers, help prevent damage caused by low strength and frost action. Sinks are generally not suitable for building sites, because the soils on the sides of sinks are generally not stable; also, the sink can become plugged, resulting in a saturated soil condition in the bottom of the sink during some parts of the year. Onsite soil and geologic investigations are needed to locate areas that can be used for high density development.

This soil is not assigned to a capability subclass.

16D—Urban land-Harvester complex, karst, 9 to 20 percent slopes. This complex consists of Urban land and the intermingled areas of moderately well drained Harvester soils on rolling and hilly uplands. Prior to urban development, areas contained circular and elongated limestone sinks. Some sinks have been filled or so altered during urban development that they are not easily recognizable. Individual areas are irregular in shape and range from 15 to 100 acres. They are about 50 to 55 percent Urban land and 25 to 30 percent Harvester soils. The Urban land and Harvester soils are so intermingled or in such an intricate pattern that to separate them in mapping was not practical.

The Urban land part of this complex is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification of the series is not feasible.

Typically, the surface layer of the Harvester soil is mixed very dark grayish brown and brown silt loam about

2 inches thick. The next layer, to a depth of about 20 inches, consists of brown and pale brown silt loam and silty clay loam fill material. Below the reworked fill material to a depth of about 60 inches is older, unworked, brown silt loam. In places, cuts and fills are several feet deep, and the cuts expose residual chert or limestone bedrock. In a few places, the surface layer is silty clay loam. In some areas, slopes around the sinks are more than 20 percent.

Included with this complex in mapping and making up about 20 percent of mapped areas are small areas of well drained Menfro soils and moderately well drained Winfield soils. These soils are in and around the unaltered sinks and in parks and a few open spaces between buildings.

The Urban land is impervious to water. Permeability is moderately slow in the Harvester soils, natural fertility is medium, and organic matter content is very low. The surface layer of the Harvester soils is friable. Surface runoff is rapid and very rapid in this complex.

The Harvester soils in this complex are in yards, open spaces around buildings, parks, and gardens and in undeveloped random tracts that are primarily in and around sinks. Recreation uses are suitable if they can be adapted to the limited size and shape of the open spaces and to the slope. The larger sinks are generally undeveloped. They make good natural areas, and in some places they can be developed into a parkland and natural area complex. Onsite investigation is needed on areas being considered for recreation uses.

Waste commonly is disposed of by community sewers. Proper design of structures and extra reinforcement in footings and foundations help prevent damage caused by shrinking and swelling. Providing adequate base material for local roads and streets and proper drainage with side ditches and culverts, or tile drains and storm sewers, help prevent damage caused by low strength and frost action. Most of the sinks in this unit are deep and have steep sides. They are generally not suitable for building sites because soils on the sides of the sinks are generally not stable; also, the sink can become plugged, resulting in a saturated soil condition in the bottom of the sink during some parts of the year. Onsite soil and geologic investigations are needed to locate areas that can be used for high density development.

This complex is not assigned to a capability subclass.

17D—Crider-Menfro silt loams, 5 to 14 percent slopes. This complex consists of moderately sloping and strongly sloping, well drained Menfro and Crider soils. These soils are on narrow ridgetops and near the head of moderately steep drainageways. Individual areas are irregular in shape and range from 5 to 35 acres. This complex is about 45 percent Crider soils and 45 percent Menfro soils. The Crider and Menfro soils have about the same limitations for many uses, and they are so intermingled or in such an intricate pattern that to separate them in mapping was not practical.

Typically, the surface layer of the Crider soil is yellowish brown silt loam about 5 inches thick. The subsoil is more than 55 inches thick. It is yellowish red silty clay loam in the upper part and silty clay in the lower part. In some areas, the surface layer is silty clay loam, because cultivation has mixed the upper part of the subsoil with the surface layer.

Typically, the surface layer of the Menfro soil is brown silt loam about 8 inches thick. The subsurface layer is brown silt loam about 4 inches thick. The subsoil is about 37 inches thick. It is brown silty clay loam with pale brown silt coatings in the upper part. The substratum to a depth of about 60 inches is brown silt loam. In some areas, the surface layer is silty clay loam, because cultivation has mixed the upper part of the subsoil with the surface soil. Also in some areas, depth to bedrock is 30 to 60 inches.

Included with this complex in mapping and making up about 10 percent of mapped areas are areas of shallow Gasconade soils and Rock outcrop. The Rock outcrop makes up less than 2 percent of most mapped areas. The Gasconade soils and Rock outcrop are primarily on south- and west-facing slopes.

Permeability is moderate, and surface runoff is rapid. Available water capacity is high, and the natural fertility and organic matter content are moderately low. The surface layer is friable in most areas.

Most areas of this complex are in woodland and pasture or are idle. The stands of trees are mainly second growth of poor or fair quality. These areas are generally not suitable for row crops because of the severe erosion hazard and scattered areas of soils that are shallow to bedrock. For small grain production, leaving crop residue on the surface helps reduce erosion, maintain organic matter content, improve tilth, reduce fertility losses, and increase water infiltration. Proper stocking rates, pasture rotation, and restricted use during wet periods help keep the pasture and soil in good condition. Areas of this complex are suited to lawn grasses, shade trees, ornamental trees, shrubs, and vines. Vegetable gardens should be planted on the contour.

Soils in this complex are suitable for camping and picnic areas and golf fairways but have moderate limitations because of slope. Land shaping and leveling are needed in places for tent and parking areas. Paths and trails should be placed on the contour where possible and resurfaced with suitable material to prevent erosion.

Areas of this complex are suitable for building sites, but a mechanically aided aeration system may be needed if a conventional septic tank absorption field isn't feasible. Footings and foundations should be designed and constructed with extra reinforcement to prevent damage from shrinking and swelling. Reshaping of the landscape by cutting and filling is common on tracts planned for medium and high density urban developments. If the limestone bedrock is exposed or shallow because of reshaping, constructing underground utilities and reestablishing plant cover on the shallow soil is difficult. Seepage zones are common during wet seasons near bedrock at the base of some cuts. Providing adequate base material for local roads and streets and proper drainage with side ditches and culverts are needed to prevent damage caused by low strength and frost action. Cutting and filling may be needed where slopes are steep. Detailed onsite investigation is needed in areas being considered for medium or high density developments.

This complex is in capability subclass IIIe.

17F—Crider-Menfro silt loams, 14 to 30 percent slopes. This complex consists of moderately steep and steep, well drained Menfro and Crider soils. These soils are on the lower part of side slopes in steep, dissected uplands. Individual areas are irregular in shape and range from 20 to 200 acres. This complex is about 45 percent Crider soils and about 35 percent Menfro soils. The Crider and Menfro soils have the same limitations for many uses, and they are so intermingled or in such an intricate pattern that to separate them in mapping was not practical.

Typically, the surface layer of the Crider soil is dark grayish brown silt loam about 1 inch thick. The subsurface layer is yellowish brown silt loam about 4 inches thick. The subsoil is about 55 inches thick. It is brown and yellowish red, firm silty clay loam and silty clay. In a few areas, the surface layer is brown silty clay loam, because cultivation has mixed the upper part of the subsoil with the surface soil.

Typically, the surface layer of the Menfro soil is dark grayish brown silt loam about 4 inches thick. The subsurface layer is brown silt loam about 3 inches thick. The subsoil is about 38 inches thick. It is yellowish brown silty clay loam with light brownish gray silt coatings on faces of peds. The substratum to a depth of about 60 inches is strong brown silt loam. In a few places, the surface layer is brown silty clay loam, because cultivation has mixed the upper part of the subsoil with the surface soil. Also in some areas, depth to bedrock is 30 to 60 inches.

Included with this complex in mapping and making up about 15 percent of mapped areas are areas of shallow Gasconade soils and Rock outcrop. The Rock outcrop makes up less than 10 percent of most mapped areas. The Gasconade soils and Rock outcrop are primarily on south- and west-facing slopes.

Permeability is moderate, and surface runoff is very rapid. Available water capacity is high. The natural fertility and organic matter content are moderately low. The surface layer is friable in most areas.

Areas of this complex are primarily in woods; poor quality second growth stands are in formerly cleared areas. A few areas are in pasture. The areas are generally not suitable for cultivated crops because of steep slopes, Rock outcrop, and the severe erosion hazard. Proper stocking rates, pasture rotation, and restricted use during wet periods help keep the pasture and soil in good condition and help prevent paths, up and down the slope, from eroding into ditches. Areas of this complex are suited to shade and ornamental trees, shrubs and vines, and lawn grasses. Mowing is relatively difficult on the slopes.

Soils in this complex are generally not suitable for most recreation uses because of the steep slopes. The forested parts are suitable for natural areas and hiking trails.

This complex occupies landscape that generally has high esthetic value for low density urban development. It is suitable for this type of development, but a mechanically aided aeration septic system is needed because of the steep slopes. Land shaping may be necessary because of the steep slope. Proper design of structures and extra reinforcement in footings, foundations, and basement walls are necessary to prevent damage caused by shrinking and swelling. Tile drains around footings and foundations that are close to bedrock help to overcome excessive wetness. Construction of medium and high density urban developments nearly always requires earthmoving and reshaping of the land. Piers or wider than normal footings help provide additional support for buildings and compensate for low strength in fill areas. Providing adequate base material for local roads and streets and proper drainage with side ditches and culverts help prevent damage caused by low strength and frost action. Slopes may require cutting and filling in areas. Detailed onsite soil and geologic investigations are needed in areas being considered for building sites.

This complex is in capability subclass VIe.

18A—Urban land-Harvester complex, 0 to 2 percent slopes. This complex consists of Urban land and the intermingled areas of nearly level, moderately well drained Harvester soils. It is on broad upland divides in the city of St. Louis and in the eastern and northern parts of St. Louis County. Individual areas are irregular in shape and range from about 30 to 900 acres. They are about 65 percent Urban land and 30 percent Harvester soils. The Urban land and Harvester soils are so intermingled or in such an intricate pattern that to separate them in mapping was not practical.

The Urban land part of this complex is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification of the series is not feasible.

Typically, the surface layer of the Harvester soil is brown silt loam about 4 inches thick. The next layer, to a depth of about 37 inches, consists of multicolored silt loam and silty clay loam fill material that contains fragments of bricks, glass, cinders, and other manmade materials. Below the reworked fill material to a depth of about 60 inches is the lower part of a buried soil. It is dark yellowish brown, mottled, firm silty clay loam. In places, the fill material is more than 40 inches thick, or part or all of the original soil has been removed during land shaping, or the surface layer is silty clay loam, or one or more soil layers contain more than 20 percent coarse fragments.

Included with this complex in mapping and making up about 5 percent of mapped areas are small areas of well drained Menfro soils, moderately well drained Winfield soils, and somewhat poorly drained Iva soils. These soils are in parks, playgrounds, and a few open spaces between buildings.

The Urban land is impervious to water. Permeability is moderately slow in the Harvester soils. Surface runoff is slow in this complex. The natural fertility is medium, and organic matter content is very low. The surface layer of the Harvester soils is friable.

The Harvester soil in this complex is in yards, open spaces between buildings, parks, playgrounds, gardens, and undeveloped random tracts. Recreation uses are suitable if they can be adapted to the limited size and shape of the open spaces. Permeability is a moderate limitation for camp and picnic areas and playgrounds. Good surface drainage is needed, and areas of heavy foot traffic need resurfacing with suitable material.

The Harvester soils are suitable for building sites. Proper design of structures and extra reinforcement in footings, foundations, and basement walls are necessary to prevent damage caused by shrinking and swelling. Drain tile around footings and foundations helps overcome excessive wetness. Community sewers are the chief means for the disposal of waste. Adequate base material for local roads and streets and proper drainage with side ditches and culverts, or tile drains and storm sewers, are needed to prevent damage caused by low strength and frost action.

This complex is not assigned to a capability subclass.

18C—Urban land-Harvester complex, 2 to 9 percent slopes. This complex consists of Urban land and the intermingled areas of gently sloping and moderately sloping, moderately well drained Harvester soils. It is on ridgetops and side slopes on uplands. Individual areas are irregular in shape and range from about 20 to 400 acres. They are about 65 percent Urban land and 30 percent Harvester soils. The Urban land and Harvester soils are so intermingled or in such an intricate pattern that to separate them in mapping was not practical.

The Urban land part of this complex is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification of the series is not feasible.

Typically, the surface layer of the Harvester soil is very dark grayish brown silt loam about 4 inches thick. The next layer, to a depth of about 25 inches, consists of multicolored silt loam and silty clay loam fill material that contains cinders. Below the reworked fill material to a depth of about 60 inches is a buried soil. It is brown and pale brown silt loam in the upper part and yellowish brown and dark yellowish brown, firm silty clay loam in the lower part. In places, the fill material is more than 40 inches thick. Also in places, part or all of the original soil has been removed during land shaping, or the surface layer is silty clay loam, or the fill material contains more than 20 percent fragments of manmade materials.

Included with this complex in mapping and making up about 5 percent of mapped areas are small areas of well drained Menfro soils, moderately well drained Winfield soils, and somewhat poorly drained Iva soils in parks, playgrounds, and a few open spaces between buildings.

The Urban land is impervious to water. Permeability is moderately slow in the Harvester soils. Surface runoff is rapid in the complex. The natural fertility is medium, and organic matter content is very low. The surface layer of the Harvester soils is friable.

The Harvester soils in this complex are in yards, open spaces between buildings, parks, playgrounds, gardens, and undeveloped random tracts (fig. 6). Recreation uses are suitable if they can be adapted to the limited size and shape of the open spaces and to the slope. Permeability is a moderate limitation for camp and picnic areas. Good surface drainage is needed, and areas of heavy foot traffic need resurfacing with suitable material.

The Harvester soils are suitable for building sites. Proper design of structures and extra reinforcement in footings, foundations, and basement walls are necessary to prevent damage caused by shrinking and swelling. Drain tile around footings and foundations helps overcome excessive wetness. Community sewers are the chief means for the disposal of waste. Adequate base material for local roads and streets and proper drainage with side ditches and culverts, or tile drains and storm sewers, are needed to prevent damage caused by low strength and frost action. Detailed onsite investigation is needed in areas where site preparation requires cuts of several feet.

This complex is not assigned to a capability subclass.

18D—Urban land-Harvester complex, 9 to 20 percent slopes. This complex consists of Urban land and the intermingled areas of strongly sloping and moderately steep, moderately well drained Harvester soils. It is on uplands on the side slopes of valleys. Individual areas are irregular in shape and range from about 10 to 120 acres. They are about 50 to 60 percent Urban land and 20 to 30 percent Harvester soils. The Urban land and Harvester soils are so intermingled or in such an intricate pattern that to separate them in mapping was not practical.

The Urban land part of this complex is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification of the series is not feasible.

Typically, the surface layer of the Harvester soil is dark brown silt loam about 3 inches thick. The next layer, to a depth of about 33 inches, consists of multicolored silt loam, silty clay loam, and clay fill material that contains

Figure 6.—Construction on Urban land-Harvester complex, 2 to 9 percent slopes. Mound in right foreground indicates the amount of cutting at this site.

sandstone fragments in the lower part. Below the reworked fill material to a depth of about 60 inches is a buried soil. It is yellowish brown, firm silt loam in the upper part and brown and dark yellowish brown, firm silty clay loam in the lower part. In places, the fill material is more than 40 inches thick. Also in places, part or all of the original soil has been removed during land shaping, or the surface layer is silty clay loam, or the fill material contains more than 20 percent fragments of manmade materials.

Included with this complex in mapping and making up about 20 percent of mapped areas are small areas of well drained Menfro soils and moderately well drained Winfield soils along drainageways, in parks, and in a few open spaces between buildings. Also included are a few small areas that have chert or bedrock exposed at the surface and a few areas along drainageways that have slope of more than 20 percent.

The Urban land is impervious to water. Permeability is moderately slow in the Harvester soils. Surface runoff is rapid and very rapid in the complex. The natural fertility is medium, and organic matter content is very low. The surface layer of the Harvester soils is friable.

The Harvester soils in this complex are in yards, open spaces between buildings, parks, gardens, and undeveloped tracts primarily adjacent to drainageways. Recreation uses are suitable if they can be adapted to the limited size and shape of the open spaces and to the slope. The slope is a severe limitation. Onsite investigation is needed in areas being considered for recreation uses.

The Harvester soils are suitable for building sites. Proper design of structures and extra reinforcement of footings, foundations, and basement walls are necessary to prevent damage caused by shrinking and swelling.

Dwellings need to be designed to fit the steeper slopes. Drain tile around footings and foundations helps overcome excessive wetness. Community sewers are the chief means for the disposal of waste. Adequate base material for local roads and streets and proper drainage with side ditches and culverts, tile drains, and storm sewers are needed to prevent damage caused by low strength and frost action. Detailed onsite investigation is needed in areas considered for high density development.

This complex is not assigned to a capability subclass.

19C—Urban land-Goss complex, 2 to 9 percent slopes. This complex consists of Urban land and the intermingled areas of gently sloping and moderately sloping, well drained Goss soils. It is on uplands on ridges and the upper part of side slopes. Individual areas are irregular in shape and range from 20 to 80 acres. They are about 55 percent Urban land and 30 percent Goss soils. The Urban land and Goss soils are so intermingled or in such an intricate pattern that to separate them in mapping was not practical.

The Urban land part of the unit is covered by streets, parking lots, buildings, and other structures that obscure or alter the soils.

Typically, the surface layer of the Goss soil is brown silt loam about 11 inches thick. The next layer, about 20 inches thick, is fill material consisting of brown cherty silty clay loam grading downward to yellowish red very cherty silty clay loam. Below the reworked fill material to a depth of 60 inches or more is red and dark red, very firm very cherty clay. In places, the surface layer is cherty silt loam, or to a depth of 20 inches the soil is less than 10 percent chert, or the depth to limestone bedrock is less than 60 inches.

Included with this complex in mapping and making up about 15 percent of mapped areas are areas of noncherty Harvester soils. These soils are primarily in fill areas.

The Urban land is impervious to water. In the Goss soils permeability is moderate, surface runoff is medium, and the natural fertility and available water capacity are low. Also in the Goss soils, organic matter content is very low, and the surface layer is friable.

The Goss soils in this complex are in yards and open spaces between buildings. Lawn grasses, trees, and shrubs grow poorly in areas that have a cherty surface layer, unless the surface is covered with suitable topsoil. Areas that have a silt loam surface layer are suitable for those recreation uses that can be adapted to the limited size and shape of the open spaces and to the moderate slope.

Proper design of structures and extra reinforcement in footings, foundations, and basement walls are necessary to prevent damage caused by shrinking and swelling. Drain tile around footings and foundations help overcome excessive wetness. Community sewers are the chief means of disposal of waste. Adequate base material for local roads and streets and proper drainage with side ditches and culverts, or tile drains and storm sewers, are needed to prevent damage caused by low strength and frost action. Detailed onsite investigation is needed in areas being considered for high density development.

This complex is not assigned to a capability subclass.

19D—Urban land-Goss complex, 9 to 20 percent slopes. This complex consists of Urban land and the intermingled areas of strongly sloping and moderately steep, well drained Goss soils. It is on uplands on the side slopes of valleys. Individual areas are irregular in shape and range from 20 to 50 acres. They are about 50 percent Urban land and 40 percent Goss soils. The Urban land and Goss soils are so intermingled or in such an intricate pattern that to separate them in mapping was not practical.

The Urban land part of the unit is covered by streets, parking lots, buildings, and other structures that obscure or alter the soils.

Typically, the surface layer of the Goss soil is reworked fill material about 15 inches thick. It is brown very cherty silt loam. Next, to a depth of about 35 inches, is yellowish red cherty silty clay. Below this to a depth of about 60 inches is red cherty silty clay. In places, the depth to limestone bedrock is less than 60 inches, or the top 6 to 20 inches of the soil contains less than 10 percent chert, or slope is more than 20 percent.

Included with this complex in mapping and making up about 10 percent of mapped areas are areas of noncherty Harvester soils. These soils are primarily in fill areas.

The Urban land is impervious to water. Permeability is moderate in the Goss soils. Surface runoff is rapid and very rapid in the complex. The natural fertility and available water capacity are low. Organic matter content is very low. The surface layer is friable in most fill areas and firm in most cut areas.

The Goss soils in this complex are in yards and open spaces between buildings. Lawn grasses, trees, and shrubs do not grow well in most areas of this soil because of droughtiness and low fertility. A layer of topsoil spread over the cherty soil is beneficial to lawn grasses and shrubs. Areas of this complex are generally not suitable for most recreation uses because of the cherty surface layer and steep slope.

Proper design of structures and extra reinforcement in footings, foundations, and basement walls are necessary to prevent damage caused by shrinking and swelling. Tile drains around footings and foundations overcome excessive wetness. Community sewers are the chief means of disposal of waste. Cutting and filling in areas of this complex has produced a benched landscape, and left some areas that are relatively shallow to bedrock. The shallow bedrock increases the difficulty and expense of digging basements and installing buried lines and cables. Adequate base material for local roads and streets and proper drainage with side ditches and culverts, or tile drains and storm sewers, are needed to prevent damage caused by low strength and frost action. Cutting and filling is necessary in some areas. Detailed onsite investigation is needed in areas being considered for high density development.

This complex is not assigned to a capability subclass.

20B—Fishpot-Urban land complex, 0 to 5 percent slopes. This complex consists of nearly level and gently sloping, somewhat poorly drained Fishpot soils and intermingled areas of Urban land. It is on flood plain and terrace positions. Most low lying areas of this complex are built up above normal flood level with fill material prior to building construction or other urban uses. However, areas are subject to rare, extensive flooding. Individual areas are generally elongated or symmetrical and range from 10 to more than 200 acres. They are about 50 percent Fishpot soils and 40 percent Urban land. The Fishpot soils and Urban land are so intermingled or in such an intricate pattern that to separate them in mapping was not practical.

Typically, the surface layer of the Fishpot soils is very dark grayish brown, friable silt loam about 1 inch thick. Next, to a depth of about 47 inches, is multicolored silt loam fill material that contains as much as 20 percent fragments of cinders, glass, brick, pebbles, concrete, and metal. Below this to a depth of about 60 inches is a buried soil. It is mottled grayish brown and brown, firm silt loam in the upper part and mottled grayish brown, brown, and dark yellowish brown, friable silt loam in the lower part. In places, part of the fill material or the lower part of the buried soil is silty clay loam. Also in places, one or more soil layers contain more than 20 percent fragments of brick, glass, concrete, and other manmade materials.

The Urban land part of this complex is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification of the series is not feasible.

Included with this complex in mapping and making up about 10 percent of mapped areas are small areas of well drained Haymond soils and moderately well drained Wilbur soils on flood plains and somewhat poorly drained Freeburg soils and well drained Ashton soils on terraces. The Haymond and Wilbur soils occupy narrow strips adjacent to streams and small undeveloped areas. The Freeburg and Ashton soils occupy small undeveloped areas on terrace positions.

Permeability is moderately slow in the Fishpot soil. The Urban land is impervious to water. Surface runoff is medium in this complex. The natural fertility is low to medium, and organic matter content is very low. A perched water table is at a depth of 2 to 5 feet late in winter and early in spring. The surface layer of the Fishpot soils is friable.

The Fishpot soils in this complex are in yards, open spaces between buildings, parks, gardens, and undeveloped random tracts. A detailed onsite investigation is needed in areas considered for recreation uses.

Tracts or lots in areas of this complex are managed as separate entities and mainly range from 1/2 acre to 4 acres. Community sewers are the chief means for disposal of waste. Limitations are severe for building sites because of wetness and flooding. Occasional, short duration flooding can be caused by local surface water, or occasional, long time inundation can result from extensive floods. Some areas of this complex are more suitable than others for lawns, vegetable and flower gardens, or ornamental trees and shrubs because of differences in surface texture and internal drainage. Adequate base material for roads and streets and suitable drainage with side ditches and culverts, or tile drains and storm sewers, are needed to prevent damage caused by low strength and frost action. Previous flooding history and detailed onsite investigation are needed to determine suitability of areas for building development.

This complex is not assigned to a capability subclass.

21B—Winfield-Urban land complex, 2 to 5 percent slopes. This complex consists of gently sloping, moderately well drained Winfield soils and intermingled areas of Urban land. It is on wide ridgetops and the upper part of side slopes. The natural topography in areas has not been altered appreciably by urban development. Individual areas are irregular in shape and range from 25 to 400 acres. They are about 55 percent Winfield soils and 35 percent Urban land. The Winfield soils and Urban land are so intermingled or in such an intricate pattern that to separate them in mapping was not practical.

Typically, the surface layer of the Winfield soils is dark brown silt loam about 5 inches thick. The subsurface layer is yellowish brown silt loam about 5 inches thick. The subsoil is about 50 inches thick. It is dark yellowish brown silty clay loam and is mottled in the lower part. The substratum is brown, mottled silt loam. In places, the upper part of the subsoil has gray mottles. Also in places, 10 inches or less has been removed from the surface or the surface has been covered by as much as 10 inches of fill material, generally from basement excavations.

The Urban land part of the unit is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification of the series is not feasible.

Included with this complex in mapping and making up about 10 percent of mapped areas are small areas of Harvester soils.

Permeability is moderate in the Winfield soils and moderate or moderately slow in the reworked areas. The Urban land is impervious to water. Surface runoff is medium in this complex. The natural fertility is medium, and organic matter content is low. A seasonal water table is at a depth of 2.5 to 4 feet during winter and early in spring. The surface layer of the Winfield soils is friable.

The Winfield soils in this complex are in yards, open spaces between buildings, parks, gardens, and undeveloped random tracts. Recreation uses are suitable if they can be adapted to the limited size and shape of the open spaces. Playgrounds need shaping and leveling in places because of the slope, and paths and trails need resurfacing with suitable material to prevent erosion.

Tracts or lots in areas of this complex are managed as separate entities and mainly range from 1/3 acre to 3 acres. Shrink-swell potential and wetness are moderate limitations for dwellings. Proper design of structures and extra reinforcement in footings, foundations, and basement walls help prevent damage from shrinking and swelling. Drain tile around footings and foundations helps overcome excessive wetness. Community sewers are the common means for disposal of waste. Mechanically aided aeration septic systems with properly constructed mound filter fields are practical in some areas. Adequate base material for local roads and streets and proper drainage with side ditches and culverts, or tile drains and storm sewers, are needed to prevent damage caused by low strength and frost action.

This complex is not assigned to a capability subclass.

21C—Winfield-Urban land complex, 5 to 9 percent slopes. This complex consists of moderately sloping, moderately well drained Winfield soils and intermingled areas of Urban land. It is on ridgetops and side slopes. The natural topography has not been altered appreciably by urban development. Individual areas are irregular in shape and range from 25 to 400 acres. They are about 55 percent Winfield soils and 35 percent Urban land. The Winfield soils and Urban land are so intermingled or in such an intricate pattern that to separate them in mapping was not practical.

Typically, the surface layer of the Winfield soil is very dark grayish brown silt loam about 4 inches thick. The subsurface layer is yellowish brown silt loam about 7 inches thick. The subsoil is about 36 inches thick. It is yellowish brown and dark yellowish brown silty clay loam and is mottled in the lower part. The substratum is dark yellowish brown, mottled silt loam. In places the lower part of the subsoil does not have gray mottles. Also in places, 10 inches or less of the surface has been removed, or the soil has been covered with as much as 10 inches of fill material, generally from basement excavations.

The Urban land part of this complex is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soil that identification of the series is not feasible.

Included with this complex in mapping and making up about 10 percent of mapped areas are small areas of Harvester soils.

Permeability is moderate in the Winfield soils and moderate to moderately slow in the reworked areas. The Urban land is impervious to water. Surface runoff is rapid in this complex. The natural fertility is medium, and organic matter content is low. A seasonal water table is at a depth of 2.5 to 4 feet during winter and early in spring. The surface layer of the Winfield soils is friable.

The Winfield soils in this complex are in yards, open spaces between buildings, parks, gardens, and undeveloped random tracts. Recreation uses are suited if they can be adapted to the limited size and shape of the open spaces and to the slope. Camp and picnic areas have only slight limitations.

Tracts or lots in areas of this complex are managed as separate entities and mainly range from 1/3 acre to 3 acres. Proper design of structures and extra reinforcement in footings, foundations, and basement walls are needed to prevent damage caused by shrinking and swelling. Drain tile around footings and foundations helps overcome excessive wetness. Community sewers are common means for disposal of sewage. Mechanically aided aeration septic systems with a properly constructed mound filter field are practical in some areas. Adequate base material for local roads and streets and proper drainage with side ditches and culverts, or tile drains and storm sewers, are needed to prevent damage caused by low strength and frost action.

This complex is not assigned to a capability subclass.

21D—Winfield-Urban land complex, 9 to 20 percent slopes. This complex consists of strongly sloping and moderately steep, moderately well drained soils and intermingled areas of Urban land. It is on the side slopes of small drainageways. The natural topography has not been altered appreciably by urban development. Individual areas are irregular in shape and range from 15 to 100 acres. They are about 50 percent Winfield soils and 35 percent Urban land. The Winfield soils and Urban land are so intermingled or in such an intricate pattern that to separate them in mapping was not practical.

Typically, the surface layer of the Winfield soil is brown silt loam about 5 inches thick. The subsurface layer is yellowish brown silt loam about 8 inches thick. The subsoil is about 35 inches thick. It is brown and strong brown silt loam and silty clay loam that is mottled in the lower part. The substratum is brown and strong brown, mottled silt loam. In places, the lower part of the subsoil does not have gray mottles. Also in places, 10 inches or less of the surface has been removed, or the soil has been covered with as much as 10 inches of fill material, generally from basement excavations.

The Urban land part of this complex is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soil that identification of the series is not feasible.

Included with this complex in mapping and making up about 15 percent of mapped areas are small areas of Harvester soils.

Permeability is moderate in the Winfield soils and moderate to moderately slow in the reworked areas. The

Urban land is impervious to water. Surface runoff is rapid in the complex. The natural fertility is medium, and organic matter content is low. A seasonal water table is at a depth of 2.5 to 4 feet during winter and early in spring. The surface layer of the Winfield soils is friable.

The Winfield soils in this complex are in yards, open spaces between buildings, parks, gardens, and undeveloped random tracts. Recreation uses are suitable if they can be adapted to the limited size and shape of the open spaces and to the slope. Onsite investigation is needed in areas that are considered for recreation uses.

Tracts or lots in areas of this complex are managed as separate entities and mainly range from 1/2 acre to 5 acres. Proper design of structures and extra reinforcement in footings, foundations, and basement walls are needed to prevent damage from shrinking and swelling. Drain tile around footings and foundations helps overcome excessive wetness. Land shaping is needed in some areas because of slope. Community sewers, if available, are better suited than septic tanks for the disposal of waste because of wetness and slope. Adequate base material for local roads and streets and proper drainage with side ditches and culverts, or tile drains and storm sewers, are needed to prevent damage caused by low strength and frost action. Detailed onsite investigations are needed in areas being considered for high density building development.

This complex is not assigned to a capability subclass.

22A—Iva-Urban land complex, 1 to 3 percent slopes. This complex consists of gently sloping, somewhat poorly drained Iva soils and intermingled areas of Urban land. It is on wide upland divides. The natural topography has not been altered appreciably by urban development. Individual areas are irregular in shape and range from about 25 to 150 acres. They are about 55 percent Iva soils and 35 percent Urban land. The Iva soils and Urban land are so intermingled or in such an intricate pattern that to separate them in mapping was not practical.

Typically, the surface layer of the Iva soil is dark grayish brown silt loam about 9 inches thick. The subsurface layer is brown silt loam about 4 inches thick. The subsoil is silty clay loam about 42 inches thick. It is grayish brown in the upper part; mottled grayish brown and yellowish brown in the next part; and multicolored in the lower part. The substratum is multicolored silt loam to a depth of about 60 inches. In places, the upper part of the subsoil does not have gray mottles. Also in places, 10 inches or less of the surface has been removed, or the soil has been covered with as much as 10 inches of fill material, generally from basement excavations.

The Urban land part of this complex is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification of the series is not feasible.

Included with this complex in mapping and making up about 10 percent of mapped areas are small areas of Harvester soils.

Permeability is moderate in the Iva soils and moderate to slow in the reworked areas. The Urban land is impervious to water. Surface runoff is medium in this complex. The natural fertility is low, and organic matter content is low. A perched water table is at a depth of 1 foot to 3 feet late in winter and early in spring. The surface layer of the Iva soils is friable.

The Iva soils in this complex are in yards, open spaces between buildings, parks, gardens, and undeveloped random tracts. Most recreation uses are generally not suited because of wetness and the limited size and shape of open spaces. Onsite investigation is needed in areas considered for recreation uses.

Tracts or lots in areas of this complex are managed as separate entities and mainly range from 1/3 acre to 3 acres. Reshaping areas for better surface drainage and installing drain tile around footings and foundations help overcome excessive wetness. Community sewers are generally used for the disposal of waste, or mechanically aided aeration systems with a properly built up mound absorption field may be needed because of the wetness. Providing adequate base material for roads and streets and proper drainage with side ditches and culverts, or tile drains and storm sewers, help prevent damage caused by low strength, frost action, and wetness.

This complex is not assigned to a capability subclass.

23B—Menfro-Urban land complex, 2 to 5 percent slopes. This complex consists of gently sloping, well drained Menfro soils and intermingled areas of Urban land. It is on wide ridgetops and the upper part of side slopes. The natural topography has not been altered appreciably by urban development. Individual areas are irregular in shape and range from 25 to 250 acres. They are about 55 percent Menfro soils and 35 percent Urban land. The Menfro soils and Urban land are so intermingled or in such an intricate pattern that to separate them in mapping was not practical.

Typically, the surface layer of the Menfro soil is dark grayish brown silt loam about 3 inches thick. The subsurface layer is yellowish brown silt loam about 8 inches thick. The subsoil is about 32 inches thick. It is dark yellowish brown silt loam and silty clay loam and has light gray silt coatings on the surfaces of peds. The substratum to a depth of about 60 inches is brown silt loam. In places, the lower part of the subsoil has light brownish gray mottles. Also in places, 10 inches or less of the surface has been removed, or the soil has been covered with as much as 10 inches of fill material, generally from basement excavations.

The Urban land part of this complex is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification of the series is not feasible.

Included with this complex in mapping and making up about 10 percent of mapped areas are small areas of Harvester soils.

Permeability is moderate in the Menfro soils and moderate to moderately slow in the reworked areas. The Urban land is impervious to water. Surface runoff is medium in this complex. The natural fertility is medium, and organic matter content is low. The surface layer of the Menfro soils is friable.

The Menfro soils in this complex are in yards, open spaces between buildings, parks, gardens, and undeveloped random tracts. Recreation uses are suitable if they can be adapted to the limited size and shape of the open spaces. In places, paths and trails need resurfacing with suitable material to prevent erosion.

Tracts or lots in areas of this complex are managed as separate entities and mainly range from 1/3 acre to 3 acres. Proper design of structures and extra reinforcement in footings, foundations, and basement walls are needed to prevent damage caused by shrinking and swelling. Drain tile around footings and foundations help overcome excessive wetness. Community sewers are the chief means for disposal of waste. Septic tank systems can be used if sufficient area exists for a filter field. Adequate base material for local roads and streets and proper drainage with side ditches and culverts, or tile drains and storm sewers, are needed to prevent damage caused by low strength and frost action.

This complex is not assigned to a capability subclass.

23C—Menfro-Urban land complex, 5 to 9 percent slopes. This complex consists of moderately sloping, well drained Menfro soils and intermingled areas of Urban land. It is on ridgetops and side slopes. The natural topography has not been altered appreciably by urban development. Individual areas are irregular in shape and range from 25 to 400 acres. They are about 55 percent Menfro soils and 35 percent Urban land. The Menfro soils and Urban land are so intermingled or in such an intricate pattern that to separate them in mapping was not practical.

Typically, the surface layer of the Menfro soil is dark yellowish brown silt loam about 6 inches thick. The subsurface layer is dark yellowish brown silt loam about 9 inches thick. The subsoil is dark yellowish brown silty clay loam about 33 inches thick. The substratum to a depth of about 60 inches is dark yellowish brown silt loam. In places, the lower part of the subsoil has light brownish gray mottles. Also in places, 10 inches or less of the surface has been removed, or the soil has been covered with as much as 10 inches of fill material, generally from basement excavations.

The Urban land part of this complex is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification of the series is not feasible.

Included with this complex in mapping and making up 10 percent of mapped areas are small areas of Harvester soils.

Permeability is moderate in the Menfro soils and moderate to moderately slow in the reworked areas. The Urban land is impervious to water. Surface runoff is medium in this complex. The natural fertility is medium, and organic matter content is moderately low. The surface layer of the Menfro soils is friable.

The Menfro soils in this complex are in yards, open spaces between buildings, parks, gardens, and undeveloped random tracts. Recreation uses are suitable if they can be adapted to the limited size and shape of the open spaces and to the slope. Camp and picnic areas have only slight limitations.

Tracts or lots in areas of this complex are managed as separate entities and mainly range from 1/3 acre to 3 acres. Shrink-swell potential is moderate for dwellings. Proper design of structures and extra reinforcement in footings, foundations, and basement walls are needed to prevent damage caused by shrinking and swelling. Drain tile around footings and foundations helps overcome excessive wetness. Community sewers are the chief means for disposal of waste, but septic tank systems can be used if sufficient area exists for a filter field. Adequate base material for local roads and streets and proper drainage with side ditches and culverts, or tile drains and storm sewers, are needed to prevent damage caused by low strength and frost action.

This complex is not assigned to a capability subclass.

23D—Menfro-Urban land complex, 9 to 20 percent slopes. This complex consists of strongly sloping and moderately steep, moderately well drained Menfro soils and intermingled areas of Urban land. It is on the side slopes of small drainageways. The natural topography has not been altered appreciably by urban development. Individual areas are irregular in shape and range from 15 to 100 acres. They are about 50 percent Menfro soils and 35 percent Urban land. The Menfro soils and Urban land are so intermingled or in such an intricate pattern that to separate them in mapping was not practial.

Typically, the surface layer of the Menfro soil is brown silt loam about 5 inches thick. The subsurface layer is dark yellowish brown silt loam about 3 inches thick. The subsoil is about 34 inches thick. It is brown silty clay loam and has a few light brownish gray silt coatings on surfaces of peds in the upper part. The substratum to a depth of about 60 inches is brown silt loam and has a few pale brown mottles. In places, the lower part of the subsoil has light brownish gray mottles. Also in places, 10 inches or less of the surface has been removed, or the soil has been covered with as much as 10 inches of fill material, generally from basement excavations.

The Urban land part of this complex is covered by streets, parking lots, buildings, and other structures that obscure or so alter the soils that identification of the series is not feasible.

Included with this complex in mapping and making up about 15 percent of mapped areas are small areas of Harvester soils.

Permeability is moderate in the Menfro soils and moderate to moderately slow in the reworked areas. The Urban land is impervious to water. Surface runoff is rapid in this complex. The natural fertility is medium, and organic matter content is low. The surface layer of the Menfro soil is friable.

The Menfro soils in this complex are in yards, open spaces between buildings, parks, gardens, and undeveloped random tracts. Recreation uses are suitable if they can be adapted to the limited size and shape of the open spaces and to the slope. Onsite investigation is needed in areas being considered for recreation uses.

Tracts or lots in this complex are managed as separate entities and mainly range from 1/2 acre to 5 acres. Land shaping is necessary in some areas because of slope. Proper design of structures and extra reinforcement in footings, foundations, and basement walls are needed to prevent damage caused by shrinking and swelling. Drain tiles around footings and foundations help overcome excessive wetness. Community sewers are a chief means for disposal of waste. Septic tanks and filter fields should be properly installed on the contour because of steep slopes. Adequate base material for local roads and streets and proper drainage with side ditches and culverts, or tile drains and storm sewers, are needed to prevent damage caused by low strength and frost action. Cutting and filling is needed in places, depending on the slope. Detailed onsite investigation is needed in areas being considered for high density development.

This complex is not assigned to a capability subclass.

24—Nevin-Urban land complex. This complex consists of nearly level, somewhat poorly drained Nevin soils and intermingled areas of Urban land. It is in upland basins. Individual areas are irregular in shape and range from 25 to 1,500 acres. Generally, they are about 50 percent Nevin soils and 45 percent Urban land; however, approximately 2,000 acres of this complex, primarily in the city of St. Louis, is more than 60 percent Urban land. The Nevin soils and Urban land are so intermingled or in such an intricate pattern that to separate them in mapping was not practical.

Typically, the surface layer of the Nevin soil is black silt loam about 7 inches thick. The subsurface layer is black silt loam about 9 inches thick. The subsoil is about 20 inches thick. It is mottled dark grayish brown and yellowish brown silty clay loam and silt loam. The substratum to a depth of about 60 inches is light brownish gray silt loam. In places, fill material has been added to improve surface drainage. In some predominantly Urban land areas, an average of 24 inches or more of fill material has been spread over much of the Nevin soils.

The Urban land part of this complex is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification of the series is not feasible.

Included with this complex in mapping and making up about 5 percent of mapped areas are small areas of Harvester soils.

Permeability is moderate in the Nevin soils. The Urban land is impervious to water. Surface runoff is slow in this complex. The natural fertility is medium, and organic matter content is moderate. A seasonal water table is at a depth of 2 to 4 feet during winter and early in spring. The surface layer of the Nevin soils is friable.

The Nevin soils in this complex are in yards, gardens, crops, parks, playgrounds, and undeveloped random tracts (fig. 7). Generally, most recreation uses are not suitable because of wetness and the limited size and shape of the open spaces.

Tracts or lots in areas of this complex are managed as separate entities and mainly range from 1/8 to 1/2 acre. Reshaping the surface for better surface drainage and installing drain tile around footings and foundations help overcome excesssive wetness. Proper design of structures and extra reinforcement in footings, foundations, and basement walls are needed to prevent damage caused by shrinking and swelling. Community sewers are the chief means of waste disposal because of wetness. Adequate base material for local roads and streets and proper drainage with side ditches and culverts, or tile drains and storm sewers, are needed to prevent damage caused by low strength and frost action.

This complex is not assigned to a capability subclass.

27—Pits, sand and gravel. This map unit consists of areas on flood plains of the Missouri and Meramec Rivers that are or were used for mining sand and gravel. It also includes a few fire clay mines on uplands. These areas generally consist of the mine pits, stockpiles of sand and gravel, piles of overburden or spoil, equipment areas, and transport roads. They range from 40 to about 300 acres.

The areas around some pits support vegetation, primarily hardwood trees, annual weeds, and perennial grasses.

Many of the pits contain water. Areas are quite variable in composition, and because of this the identification of soils and soil-like materials is not practical. A detailed onsite investigation is needed to determine the optimum or suitable use of areas.

This map unit is not assigned to a capability subclass.

28—Pits, quarry. This map unit consists of areas on the uplands that are or were used for quarrying limestone. It also includes one quartz sand quarry. These areas generally consist of the quarry pits, stockpiles of lime and crushed rock, piles of overburden or spoil, equipment areas, and transport roads. They range from 40 to about 200 acres.

A small amount of soil material in these areas supports vegetation, primarily small hardwoods, annual weeds, and perennial grasses.

The active quarry pits are dry, but most of the abandoned pits contain water. Areas are quite variable in

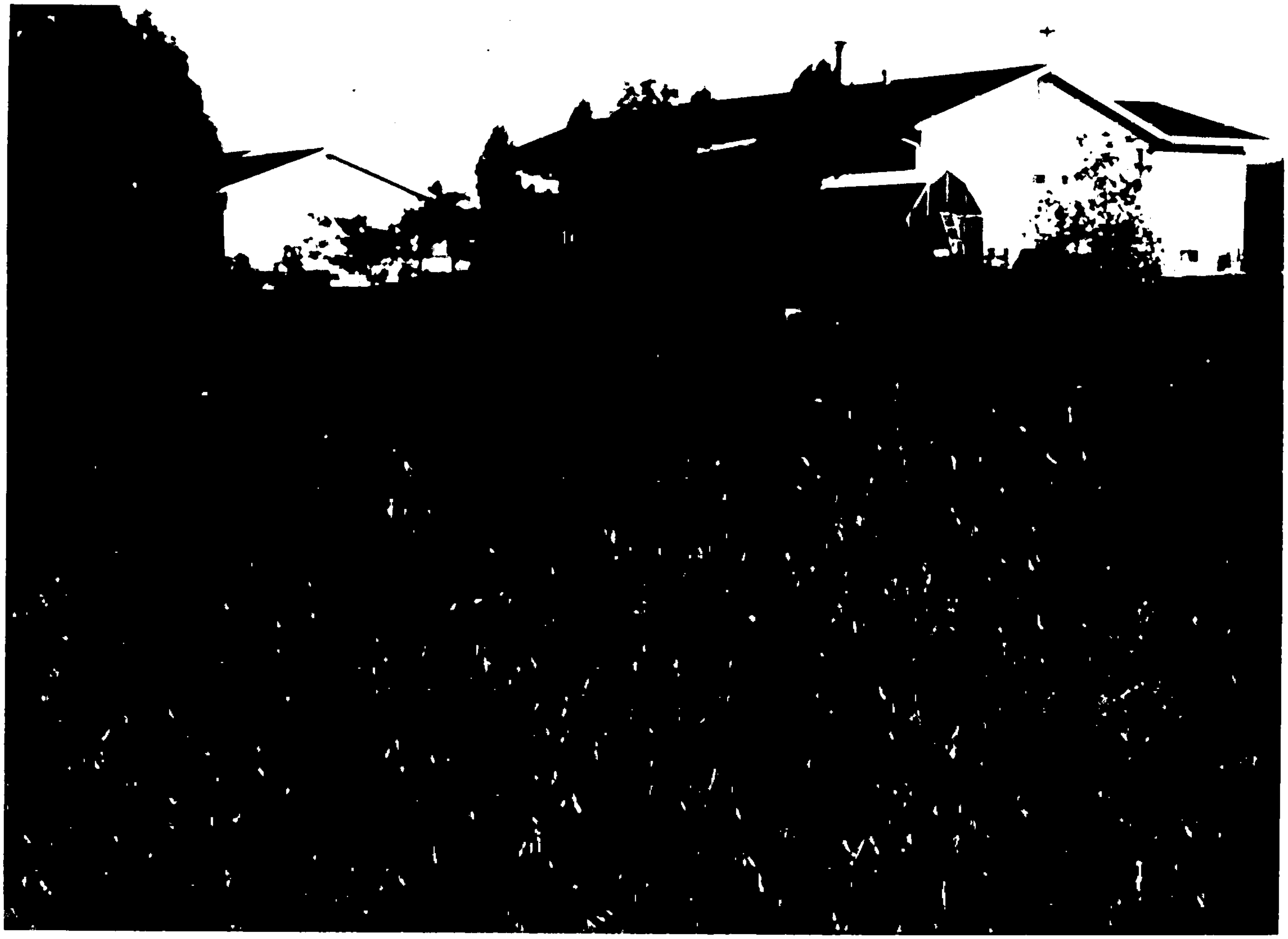

Figure 7.—Urban development and soybeans on Nevin-Urban land complex. Soil material excavated from basements is spread on the surface around houses to improve drainage.

composition, and because of this it is not practical to identify the soils and soil-like materials in this unit. A detailed onsite investigation is needed to determine the optimum or suitable use of areas.

This map unit is not assigned to a capability subclass.

29—Dumps-Orthents complex. This complex consists of solid-waste landfills in St. Louis County. Generally, part of the landfill is currently being used, and the associated completed sections have been covered by silty soil material. Individual areas range from 20 to about 100 acres.

The dumps, or active part of the complex, consist of layers of combustible and noncombustible solid waste separated by layers of soil material. The layers consist of 1 foot of soil material for each 2 feet of solid waste.

The Orthents, or completed parts of the complex, have about 4 feet of soil material over the layered solid waste. Normally, the Orthents are seeded to vegetation as soon as the landfill is completed. They are suitable for most kinds of vegetation. They can be used as greenbelt and recreational areas, such as parks and golf courses.

This map unit is not assigned to a capability subclass.

31—Elsah silt loam. This nearly level and gently sloping, somewhat excessively drained soil is in small stream bottoms and in places adjacent to the channel of larger streams. This soil is frequently flooded. Individual areas are long and narrow and range from 5 to 60 acres.

Typically, the surface layer is dark brown, friable silt loam about 7 inches thick. The substratum is brown, friable very cherty silt loam and friable very cherty loam to a depth of about 60 inches. In places, the surface layer is cherty silt loam.

Included with this soil in mapping are small areas of Wilbur soils and Haymond soils. The Haymond soils are well drained, nearly free of chert, and adjacent to the stream channel. The Wilbur soils are moderately well drained and generally adjacent to the upland or terrace soils. The included soils make up about 15 percent of mapped areas.

Permeability is moderately rapid, and surface runoff is slow or medium. The organic matter content is low, and natural fertility is medium. Available water capacity is low. The surface layer is friable and is easily tilled through a fairly wide range of soil moisture.

Most areas of this soil are in woodland, pastureland, or are idle. Areas are suited to grasses and legumes for pasture. Proper stocking rates, pasture rotation, and restricted use during wet periods help keep the pasture and soil in good condition.

This Elsah soil is suitable for limited recreation uses, such as paths, trails, and picnic areas. It is not suitable for permanent facilities because of the probability of frequent flooding. Onsite investigation is needed to locate areas that have the least probability of flooding.

This soil is generally not suitable for building sites because of frequent flooding. Levees reduce but do not completely eliminate the flood hazard.

This soil is in capability subclass IIs.

32—Haymond silt loam. This nearly level, well drained soil is in small stream bottoms and adjacent to the channel of larger streams. This soil is frequently flooded. Individual areas are long and narrow and range from 10 to 150 acres.

Typically, the surface layer is brown, very friable silt loam about 5 inches thick. The substratum to a depth of about 52 inches is brown, friable silt loam, and below that to 60 inches or more, it is mottled brown, yellowish brown, and gray, friable silt loam. In a few places, the surface layer is dark brown. Also in places, the upper part of the substratum is dark brown or very dark grayish brown.

Included with this soil in mapping are small areas of Elsah soils and Wilbur soils. The Elsah soils are somewhat excessively drained, cherty or very cherty to a depth of 60 inches, and adjacent to the stream channels. The Wilbur soils are moderately well drained and, in most places, adjacent to upland or terrace soils. The included soils make up about 15 percent of mapped areas.

Permeability is moderate, and surface runoff is very slow. The organic matter content is moderate, and natural fertility is medium. Available water capacity is very high. The surface layer is friable and is easily tilled through a fairly wide range of soil moisture.

Most areas of this soil are in cropland or pastureland. A small acreage is in trees. Areas are generally not suitable for crops that are easily damaged by floodwater. Proper stocking rates, pasture rotation, and restricted use during wet periods help keep the pasture and soil in good condition.

This Haymond soil is suited to trees. Most species grow well, including black walnut. Plant competition is a moderate limitation. Seedling survival can be improved by careful and thorough site preparation. This may include prescribed burning, spraying, or cutting.

This soil is suitable for limited recreation uses, such as paths, trails, and picnic areas. It is not suitable for permanent facilities because of the probability of frequent flooding. Onsite investigation is needed to locate areas that have the least probability of flooding.

This soil is generally not suitable for building sites because of frequent flooding. Levees reduce but do not completely eliminate the flood hazard.

This soil is in capability subclass IIw.

33—Wilbur silt loam. This nearly level, moderately well drained soil is in small stream bottoms and adjacent to the channel of larger streams. This soil is frequently flooded. Individual areas are long and narrow and range from 10 to 150 acres.

Typically, the surface layer is dark grayish brown and brown, very friable silt loam about 6 inches thick. The substratum to a depth of about 60 inches is brown and grayish brown silt loam with gray and dark brown mottles. In a few places, the upper part of the substratum does not have gray mottles. Also in a few places, the surface layer is dark brown or very dark grayish brown.

Included with this soil in mapping are small areas of Elsah soils and Haymond soils adjacent to the stream channel. The Elsah soils are somewhat excessively drained and cherty or very cherty to a depth of about 60 inches. The Haymond soils are well drained. The included soils make up about 15 percent of mapped areas.

Permeability is moderate, and surface runoff is slow. The organic matter content is moderate, and natural fertility is low. Available water capacity is very high. A seasonal high water table is at a depth of 3 feet or more during winter and in spring. The surface layer is friable and is easily tilled through a fairly wide range of soil moisture.

Most areas of this soil are in cropland or pastureland. A small acreage is in trees. Areas are generally not suitable for crops that are easily damaged by floodwater. Proper stocking rates, pasture rotation, and restricted use during wet periods help keep the pasture and soil in good condition.

This Wilbur soil is suited to trees. Many species grow well, including black walnut. Plant competition is a moderate limitation. Seedling survival can be improved by careful and thorough site preparation. This may include prescribed burning, spraying, or cutting.

This soil is generally not suitable for recreation uses because of frequent flooding and a high water table late in winter and early in spring.

This soil is generally not suitable for building sites and the onsite disposal of waste because of frequent flooding. Levees reduce but do not completely eliminate the flood hazard.

This soil is in capability subclass IIw.

40—Eudora silt loam. This nearly level, well drained soil is on natural levees adjacent to abandoned stream channels on the Missouri River flood plain. Individual areas are generally elongated and range from 20 to 300 acres. This soil is protected by levees, but it is subject to inundation by rare floods of intermediate regional or standard project dimensions.

Typically, the surface layer is very dark grayish brown, friable silt loam about 12 inches thick. The substratum to a depth of about 60 inches is stratified brown and dark grayish brown silt loam and very fine sandy loam in the upper part and stratified, multicolored, silty clay, clay, very fine sandy loam and loam in the lower part. In places, the surface layer, to a depth of 10 inches or less, is clay loam or silty clay loam.

Included with this soil in mapping are areas of somewhat poorly drained Blake soils in depressions and small channels. Also included are narrow strips of soils that have strata of loamy sand, 4 to 10 inches thick, to a depth of 40 inches. The included soils make up about 15 percent of mapped areas.

Permeability is moderate and surface runoff is slow. The organic matter content is moderate, and natural fertility is medium. The surface layer is friable and is easily tilled through a fairly wide range of soil moisture.

Nearly all areas of this soil are used for cultivated crops. Areas are suited to corn, soybeans, small grain, truck crops, and grasses and legumes. They are very well suited to sod production. Leaving large amounts of residue on cropland helps maintain organic matter content, improve tilth, and increase water infiltration. Proper stocking rates, pasture rotation, and restricted use during wet periods help keep pasture and soil in good condition. Areas are also suited to lawn grasses, shade trees, ornamental trees, shrubs, vines, and vegetable gardens.

This Eudora soil is protected by levees, but previous flooding history should be considered in the design of any building sites and placement of sanitary facilities. Farmsteads are commonly built on areas of this soil, generally at the highest elevation of the local landscape. The elevation is commonly raised a few more feet by constructing the house on a mound of fill material. Detailed onsite investigations are needed to locate suitable building sites.

This soil is in capability class I.

41—Booker clay. This nearly level, very poorly drained soil is in depressional slackwater areas on the Missouri River flood plain. Individual areas are irregular in shape and range from 10 to 120 acres. This soil occupies a lower position on the landscape than do the adjacent soils. Therefore, local surface water commonly covers this soil following heavy rainfall. This soil is protected from most river floods by levees but is subject to inundation by rare floods of intermediate regional or standard project dimensions.

Typically, the surface layer is very dark gray clay about 11 inches thick. The subsoil is dark gray, firm clay about 26 inches thick. The substratum to a depth of about 60 inches is dark gray, firm clay. In places, the surface is covered by 10 inches or less of dark grayish brown or brown silt loam or silty clay loam overwash.

Included with this soil in mapping are areas of somewhat poorly drained Waldron soils in channels and on slightly higher parts of the landscape. The included soils make up 5 to 10 percent of mapped areas.

Permeability and surface runoff are very slow. The organic matter content is moderate, and natural fertility is medium. A water table is at or near the surface during winter and spring. The surface layer is firm and difficult to till through most of the range in soil moisture.

Nearly all areas of this soil are used for cultivated crops, although a few are too wet to plant in some years. Areas are suited to corn, soybeans, and grain sorghum. They are not well suited to alfalfa and wheat, because these crops are commonly damaged by local surface water during wet periods late in winter and early in spring. Leaving large amounts of residue on the soil helps maintain organic matter content, improve tilth, and increase water infiltration. The wetness of this soil restricts kinds of pasture and hay crops that can be grown. Using this soil for pasture is difficult because of the clayey surface and because of wetness during parts of the year. Very restricted use during wet periods, pasture rotation, and proper stocking rates are needed to keep the soil and pasture in good condition.

This soil generally is not suitable for building sites and onsite waste disposal because of rare flooding during levee breaks or because of local runoff and extreme wetness.

This soil is in capability subclass IIIw.

42—Blake silty clay loam. This nearly level, somewhat poorly drained soil is at an intermediate elevation on the Missouri River flood plain. Individual areas are irregular in shape and range from 20 to 800 acres. This soil is protected by levees but is subject to inundation by rare floods of intermediate regional or standard project dimensions.

Typically, the surface layer is very dark grayish brown, friable silty clay loam about 4 inches thick. The subsurface layer is very dark grayish brown, firm silty clay loam about 5 inches thick. The substratum to a depth of about 60 inches is stratified brown, dark grayish brown, and very dark grayish brown, friable silty clay loam, very fine sandy loam, and firm clay. In places, the surface layer to a depth of 10 inches or less is silt loam or very fine sandy loam.

Included with this soil in mapping are areas of more clayey Waldron soils in small channels and depressions. Also included are areas of sandy Eudora soils on narrow ridges in gently undulating bottom land positions. The included soils make up about 15 percent of mapped areas.

Permeability is moderate, and surface runoff is slow. The organic matter content is moderate, and natural fertility is medium. The water table is at a depth of 2 to 4 feet for most of the year. The surface layer is friable or firm and is fairly easy to till through a moderate range of soil moisture.

Nearly all areas of this soil are used for cultivated crops. They are suited to corn, soybeans, truck crops, small grain, and grasses and legumes (fig. 8). Leaving large amounts of crop residue on the surface helps maintain organic matter content, improve tilth, and increase water infiltration. Proper stocking rates, pasture rotation, and restricted use during wet periods help keep the pasture and soil in good condition. Areas are also suited to sod grasses and vegetable gardens.

This soil is protected by levees, but previous flooding history should be considered in the design and placement of buildings and for onsite waste disposal. Detailed onsite investigation is needed to locate areas that are suitable for building sites.

This soil is in capability class I.

43—Waldron silty clay. This nearly level, somewhat poorly drained soil is in old stream channels and depressional areas on the Missouri River flood plain. Individual areas are generally elongated and range from 10 to 150 acres. This soil is protected by levees but is subject to inundation by rare floods of intermediate

Figure 8.—Pumpkins on Blake silty clay loam are an example of truck farming on the Missouri River flood plain.

regional or standard project dimensions. Also, some areas commonly are covered by local surface water following periods of heavy rainfall.

Typically, the surface layer is very dark grayish brown, firm silty clay about 7 inches thick. The substratum to a depth of about 60 inches is dark grayish brown, firm silty clay in the upper part and multicolored, stratified silty clay, silty clay loam, silt loam, and clay in the lower part. In places, the surface layer, to a depth of 10 inches or less, is silty clay loam or silt loam.

Included with this soil in mapping are small slackwater areas of very poorly drained Booker soils and scattered areas of Blake soils on slightly higher positions. The included soils make up about 15 percent of mapped areas.

Permeability and surface runoff are slow. Available water capacity and organic matter content are moderate. The natural fertility is medium. A water table is at a depth of 1 foot to 3 feet during winter and spring. The surface layer is firm and is fairly difficult to till through most of the range of soil moisture.

Nearly all areas of this soil are used for cultivated crops. They are suited to corn, soybeans, and grain sorghum. Areas are not well suited to alfalfa and wheat, because in places these crops are commonly damaged by local surface water during wet periods late in winter and early in spring. Leaving large amounts of crop residue on the surface helps maintain organic matter content, improve tilth, and increase water infiltration. The suitability of this soil for pasture is limited because of the clayey surface texture and the wetness during part of the year. Very restricted use during wet periods, along with pasture rotation and proper stocking rates, is necessary to keep the soil and pasture in good condition.

This soil is protected by levees, but previous flooding history should be considered in the design and placement of buildings and onsite waste disposal. Detailed onsite investigation is needed to locate areas that are suitable for building sites.

This soil is in capability subclass IIw.

44—Sarpy loamy fine sand, rarely flooded. This nearly level, excessively drained soil is on high natural levees near the stream channel and downstream from levee breaks. Individual areas are irregular in shape or are elongated. They range from 20 to 100 acres. This soil is protected by levees, but some areas are subject to inundation by rare floods of intermediate regional or standard project dimensions.

Typically, the surface layer is brown, very friable loamy fine sand about 6 inches thick. The substratum to a depth of about 60 inches is brown and yellowish brown, very friable loamy fine sand and loamy very fine sand in the upper part. In the lower part, it is very dark gray loamy fine sand with thin lenses and strata of silty clay. In a few places, lenses of silt loam or loam as much as 6 inches thick are at a depth of more than 30 inches.

Included with this soil in mapping are small areas of well drained Eudora soils. The included soils make up less than 10 percent of mapped areas.

Permeability is rapid, and surface runoff is slow. The organic matter content is very low, and natural fertility is low. The surface layer is very friable and is easily tilled through a wide range of soil moisture.

Most areas of this soil are used for cultivated crops. The areas are suited to wheat and other small grain. They are too droughty for row crops and many summer crops. Leaving large amounts of crop residue on the surface helps maintain organic matter content and increase water holding capability.

This Sarpy soil has only slight limitations for picnic areas, playgrounds, and paths and trails.

This soil is protected by levees, but the previous flooding history should be considered in the design and placement of buildings and onsite waste disposal. Detailed onsite investigation is needed to locate areas that are suitable for building sites.

This soil is in capability subclass IVs.

45—Sarpy loamy fine sand, frequently flooded. This nearly level, excessively drained soil is on high natural levees near the stream channel. Individual areas are irregular in shape and range from 10 to 400 acres. This soil is not protected from flooding. Most areas are frequently flooded, and the rest are occasionally flooded.

Typically, the surface layer is dark grayish brown loamy fine sand about 3 inches thick. The substratum to a depth of about 60 inches is brown stratified fine sand and loamy fine sand.

Included with this soil in mapping are small areas of well drained Eudora soils on old natural levees. The included soils make up less than 10 percent of mapped areas.

Permeability is rapid, and surface runoff is slow. The organic matter content is very low, and natural fertility is low. The surface layer is very friable.

Nearly all areas of this soil are wooded. Areas are generally not suitable for cultivated crops and hay because of droughtiness in summer and the probability of frequent flooding.

This Sarpy soil is generally not suitable for most recreation uses and for building sites and onsite waste disposal because of frequent flooding.

This soil is in capability subclass IVs.

46—Parkville clay. This nearly level, somewhat poorly drained soil is in low areas adjacent to old stream channels on slightly higher positions in the Missouri River flood plain. Individual areas are irregular in shape and range from 10 to 60 acres. This soil is protected by levees but is subject to inundation by rare floods of intermediate regional or standard project dimensions.

Typically, the surface layer is very dark gray, firm clay about 9 inches thick. The subsurface layer is very dark gray, mottled, firm clay about 9 inches thick. The substratum to a depth of about 60 inches is mottled light brownish gray, light yellowish brown, and brown, stratified, friable and very friable very fine sandy loam in the upper part. In the lower part, it is thinly stratified, multicolored, very friable very fine sandy loam and loamy very fine sand. In places, the surface and subsurface layers are silty clay, or the surface layer to a depth of 10 inches or less is silty clay loam.

Included with this soil in mapping are small areas of Waldron soils. The included soils make up less than 5 percent of mapped areas.

Permeability is very slow in the upper part of the profile and moderately rapid in the lower part. Surface runoff is slow. The natural fertility and organic matter content are medium. Commonly, a water table is present at a depth of 1 foot to 2 feet during most of the year. The surface layer is firm and difficult to till through most of the range in soil moisture.

Nearly all areas of this soil are used for cultivated crops. The areas are suited to winter annuals, such as wheat, and to deep-rooted perennials. Corn and soybeans are suited, but lack of soil moisture is a common limitation in summer. Leaving large amounts of crop residue on the surface helps maintain organic matter content, improve tilth, and increase water infiltration. This soil has limited suitability for pasture because of the clayey surface and because of wetness in some areas in winter and early in spring. Very restricted use during wet periods, along with pasture rotation and proper stocking rates, is needed for pasture.

This Parkville soil is generally not suitable for recreation uses because of wetness and the clayey surface texture.

This soil is protected by levees, but previous flooding history should be considered in the design and placement of buildings and onsite waste disposal. Detailed onsite investigation is needed to locate areas that are suitable for building sites.

This soil is in capability subclass IIw.

49—Blake-Eudora-Waldron complex. This complex consists of somewhat poorly drained Blake soils, well drained Eudora soils, and somewhat poorly drained Waldron soils. It is on the flood plain adjacent to the Missouri and Mississippi Rivers. Individual areas are commonly elongated in shape and range from 100 to 2,000 acres. They are about 40 percent Blake soils, 30 percent Eudora soils, and 20 percent Waldron soils. Areas are not protected from flooding; therefore, flooding, in places, ranges from frequent to occasional or rare. The Blake, Eudora, and Waldron soils are so intermingled or in such an intricate pattern that to separate them in mapping was not practical.

Typically, the surface layer of the Blake soil is very dark grayish brown silty clay loam about 9 inches thick. The substratum to a depth of about 66 inches is stratified, brown, dark grayish brown, and very dark grayish brown silty clay loam and very fine sandy loam. In places, the surface layer, to a depth of 10 inches or less, is silt loam or very fine sandy loam.

Typically, the surface layer of the Eudora soil is very dark grayish brown fine sandy loam about 12 inches thick. The substratum to a depth of about 60 inches is stratified, brown and yellowish brown very fine sandy loam.

Typically, the surface layer of the Waldron soil is very dark grayish brown silty clay about 9 inches thick. The substratum to a depth of about 60 inches is stratified, dark grayish brown and brown, firm silty clay, clay loam, and very fine sandy loam.

Included with this complex in mapping are narrow strips of sandy Sarpy soils adjacent to the riverbank in places, and a few areas of clayey Booker soils in the bottom of sloughs. The included soils make up about 10 percent of the mapped areas.

Permeability is moderate in the Eudora and Blake soils and slow in the Waldron soil. Surface runoff is slow. Available water capacity is high in the Blake and Eudora soils and moderate in the Waldron soil. The natural fertility is medium. Organic matter content is low in the Eudora soil and moderate in the Blake and Waldron soils. In areas of these soils, the water table is at a depth of 1 foot to 4 feet during winter and in spring. The surface layer is friable and fairly easy to till in many areas of the complex. In other areas it is firm and fairly difficult to till over a moderately wide range of soil moisture.

Most areas of this complex are in woodland. The rest is used for cultivated crops. The soils are suited to cultivated crops and hayland; however, occasional or frequent flooding can damage crops in most areas in most years. Crop residue management that leaves large amounts of residue on the surface helps maintain organic matter content, improve tilth, and increase water infiltration.

This complex is generally not suited to recreational uses, building sites, and onsite waste disposal because of flooding.

This complex is in capability subclass IIIw.

52A—Freeburg silt loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on stream terraces throughout the county. It is also in old stream valleys in the drainage system of the Meramec River. Individual areas are irregular in shape and range from 10 to 100 acres. Most areas of this soil are subject to occasional floods; in a few areas, floods are rare.

Typically, the surface layer is dark grayish brown, friable silt loam about 7 inches thick. The subsurface layer is pale brown, mottled, friable silt loam about 7 inches thick. The subsoil is about 46 inches thick. It is mottled grayish brown, brown, and yellowish brown, firm silty clay loam. In places, the subsoil is stratified with layers of silt loam, and the upper part of the subsoil does not have grayish brown mottles. In a few places, one layer or more contains 5 to 20 percent chert fragments.

Escarpments or short steep slopes are generally at the lower boundary of areas.

Included with this soil in mapping and making up about 15 percent of mapped areas are small areas of Ashton, Bremer, Elsah, Haymond, and Wilbur soils. The well drained Ashton soils are adjacent to escarpments and short, steep slopes and are on narrow low terraces adjacent to streams. The poorly drained Bremer soils are in a narrow strip adjacent to Gasconade soils on steep uplands. The somewhat excessively drained Elsah soils, well drained Haymond soils, and moderately well drained Wilbur soils occupy narrow, discontinuous strips adjacent to small streams.

Permeability is moderately slow, and surface runoff is slow. The organic matter content and natural fertility are low. Available water capacity is high. A perched water table is at a depth of about 1.5 to 3 feet during winter and spring. The surface layer is friable and is easily tilled through a fairly wide range of soil moisture.

Most areas of this soil are used for cultivated crops or are in pasture. A small acreage is in trees or is idle. The areas are suited to corn, soybeans, small grain, and grasses and legumes. Leaving large amounts of crop residue on the surface helps maintain organic matter content, improve tilth, and increase water infiltration. Proper stocking rates, pasture rotation, and restricted use during wet periods help keep the pasture and soil in good condition. Areas are also suited to vegetable gardens, lawn grasses tolerant of wetness, shade trees, ornamental trees, shrubs, and vines.

This Freeburg soil is suitable for recreation uses. Wetness, slow permeability, and flooding are moderate limitations for picnic areas, playgrounds, and golf fairways. In places, picnic and parking areas need grading to provide better surface drainage, and walkways need resurfacing with suitable material to overcome wetness. Permanent structures should be above flood level or protected from damaging floods.

This soil is generally not suitable for building sites and onsite waste disposal because of occasional flooding. Constructing local roads and streets on raised, well compacted fill material, properly designing side ditches and culverts, and providing adequate base material help prevent damage caused by flooding, low strength, and frost action. Flooding frequency information and detailed onsite investigation are needed to locate areas suitable for building sites.

This soil is in capability subclass IIw.

52B—Freeburg silt loam, 2 to 5 percent slopes. This gently sloping, somewhat poorly drained soil is on stream terraces and terrace rims throughout the county. It is also in stream abandoned valleys in the drainage system of the Meramec River. Individual areas are irregular in shape and range from 10 to 40 acres. Most areas of this soil are subject to occasional floods; in a few areas, floods are rare.

Typically, the surface layer is brown silt loam about 6 inches thick. The subsurface layer is brown silt loam about 8 inches thick. The subsoil is about 22 inches thick. It is brown and pale brown, mottled silty clay loam. The substratum is grayish brown silt loam to a depth of about 60 inches. In many places, the subsoil is stratified with layers of silt loam, and the upper part of the subsoil does not have grayish brown mottles. In a few places, one layer or more contains 5 to 20 percent chert fragments. Escarpments or short slopes of more than 5 percent are commonly at the lower boundary of areas.

Included with this soil in mapping and making up about 15 percent of mapped areas are small areas of Ashton, Bremer, Elsah, Haymond, and Wilbur soils. The well drained Ashton soils are mainly on convex slopes that have good surface drainage. The poorly drained Bremer soils are in narrow strips adjacent to Gasconade soils on steep uplands. The somewhat excessively drained Elsah soils, well drained Haymond soils, and moderately well drained Wilbur soils are in narrow, discontinuous strips adjacent to small streams.

Permeability is moderately slow, and surface runoff is medium. The organic matter content and natural fertility are low. Available water capacity is high. Commonly, a perched water table is at a depth of 1.5 to 3 feet during spring. The surface layer is friable and is easily tilled through a fairly wide range of soil moisture.

Most areas of this soil are used for cultivated crops, are in pasture, or are idle. A small acreage is in trees. The areas are suited to corn, soybeans, small grain, grasses, and legumes. The erosion hazard is moderate for cultivated crops. Minimum tillage and leaving large amounts of crop residue on the surface help decrease erosion, maintain organic matter content, improve tilth, increase water infiltration, and reduce fertility losses. Proper stocking rates, pasture rotation, and restricted use during wet periods help keep the pasture and soil in good condition. Areas are also suited to vegetable gardens, lawn grasses, shade trees, ornamental trees, shrubs, and vines.

This Freeburg soil is suitable for recreation uses. Wetness, slow permeability, flooding, and slope are moderate limitations for picnic areas, playgrounds, and golf fairways. In places, picnic and parking areas need grading to provide better surface drainage, and playgrounds need leveling. Walkways should be resurfaced with suitable material to overcome wetness. Permanent structures need to be located above flood level or protected from damaging floods.

This soil generally is not suitable for building sites and onsite waste disposal because of occasional flooding. Constructing local roads and streets on raised, well compacted fill material, properly designing side ditches and culverts, and providing adequate base material help prevent damage caused by flooding, low strength, and frost action. Flooding frequency information and detailed onsite investigation are needed to locate areas suitable for building sites.

This soil is in capability subclass IIe.

53A—Bremer silt loam, 1 to 3 percent slopes. This gently sloping, poorly drained soil is on stream terraces. It is also in stream valleys in the drainage system of the Meramec River. Individual areas are irregular in shape and range from 10 to 60 acres. Flooding is rare.

Typically, the surface layer is black, firm silt loam about 6 inches thick. The subsurface layer is very dark gray, firm silt loam and silty clay loam about 13 inches thick. The subsoil to a depth of about 47 inches is dark gray and dark grayish brown, mottled, firm silty clay loam. In places, 8 to 15 inches of brown silt loam, recent overwash from adjacent uplands, is on the surface.

Included with this soil in mapping are small areas of somewhat poorly drained Freeburg soils. These soils are on slightly higher positions and are rarely flooded. They make up about 5 percent of mapped areas.

Permeability is moderately slow, and surface runoff is slow. The organic matter content is moderate, and natural fertility is medium. Available water capacity is high. A water table is at a depth of 1 foot to 2 feet during winter and spring. The surface layer is firm but is fairly easy to till through a moderate range of soil moisture.

Most areas of this soil are used for cultivated crops. The rest are mainly in pasture. Areas are suited to corn, soybeans, small grain, and grasses and legumes. Leaving large amounts of crop residue on the surface helps maintain organic matter content, improve tilth, and increase water infiltration. Proper stocking rates, pasture rotation, and restricted use during wet periods help keep the pasture and soil in good condition.

This Bremer soil is suitable for recreation uses; however, wetness is a moderate or severe limitation that is difficult to overcome. This soil is slow to dry after rains. The water table in winter and early in spring is high, and the surface layer is sticky when wet. Generally, the surface of picnic areas and paths and trails need to be covered with suitable material to help prevent stickiness and wetness. Golf fairways should be designed for good surface drainage to overcome wetness.

This soil is generally not suitable for building sites and onsite waste disposal because of rare flooding. Flooding frequency information and detailed onsite investigation are needed to locate areas suitable for building sites.

This soil is in capability subclass IIw.

55A—Ashton silt loam, 0 to 2 percent slopes. This nearly level, well drained soil is on low stream terraces. Individual areas are irregular in shape and range from 10 to 200 acres. This soil is subject to occasional flooding.

Typically, the surface layer is dark brown silt loam about 8 inches thick. The subsoil is brown silt loam about 41 inches thick. The substratum to a depth of about 60 inches is brown silt loam. In many places, the surface layer is dark grayish brown or brown. In a few places, one or more layers and the substratum contain 5 to 20 percent chert fragments. Escarpments or short, steep slopes are generally at the lower boundary of areas of this soil.

Included with this soil in mapping and making up 5 to 15 percent of mapped areas are small areas of Freeburg, Elsah, and Wilbur soils. The somewhat poorly drained Freeburg soils are in narrow strips adjacent to the upland and in depressional areas. The somewhat excessively drained Elsah soils and moderately well drained Wilbur soils occupy narrow discontinuous strips adjacent to small streams.

Permeability is moderate, and surface runoff is slow. The organic matter content is low, and natural fertility is medium. Available water capacity is very high. The surface layer is friable and is easily tilled through a fairly wide range of soil moisture.

Nearly all areas of this soil are used for cultivated crops. The areas are suited to corn, soybeans, small grain, and grasses and legumes (fig. 9). Leaving large amounts of crop residue on the surface helps maintain organic matter content, improve tilth, and increase water infiltration. Proper stocking rates, pasture rotation, and restricted use during wet periods help keep the pasture and soil in good condition. Areas are also well suited to vegetable gardens, lawn grasses, shade and ornamental trees, shrubs, and vines.

This soil is suitable for most recreation uses. It has moderate limitations for playgrounds and golf fairways because of flooding. Previous flooding history can be used to select the most suitable areas.

This Ashton soil is generally not suitable for building sites and onsite waste disposal because of occasional flooding. Flooding frequency information and detailed onsite investigation are needed to locate areas suitable for building sites.

This soil is in capability subclass IIw.

55B—Ashton silt loam, 2 to 5 percent slopes. This gently sloping, well drained soil is on stream terraces and terrace rims. Individual areas are irregular in shape and range from 10 to 60 acres. Most areas are subject to occasional flooding, but in a few areas flooding is rare.

Typically, the surface layer is very dark grayish brown, friable silt loam about 8 inches thick. The subsoil is brown silty clay loam about 34 inches thick. The substratum to a depth of about 60 inches is brown silt loam. In many places, the surface layer is dark grayish brown or brown. In a few places, the lower part of the subsoil and substratum are loam or sandy loam. Also, in a few places, one or more layers and the substratum contain 5 to 20 percent chert fragments. Escarpments or short slopes of more than 5 percent are generally at the lower boundary of areas in the large stream bottoms.

Included with this soil in mapping and making up 10 to 15 percent of mapped areas are small areas of Freeburg, Elsah, and Wilbur soils. The somewhat poorly drained Freeburg soils are in long, narrow, depressional areas. The somewhat excessively drained Elsah soils

Figure 9.—Ashton silt loam, 0 to 2 percent slopes, on a terrace adjacent to the Meramec River is well suited to row crops.

and moderately well drained Wilbur soils occupy narrow, discontinuous strips adjacent to small streams.

Permeability is moderate, and surface runoff is medium. The organic matter content is low, and natural fertility is medium. Available water capacity is high. The surface layer is friable and is easily tilled through a fairly wide range of soil moisture.

Most areas of this soil are used for cultivated crops. A few areas are in pasture or are idle. The areas are suited to corn, soybeans, small grain, and grasses and legumes. Cultivating on the contour, minimum tillage, and leaving large amounts of crop residue on the surface help reduce erosion, maintain organic matter content, improve tilth, increase water infiltration, and reduce fertility losses. Proper stocking rates, pasture rotation, and restricted use during wet periods help keep the pasture and soil in good condition. Areas are also suited to vegetables, lawn grasses, shade trees, ornamental trees, shrubs, and vines.

This soil is suitable for most recreation uses. Limitations for playgrounds and golf fairways are moderate because of flooding. Previous flooding history can be used to select the most desirable sites.

This Ashton soil is generally not suitable for building sites and onsite waste disposal because of occasional flooding. Flooding frequency information and detailed onsite investigation are needed to locate areas suitable for building sites.

This soil is in capability subclass IIw.

56A—Weller silt loam, 0 to 2 percent slopes. This nearly level, moderately well drained soil is on high stream terraces along the Meramec River. Individual areas are elongated or irregular in shape. They range from 10 to 80 acres. Most areas are not subject to flooding, but in a few areas flooding is rare.

Typically, the surface layer is dark grayish brown and brown silt loam about 9 inches thick. The subsurface layer is light brownish gray silt loam about 9 inches thick. The subsoil is about 25 inches thick. It is grayish brown and brown silty clay loam and silty clay and has yellowish brown and dark yellowish brown mottles in the lower part. The substratum to a depth of about 60 inches is light brownish gray, mottled silt loam. In a few places, only the lower part of the subsoil has gray mottles. Escarpments or short, steep slopes are generally at the lower boundary of areas.

Included with this soil in mapping are small areas of somewhat poorly drained Freeburg silt loam in colluvial positions adjacent to uplands. The included soil makes up 5 to 10 percent of mapped areas.

Permeability is slow, and surface runoff is slow. The organic matter content and natural fertility are low. Available water capacity is high. A perched water table is at a depth of 2 to 4 feet during winter and spring. The surface layer is friable and is easily tilled through a fairly wide range of soil moisture.

Nearly all areas of this soil are used for cultivated crops. The areas are suited to corn, soybeans, small grain, and grasses and some legumes. At times during wet periods, a high water table can hinder planting and harvesting. Leaving large amounts of crop residue on the surface helps maintain organic matter content, improve tilth, and increase water infiltration. Proper stocking rates, pasture rotation, and restricted use during wet periods help keep the pasture and soil in good condition. Areas are also suited to vegetables, lawn grasses, shade and ornamental trees that tolerate wetness, shrubs, and vines.

This soil is suitable for most recreation uses. The wetness and slow permeability are moderate limitations. Camp and picnic areas and playgrounds need to be graded for better surface drainage, and walkways need to be resurfaced with suitable material to overcome wetness.

This Weller soil is suitable for building sites if the area is not subject to rare flooding. The proper design of structures and extra reinforcement in footings, foundations, and basement walls are needed to prevent damage caused by shrinking and swelling. Drain tile around footings and foundations help overcome excessive wetness. Sewage lagoons function satisfactorily for waste disposal. Providing adequate base material to local roads and proper drainage with side ditches and culverts help prevent damage caused by low strength, shrinking and swelling, and frost action. Flooding frequency information is needed for low areas that may be subject to rare flooding.

This soil is in capability subclass IIw.

56B—Weller silt loam, 2 to 5 percent slopes. This gently sloping, moderately well drained soil is on high stream terraces and terrace rims along the Meramec River. Individual areas are elongated and range from 10 to 50 acres. Most areas are not subject to flooding, but in a few areas flooding is rare.

Typically, the surface layer is dark grayish brown, friable silt loam about 4 inches thick. The subsurface layer is grayish brown and brown, friable silt loam about 9 inches thick. The subsoil to a depth of 60 inches or more is brown silty clay loam in the upper part; yellowish brown, mottled silty clay in the next part; and grayish brown, mottled silty clay loam in the lower part. In a few places, the surface layer is brown silty clay loam, because plowing has mixed the upper part of the subsoil with the surface soil. Also in a few places, the lower part of the subsoil is brown and yellowish brown and does not have gray mottles. Escarpments or short, steep slopes are at the lower boundary of some areas.

Included with this soil in mapping and making up 10 to 15 percent of mapped areas are long, narrow areas of Freeburg soils. These soils are mainly in colluvial positions near the bottom of slopes.

Permeability is slow, and surface runoff is medium. The organic matter content and natural fertility are low. Available water capacity is high. A perched water table is at a depth of 2 to 4 feet during winter and spring. The surface layer is friable and is easily tilled through a fairly wide range of soil moisture.

Most areas of this soil are used for cultivated crops or are in pasture. Most areas are suited to row crops and small grain, but the erosion hazard is moderate or severe. Farming on the contour, minimum tillage, and leaving large amounts of crop residue on the surface help reduce erosion, maintain organic matter content, improve tilth, and reduce fertility losses. Proper stocking rates, pasture rotation, and restricted use during wet periods help keep the pasture and soil in good condition. Areas are also suited to vegetables, lawn grasses, shade and ornamental trees that tolerate wetness, shrubs, and vines.

This soil is suitable for most recreation uses. The wetness and slow permeability are moderate limitations. Camp and picnic areas need to be graded for better surface drainage, and playgrounds need to be leveled. Walkways should be resurfaced with suitable material to overcome wetness.

This Weller soil is suitable for building sites and onsite waste disposal. Proper design of structures and extra reinforcement in footings, foundations, and basement walls help prevent damage caused by shrinking and swelling. Drain tile around footings and foundations help overcome excessive wetness. Sewage lagoons function if sites are graded to modify the slope. Providing adequate base material to local roads and streets and proper drainage with side ditches and culverts help prevent damage caused by low strength, shrinking and swelling, and frost action. Flooding frequency information is needed in low areas that may be subject to rare flooding.

This soil is in capability subclass IIIe.

prime farmland

Prime farmland is one of several kinds of important farmlands defined by the U.S. Department of Agriculture. It is of major importance in providing the Nation's short- and long-range needs for food and fiber. The supply of high quality farmland is limited, and the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, must encourage and facilitate the use of our Nation's prime farmland with wisdom and foresight.

Prime farmland, as defined by the U.S. Department of Agriculture, is the best land for producing food, feed, forage, fiber, and oilseed crops. It has the soil quality, growing season, and moisture supply needed to economically produce a sustained high yield of crops. If it is properly treated and high level management and acceptable farming methods are used, prime farmland produces the highest yields with minimal inputs of energy and economic resources, and its use results in the least damage to the environment.

Prime farmland in the survey area can now be in cropland, pastureland, woodland, or other land uses but not in Urban land, built-up land, or water areas. It must either be used for producing food or fiber or be available for these uses.

Prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation. It also has favorable temperature and growing season and acceptable acidity or alkalinity. It has few or no rocks and is permeable to water and air. Prime farmland is not excessively erodible or saturated with water for long periods and is not frequently flooded during the growing season. The slope ranges mainly from 0 to 5 percent. For more detailed information on the criteria for prime farmland, consult the local staff of the Soil Conservation Service or the University of Missouri Extension Service.

About 42,000 acres, or nearly 12 percent of St. Louis County, meets the requirements for prime farmland. Most of the areas are in soil associations 1 and 3 of the general soil map. Nearly all of this prime farmland is used for crops. The major crops are soybeans, corn, and wheat. Minor crops include grain sorghum, sod grasses, truck crops, and pasture. This land accounts for most of the county's agricultural production each year.

Urban development has brought the prime farmland on the uplands of St. Louis County nearly to the point of extinction. It is also removing bottom land and terrace soils from agricultural production, but at a slower rate. Agricultural production has a rather small impact on the economy of St. Louis County.

The map units that are considered prime farmland in St. Louis County are listed in this section. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps in the back of this publication. The soil qualities that affect use and management are described in the section "Detailed soil map units."

If a soil meets the requirements for prime farmland only in areas where it is drained or is not frequently flooded during the growing season, this is described after the soil name in the following list. Onsite investigation is needed to determine whether or not a specific area of the soil is adequately drained or is frequently flooded during the growing season. In St. Louis County, the naturally wet soils generally have been adequately drained because of the application of drainage measures or because of the incidental drainage that results from farming, road building, or other kinds of land development.

The map units that meet the soil requirements for prime farmland are:

1B—Winfield silt loam, 2 to 5 percent slopes
2B—Menfro silt loam, 2 to 5 percent slopes
5A—Iva silt loam, 1 to 3 percent slopes (where adequately drained)
12—Nevin silt loam
32—Haymond silt loam (where protected or where flooding is once or less in 2 years during growing season)
33—Wilbur silt loam (where protected or where flooding is once or less in 2 years during growing season)
40—Eudora silt loam
41—Booker clay (where adequately drained)
42—Blake silty clay loam
43—Waldron silty clay (where adequately drained)
46—Parkville clay (where adequately drained)
49—Blake-Eudora-Waldron complex (where adequately drained and protected or where flooding is once or less in 2 years during growing season)
52A—Freeburg silt loam, 0 to 2 percent slopes
52B—Freeburg silt loam, 2 to 5 percent slopes
53A—Bremer silt loam, 1 to 3 percent slopes (where adequately drained)
55A—Ashton silt loam, 0 to 2 percent slopes
55B—Ashton silt loam, 2 to 5 percent slopes
56A—Weller silt loam, 0 to 2 percent slopes
56B—Weller silt loam, 2 to 5 percent slopes

use and management of the soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

crops and pasture

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed soil map units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

Land is rapidly being removed from farming in St. Louis County. According to the 1969 census, about 101,300 acres was in farms. By 1974, the land in farms had decreased to 80,350 acres. In 1978, the county had approximately 4,500 acres of corn, 17,500 acres of soybeans, 7,600 acres of wheat, and 5,600 acres of hayland (*11*). The county has a high population of horses, and most pastureland is for the keeping of horses.

Soil erosion is a major problem on the limited amount of upland that is cropped. Soil drainage and flood control are not major management concerns on cropland, except along the lower Meramec River. The bottom land along the Missouri River is protected by levees. It is subject to flooding only if river levels are extremely high. Some areas of Waldron soils and Booker soils are subject to flooding by local runoff and could benefit from drainage ditches where feasible. Many of the small tributary streams are subject to short duration flooding following heavy rains. In some years, crop losses occur along these streams because of flooding.

When the water level is high in the Mississippi River, water is backed up the Meramec River to about the city of Fenton. This lowland flooding lasts several days to 2 weeks or more. Upstream from the city of Fenton, bottom land flooding is shorter in duration and probably less frequent.

Natural soil fertility low on nearly all of the upland and terrace soils in the county; therefore, these soils need additional plant nutrients for maximum production. Many of the bottom land soils along the Missouri River have an adequate supply of essential plant nutrients. These soils require only an application of starter fertilizer to produce high crop yields. On all soils, a soil test is the best basis for determining the amount of lime and fertilizer needed to produce the desired crop production.

Soil tilth is important in the germination of seeds and the infiltration of water. Soils that have good tilth are granular and porous. Most of the cropped upland and terrace areas in the county have fairly good tilth. However, they are low in organic matter, which is a factor in stabilizing soil structure. Overtilling or tilling when the soil is wet breaks down and compacts the surface granules. The severely eroded upland areas have a silty clay surface texture and fairly poor tilth.

Maintaining good tilth on the bottom land soils that have silty or sandy texture is relatively easy. The more clayey soils, such as Booker, Waldron, and Parkville soils, are much more difficult to till because they stay wet later in spring. They should not be tilled when they are wet, because they become very cloddy and seedbeds are difficult to prepare.

Field crops commonly grown in the survey area are shown in table 5.

Grass and grass-legume mixtures are grown for pasture and hay. The most common legumes are alfalfa and red clover. The grasses include fescue, orchardgrass, brome, and reed canarygrass.

The fruit orchards that once dotted the St. Louis County uplands have been replaced by urban areas. There is a demand for bluegrass sod, and a number of sod farms are in the western and northern parts of the county. They are primarily on the Nevin, Freeburg, and Eudora soils, which have a thick, medium textured surface layer. Several moderate size truck farms are also in the western part of St. Louis County. They produce a large variety of crops, including sweet corn, pumpkins, squash, watermelons and muskmelons, tomatoes, spinach, radishes, cucumbers, and many others.

yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils.

land capability classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit (*21*). Only class and subclass are used in this survey. These levels are defined in the following paragraphs.

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

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use. There are no class V soils in the survey area.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production. There are no class VIII soils in the survey area.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e*, *w*, or *s*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony.

In class I there are no subclasses because the soils of this class have few limitations. The capability classification of each map unit, except those in Urban land complexes; Pits, sand and gravel; Pits, quarry; and

Dumps-Orthents complex, is given in the section "Detailed soil map units."

windbreaks and environmental plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

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

Table 6 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 6 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service, the Cooperative Extension Service, the Missouri Department of Conservation, or from a nursery.

recreation

Edward A. Gaskins, biologist, Soil Conservation Service, assisted in the preparation of this section.

The Statewide Comprehensive Outdoor Recreation Plan (SCORP) shows a total of 27,137 acres of existing recreation developments in St. Louis County and the city of St. Louis (*17*). The facilities listed include 3 miles of bike paths, 28 miles of horse trails, 2,817 acres of playfields, 1,340 acres of fishing waters, 938 acres of boating water, 267 acres of water suitable for sailboat or canoe use, 260,042 square feet of swimming area, 131 acres of camping area, 21 miles of hiking trails, 1,162 acres of picnicking areas, and 58 acres of winter sports areas. Increases in bike and foot trails, in playfields, and in fishing, swimming, camping, picnic, and winter sports areas are needed by 1990 to serve a projected county population of 1,661,300 (*4*).

At present, recreation needs for the highly populated survey area are served by fourteen county and municipal parks larger than 100 acres. They range in size from Willmore Park, 106 acres, to Greensfeldor County Park, 1,720 acres. Numerous smaller parks occur throughout the area. State owned areas are Rockwoods Reservation, 3,229 acres; Babler State Park, 2,445 acres; Ranken-Reither Tract State Park, 1,077 acres; and Howell Island, 2,575 acres.

The NACD Nationwide Outdoor Recreation Inventory lists 146 private and semiprivate commercial recreation enterprises in St. Louis County (*10*). They vary from campgrounds, field sports areas, boat rentals, and fee fishing lakes to tennis clubs, shooting clubs, golf courses, and horse rentals. In St. Louis County, field sports areas and golfing facilities are considered to be major recreation needs.

The soils of the survey area are rated in table 7 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 7, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 7 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 10 and interpretations for dwellings without basements and for local roads and streets in table 9.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have gentle slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Steep slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking, horseback riding, and bicycling should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

wildlife habitat

Edward A. Gaskins, biologist, Soil Conservation Service, assisted in the preparation of this section.

St. Louis County is one of the 13 counties that make up the North and East Ozark Border Zoogeographic Region in Missouri (*13*). The topography is mainly gently rolling to rolling. Wide, nearly level bottom lands are along the Missouri and Mississippi Rivers.

Population records from 1970 to 1975 indicate a movement of people from the inner city into the surrounding county (*4*). This shift in population increases the pressure on the county's farmland and forest lands as increasing amounts of wildlife habitat are converted to urban development and the associated facilities. At present, approximately 26 percent of the land area is in some form of woody vegetation, 8 percent is in grassland, 14 percent is cultivated, and 52 percent is Urban land. Regardless of urban growth, very good populations of game birds and animals are in the remaining areas of wildlife habitat.

Oak-hickory hardwood forest originally covered the survey area. By 1972 only 18 percent of the land area, or approximately 66,000 acres, was classified as commercial forest land (*5*). Urban growth within the county since that date has further reduced this acreage. Loss of habitat appears to be the major problem confronting the wildlife resource. Even so, a diversity of wildlife is present, and populations of some species appear to be increasing: blackbirds, for example. Songbird populations are excellent. Furbearers are rated good to excellent. Populations of raccoon, muskrat, and beaver are excellent; coyote, very good; opossum, skunk, and mink, good; and fox and weasel, fair.

The Goss-Gasconade-Menfro association has 85 percent of its land area in woody vegetation, and the Menfro-Winfield-Urban land association has 38 percent. This and the wooded acreage in the other soil associations provide the primary habitat for woodland wildlife species. Currently, approximately 94,000 acres of some form of woody cover are estimated to be in the survey area. The largest area of relatively undisturbed timberland is in the southwest part. Relatively continuous blocks of woodland occur along the Missouri and Meramec Rivers; however, much of the timber has been cleared along the Mississippi River. In wooded areas, deer and squirrel populations are rated excellent, and numbers of wild turkey and woodcock are rated good.

The Blake-Eudora-Waldron, Wilbur-Haymond-Elsah, and Freeburg-Ashton-Weller associations have 60 to 80 percent of their areas in cropland or grassland. This and similar areas in the other soil associations provide habitat for the county's openland wildlife species. Rabbit and dove populations in these wildlife areas are good to excellent, quail numbers are rated poor, and the population of pheasants is small.

The primary waterfowl areas in St. Louis County are in those soil associations bordering the three major rivers: the Blake-Eudora-Waldron association along the Missouri River, the Wilbur-Haymond-Elsah association along the Meramec River, and the Urban land-Harvester-Fishpot association along the Mississippi River. Large numbers of birds are attracted to these areas each spring and fall. Several type 1 wetlands were viewed during fieldwork, but the more permanent wetlands, types 3 to 7, are extremely scarce in the county. Overall populations of waterfowl and shore birds are considered to be excellent. Nesting populations of bluewing teal, mallard, and wood ducks are rated fair to good.

The primary fishery resources are the Mississippi, Missouri, and Meramec Rivers. The remaining streams in the county are either intermittent or polluted to the extent that they no longer contain an adequate sport fishery. The Mississippi and Missouri Rivers support commercial fishing operations, and carp, paddlefish, carpsuckers, buffalo fish, and channel and flathead catfish are taken by hook and line. Backwater areas add largemouth and white bass, crappie, and walleye to this fishery. The Meramec River supports largemouth, smallmouth, and rock bass, suckers, walleye, carp, carpsuckers, and catfish. St. Louis County has 132 miles of permanent flowing streams within its boundaries (*4*). At present, two public access areas are available to fishermen in the county.

Numerous county and municipal lakes and associated recreational areas are available to the public for impoundment-type fishing. Creve Coeur, Forest Park, Fairylands Park, Carondelet Park, Fairgrounds Park, O'Fallon Park, Willmore Park, and Spanish Lake Park have well used fishing lakes. More than 500 private ponds throughout the county offer an opportunity for small impoundment-type fishing. Several commercial fee fishing lakes are also in operation. The ponds and lakes are generally stocked with largemouth bass, channel catfish, and bluegills. Many municipal lakes are stocked with black bullhead catfish and carp. Crappie and numerous other lake fishes are commonly found in the larger impoundments.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 8, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, millet, soybeans, and grain sorghums.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are bluegrass, switchgrass, orchardgrass, indiangrass, clover, trefoil, alfalfa, and crownvetch.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, pokeweed, foxtail, croton, and partridgepea.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, the available water capacity, and wetness. Examples of these plants are oak, poplar, cherry, sweetgum, apple, hawthorn, dogwood, hickory, blackberry, wild plum, sumac, persimmon, and sassafras. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian-olive, autumn-olive, crabapple, Amur honeysuckle, hawthorn, and hazelnut.

Coniferous plants furnish winter cover, browse, seeds, and cones. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wildrice, cutgrass, cattail, rushes, sedges, and buttonbush.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite, pheasant, meadowlark, field sparrow, cottontail, red fox, woodchuck, and mourning dove.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, raccoon, and beaver.

engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

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

building site development

Table 9 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

sanitary facilities

Table 10 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 10 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to effectively filter the effluent. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 10 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 10 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

construction materials

Table 11 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 11, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

water management

Table 12 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and embankments, dikes and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances, such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

soil properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

engineering index properties

Table 13 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil series and their morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains particles coarser than sand, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments more than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

physical and chemical properties

Table 14 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion and the amount of soil lost. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.
2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.

5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.

6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.

7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to wind erosion.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 14, the estimated content of organic matter of the plow layer is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

soil and water features

Table 15 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

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

Flooding, the temporary inundation of an area, is caused by overflowing streams or by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt and water in swamps and marshes are not considered flooding.

Table 15 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that when flooding occurs, it will usually be during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered is local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 15 are the depth to the seasonal high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 15.

An apparent water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A perched water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations generally can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavations.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high,* is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*22*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. In table 16, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Alfisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Udalf (*ud*, meaning humid, plus *alf*, from Alfisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Hapludalfs (*Hapl*, meaning minimal horizonation, plus *udalf*, the suborder of the Alfisols that have an udic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Hapludalfs.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-silty, mixed, mesic Typic Hapludalfs.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

soil series and their morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (*20*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*22*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed soil map units."

Ashton series

The Ashton series consists of deep, well drained, moderately permeable soils on low terraces of streams. These soils formed in loess and alluvium, possibly mixed with colluvium in some places. Slope ranges from 0 to 5 percent.

Ashton soils are adjacent to Freeburg soils on terraces and Elsah, Haymond, and Wilbur soils on flood plains. The somewhat poorly drained Freeburg soils do not have a mollic epipedon and are at higher positions on the landscape than Ashton soils. The Elsah, Haymond, and Wilbur soils do not have a B horizon and generally are at a lower position.

Typical pedon of Ashton silt loam, 2 to 5 percent slopes; 1,050 feet south and 1,100 feet east of the northwest corner sec. 32, T. 44 N., R. 3 E.; UTM coordinates, zone 15, 4,264,975 meters N. and 699,370 meters E.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, brown (10YR 5/3) dry; weak fine subangular blocky structure parting to moderate very fine granular; friable; many fine roots; slightly acid; clear smooth boundary.

B1—8 to 14 inches; brown (7.5YR 4/4) silt loam; moderate very fine subangular blocky structure; friable; common dark brown (7.5YR 3/2) stains on surfaces of peds; common fine roots; medium acid; clear wavy boundary.

B2t—14 to 42 inches; brown (7.5YR 4/4) silty clay loam; moderate very fine subangular blocky structure; firm; few fine roots; thin discontinuous clay films; few fine chert fragments; medium acid; gradual smooth boundary.

C1—42 to 54 inches; brown (7.5YR 4/4) silt loam; weak fine subangular blocky structure; firm; few fine roots; medium acid; gradual smooth boundary.

C2—54 to 60 inches; brown (7.5YR 4/4) silt loam; common fine and medium distinct pale brown (10YR 6/3) and light yellowish brown (10YR 6/4) mottles; massive; firm; common black iron and manganese stains; medium acid.

The solum ranges from 40 to 55 inches in thickness. Depth to bedrock is more than 10 feet. Clay content of the control section averages between 24 and 32 percent.

The Ap horizon has hue of 10YR or 7.5YR, value of 3, and chroma of 2 or 3. The B horizon has hue of 7.5YR, value of 3 through 5, and chroma of 3 or 4. The C horizon has hue of 7.5YR or 10YR, value of 4, and chroma of 3 or 4.

Blake series

The Blake series consists of deep, somewhat poorly drained, moderately permeable soils on flood plains. These soils formed in recently deposited alluvium. Slope ranges from 0 to 2 percent.

Blake soils are commonly adjacent to Booker, Eudora, Parkville, Sarpy, and Waldron soils. The very poorly drained Booker soils are in old stream channels and in depressional slackwater areas. The Waldron soils have more clay throughout the solum than Blake soils. The well drained Eudora soils are on old, natural levees and slightly higher positions on the landscape than Blake soils. The somewhat poorly drained Parkville soils have more clay in the upper part of the solum and more sand in the lower part. They occupy landscape positions similar to those of Blake soils or slightly lower. The excessively drained Sarpy soils have more sand throughout and are on natural levees adjacent to the streambank and on depositional fans below levee breaks.

Typical pedon of Blake silty clay loam; 800 feet east and 1,050 feet south of the junction of Larimore Road and Columbia Bottom Road; UTM coordinates, zone 15, 4,297,230 meters N. and 745,015 meters E.

Ap1—0 to 4 inches; very dark grayish brown (10YR 3/2) silty clay loam; moderate very fine granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

Ap2—4 to 9 inches; very dark grayish brown (10YR 3/2) silty clay loam; moderate fine subangular blocky structure; firm; few fine roots; slight effervescence; mildly alkaline; abrupt smooth boundary.

C1—9 to 23 inches; stratified dark grayish brown (10YR 4/2) silty clay loam and brown (10YR 5/3) very fine sandy loam; massive, laminated; firm and friable strata; few fine roots; slight effervescence; mildly alkaline; clear wavy boundary.

C2—23 to 37 inches; stratified brown (10YR 5/3) very fine sandy loam and dark grayish brown (10YR 4/2) silty clay loam; massive, laminated; friable; few fine roots; slight effervescence; mildly alkaline; abrupt wavy boundary.

C3—37 to 43 inches; very dark grayish brown (10YR 3/2) clay; massive; firm; few fine roots; brown (10YR 4/3) stains; strong effervescence; moderately alkaline; abrupt wavy boundary.

C4—43 to 57 inches; brown (10YR 5/3) very fine sandy loam; single grain; friable; strong effervescence; mildly alkaline; abrupt wavy boundary.

C5—57 to 66 inches; dark grayish brown (10YR 4/2) very fine sandy loam; weak very fine subangular blocky structure; firm; strong effervescence; moderately alkaline.

The solum is less than 10 inches thick.

The Ap horizon has value of 3 or 4 and chroma of 2. The C horizon has value of 4 or 5 and chroma of 2 or 3. Clay lenses generally have value of 3.

Booker series

The Booker series consists of deep, very poorly drained, very slowly permeable soils on flood plains. These soils formed in recently deposited alluvium. Slope is 0 to 1 percent.

Booker soils are commonly adjacent to Blake, Eudora, and Waldron soils. The somewhat poorly drained Blake soils have a loamy C horizon, are nearly level, and are on higher positions on the landscape than Booker soils. The well drained Eudora soils have more silt in the upper part of the profile, are on natural levees, and in some places are separated from the Booker soils by a short, steep slope. The somewhat poorly drained Waldron soils have less clay and are in old stream channels and on approximately the same positions on the landscape as Booker soils.

Typical pedon of Booker clay; 450 feet north and 50 feet east of the junction of Long Road and Olive Street Road; UTM coordinates, zone 15, 4,282,590 meters N. and 707,290 meters E.

Ap—0 to 11 inches; very dark gray (10YR 3/1) clay, gray (10YR 5/1) dry; weak medium prismatic structure; firm; common fine roots; few medium prominent reddish brown (5YR 4/4) mottles; few chert fragments; medium acid; abrupt smooth boundary.

B2—11 to 37 inches; dark gray (10YR 4/1) clay; moderate medium prismatic structure parting to weak fine angular blocky; firm; few roots; many medium prominent reddish brown (5YR 4/4) mottles; medium acid; gradual smooth boundary.

C—37 to 60 inches; dark gray (10YR 4/1) clay; massive; few slickensides; few fine prominent reddish brown (5YR 4/4) mottles; medium acid.

The solum is 36 to 46 inches thick.

The B horizon has value of 2 to 4 and chroma of 1. The C horizon has value of 4 or 5 and chroma of 1.

Bremer series

The Bremer series consists of deep, poorly drained, moderately slowly permeable soils on stream terraces. These soils formed in loess and alluvium, possibly mixed with colluvium. Slope ranges from 1 to 3 percent.

Bremer soils are commonly adjacent to Freeburg and Weller soils on terraces and below Gasconade soils on the upland. The somewhat poorly drained Freeburg and Weller soils do not have a mollic epipedon. The Weller soils are on higher positions on the landscape than Bremer soils, and the Freeburg soils are on slightly lower positions. The steep and very steep Gasconade soils are shallow to limestone bedrock.

Typical pedon of Bremer silt loam, 1 to 3 percent slopes; 2,420 feet north and 55 feet east of the southwest corner sec. 7, T. 43 N., R. 3 E.; UTM coordinates, zone 15, 4,261,500 meters N. and 697,525 meters E.

Ap—0 to 6 inches; black (10YR 2/1) silt loam, gray (10YR 5/1) dry; moderate very fine subangular blocky structure; firm; common fine roots; medium acid; abrupt smooth boundary.

A12—6 to 8 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; moderate fine and very fine subangular blocky structure; firm; few fine roots; medium acid; abrupt smooth boundary.

A13—8 to 19 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; strong very fine subangular blocky structure; firm; few fine roots; slightly acid; clear wavy boundary.

B21t—19 to 42 inches; dark gray (10YR 4/1) silty clay loam; few fine prominent brown (7.5YR 5/4) and common fine distinct dark brown (10YR 3/3) mottles; moderate very fine subangular blocky structure; firm; thin discontinuous clay films; common small black concretions of iron and manganese oxides; slightly acid; clear wavy boundary.

B22t—42 to 57 inches; dark grayish brown (10YR 4/2) silty clay loam; common fine distinct dark yellowish brown (10YR 4/4) and few fine faint brown mottles; moderate very fine subangular blocky structure; firm; thin continuous dark gray (10YR 4/1) clay films; many small and medium black and brown concretions of iron and manganese oxides; slightly acid; gradual wavy boundary.

B3—57 to 66 inches; dark grayish brown (10YR 4/2) silty clay loam; many medium distinct dark yellowish brown (10YR 4/4) and common fine faint brown (10YR 5/3) mottles; moderate very fine subangular blocky structure; firm; many small and medium black and brown concretions; slightly acid.

The solum is more than 50 inches thick. Depth to bedrock is more than 10 feet.

The B horizon has value of 3 or 4 and chroma of 1 or 2 but has mottles that are higher in chroma.

Clarksville series

The Clarksville series consists of deep, somewhat excessively drained, very cherty soils on uplands. These soils formed in cherty limestone residuum. Permeability is moderately rapid. Slope ranges from 5 to 50 percent.

Clarksville soils are commonly adjacent to Crider, Gasconade, Menfro, Union, and Winfield soils. The Crider and Gasconade soils are at a lower position on the landscape than Clarksville soils. The Gasconade soils have limestone bedrock at a depth of less than 20 inches, and the Crider soils are well drained and do not have chert in the upper part of the solum. In places, the well drained Menfro and moderately well drained Winfield soils occupy the wider ridgetops and the steep north- and east-facing side slopes. They do not have chert. The moderately well drained Union soils are on moderately wide ridgetops in places and have a very cherty fragipan at a depth of 24 to 40 inches.

Typical pedon of Clarksville cherty silt loam, 14 to 50 percent slopes; 1,800 feet north and 950 feet west of the southeast corner sec. 27, T. 44 N., R. 4 E.; UTM coordinates, zone 15, 4,266,285 meters N. and 713,390 meters E.

A1—0 to 1 inch; black (10YR 2/1) cherty silt loam; moderate very fine granular structure; very friable; many fine tree roots; 25 percent chert fragments; strongly acid; abrupt wavy boundary.

A2—1 to 6 inches; light yellowish brown (10YR 6/4) cherty silt loam; weak thin platy structure; very friable; few fine tree roots; 25 percent chert fragments; strongly acid; clear wavy boundary.

B1—6 to 14 inches; pale brown (10YR 6/3) cherty silt loam; moderate very fine subangular blocky structure; friable; few fine tree roots; 40 percent chert fragments; strongly acid; clear wavy boundary.

B21t—14 to 33 inches; light yellowish brown (10YR 6/4) very cherty silt loam; moderate very fine subangular blocky structure; friable; few fine tree roots; 50 percent chert fragments; very strongly acid; clear wavy boundary.

B22t—33 to 66 inches; mixed strong brown (7.5YR 5/6), yellowish red (5YR 5/6), and light yellowish brown (10YR 6/4) very cherty silt loam; moderate very fine subangular blocky structure; friable; few fine tree roots; common fine distinct black stains; 80 percent chert fragments; very strongly acid.

The solum is more than 60 inches thick. Depth to bedrock is more than 6 feet.

The A1 horizon has value of 2 or 3 and chroma of 1 or 2. The A2 horizon has value of 6 and chroma of 3 or 4. The chert content in the A horizon ranges from about 20 to 50 percent. The B2 horizon has hue of 5YR to 10YR, value of 4 to 6, and chroma of 4 to 6. The chert content in the B2 horizon ranges from about 50 to 90 percent. The B horizon has less than 35 percent clay.

Crider series

The Crider series consists of deep, well drained, moderately permeable soils on uplands. These soils formed in shallow loess and the underlying residuum derived from limestone and dolomite rock that is low in chert. Slope ranges from 5 to 30 percent.

Crider soils are similar to Menfro and Winfield soils and commonly adjacent to Clarksville, Gasconade, Goss, and Menfro soils on uplands. The Clarksville and Goss soils are cherty and at higher positions on the landscape than Crider soils. The shallow Gasconade soils are at the same elevation as Crider soils, but predominantly occupy south- and west-facing slopes. The Menfro soils have a brown B horizon and do not have chert in the lower part of the solum. The Winfield soils have mottles that have chroma of 2 in the lower part of the B horizon.

Typical pedon of Crider silt loam, in an area of Crider-Menfro silt loams, 14 to 30 percent slopes; 450 feet west and 2,450 feet north of the southeast corner sec. 28, T. 44 N., R. 4 E.; UTM coordinates, zone 15, 4,266,440 meters N. and 712,905 meters E.

A1—0 to 1 inch; dark grayish brown (10YR 4/2) silt loam; weak very fine granular structure; friable; many fine roots; strongly acid; abrupt wavy boundary.

A2—1 to 5 inches; yellowish brown (10YR 5/4) silt loam; moderate very fine subangular blocky structure; friable; common fine roots; strongly acid; clear wavy boundary.

B21t—5 to 9 inches; brown (7.5YR 4/4) silty clay loam; moderate very fine subangular blocky structure; firm; few fine roots; thin patchy clay films; strongly acid; gradual wavy boundary.

B22t—9 to 15 inches; yellowish red (5YR 4/6) silty clay loam; moderate very fine subangular blocky structure; firm; few fine roots; thin patchy clay films; few fine sand grains; strongly acid; diffuse smooth boundary.

B23t—15 to 29 inches; yellowish red (5YR 4/6) silty clay loam; moderate very fine subangular blocky structure; firm; few fine roots; thin continuous clay films; few black concretions of iron and manganese; few fine chert fragments; many fine sand grains; strongly acid; clear wavy boundary.

IIB24t—29 to 43 inches; yellowish red (5YR 4/6) silty clay loam; few medium distinct (10YR 6/4) mottles; moderate fine and very fine subangular blocky structure; firm; few fine roots; medium continuous clay films; few black concretions; 2 percent fine and medium chert fragments; many fine sand grains; medium acid; clear wavy boundary.

IIB25—43 to 60 inches; yellowish red (5YR 4/6) silty clay; moderate fine and very fine subangular blocky structure; firm; few fine roots; common black stains; 15 percent fine and medium chert fragments; common fine sand grains; slightly acid.

The solum is more than 5 feet thick. Depth to bedrock is more than 6 feet.

The A1 horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 2. The B2 horizon has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 4 or 6.

Elsah series

The Elsah series consists of deep, somewhat excessively drained, very cherty soils on flood plains. These soils formed in cherty alluvium. Permeability is moderately rapid. Slope ranges from 0 to 5 percent.

Elsah soils are commonly adjacent to Ashton, Haymond, Freeburg, and Wilbur soils. The well drained, chert free Ashton soils are on low terraces. The well drained, chert free Haymond soils occupy the same positions on the landscape as Elsah soils. The somewhat poorly drained, chert free Freeburg soils have a B horizon and are on terraces. The moderately well drained, chert free Wilbur soils occupy positions on the landscape similar to those of Elsah soils.

Typical pedon of Elsah silt loam; 1,120 feet west and 300 feet north of the southeast corner sec. 5, T. 44 N., R. 3 E.; UTM coordinates, zone 15, 4,272,290 meters N. and 700,240 meters E.

Ap—0 to 7 inches; dark brown (10YR 3/3) silt loam, pale brown (10YR 6/3) dry; very fine granular structure; friable; many fine roots; slightly acid; abrupt smooth boundary.

IIC1—7 to 16 inches; brown (10YR 4/3) very cherty loam; massive; friable; common fine roots; 75

percent chert fragments; slightly acid; clear wavy boundary.

IIC2—16 to 33 inches; brown (10YR 4/3) very cherty silt loam; massive; friable; common fine roots; 55 percent chert fragments; slightly acid; clear wavy boundary.

IIC3—33 to 60 inches; brown (10YR 4/3) very cherty loam; massive; friable; common fine roots; 90 percent chert fragments; neutral.

The solum is less than 18 inches thick. Depth to bedrock is more than 5 feet.

The A1 or Ap horizon has value of 3 or 4 and chroma of 3. The IIC horizon has value of 4 or 5 and chroma of 3 or 4. Chert content of the IIC horizon ranges from 35 to 90 percent.

Eudora series

The Eudora series consists of deep, well drained, moderately permeable soils on flood plains. These soils formed in recently deposited alluvium. Slope ranges from 0 to 2 percent.

Eudora soils are commonly adjacent to Blake, Booker, Waldron, and Sarpy soils. The somewhat poorly drained Blake soils are nearly level, have a silty clay loam A horizon, and are on slightly lower positions on the landscape than Eudora soils. The very poorly drained Booker soils and somewhat poorly drained Waldron soils have more clay and are in old stream channels and depressional slackwater areas. The excessively drained Sarpy soils have more sand and are on natural levees adjacent to the streambank and depositional fans below levee breaks.

Typical pedon of Eudora silt loam; 300 feet east of Creve Coeur Mill Road and 2,850 feet north of junction of Creve Coeur Mill Road and River Valley Road; UTM coordinates, zone 15, 4,288,740 meters N. and 717,815 meters E.

Ap—0 to 12 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate very fine subangular blocky structure parting to moderate very fine granular; friable; common fine roots; slightly acid; abrupt smooth boundary.

C1—12 to 23 inches; brown (10YR 4/3) and dark grayish brown (10YR 4/2) silt loam; weak very fine subangular blocky structure; friable; few fine roots; neutral; clear wavy boundary.

C2—23 to 37 inches; brown (10YR 4/3) very fine sandy loam; many fine faint yellowish brown (10YR 5/4) and common fine distinct light brownish gray (10YR 6/2) mottles; common fine prominent yellowish red (5YR 5/6) stains; massive, laminated; friable; few fine roots; slight effervescence; moderately alkaline; abrupt wavy boundary.

C3—37 to 47 inches; stratified grayish brown (10YR 5/2) silty clay and clay, brown (10YR 5/3) very fine sandy loam, and pale brown (10YR 6/3) loam; few fine prominent strong brown (7.5YR 5/6) mottles; common yellowish red (5YR 5/6) stains; massive, laminated; friable and firm strata; few fine roots; slight effervescence; moderately alkaline; abrupt wavy boundary.

C4—47 to 60 inches; brown (10YR 4/3) silty clay; moderate fine angular blocky and subangular blocky structure; firm; grayish brown (10YR 5/2) coatings on surfaces of peds; few fine roots; few 1 inch strata of very fine sandy loam; slight effervescence; moderately alkaline.

The solum is less than 20 inches thick.

The C horizon has value of 4 or 5 and chroma of 2 or 3, but has mottles that are higher in chroma. Thinly stratified zones of different textures are commonly present in the C horizon.

Fishpot series

The Fishpot series consists of deep, somewhat poorly drained soils on stream terraces and bottom lands. These soils are a mixture of loess and alluvium, and the upper part of the soil commonly includes fill material from adjacent uplands. The top several feet has been deposited or reworked during urban development. Permeability is moderately slow. Slope ranges from 0 to 5 percent.

Fishpot soils are commonly adjacent to Harvester soils and Urban land, bottom land. The Urban land, bottom land, is on the same position on the landscape as Fishpot soils, but more than 85 percent of the surface is covered by asphalt, concrete, buildings, or other impervious materials. The Harvester soils are on the adjacent urbanized uplands.

Typical pedon of Fishpot silt loam, in an area of Fishpot-Urban land complex, 0 to 5 percent slopes; in Deer Creek Park in the city of Maplewood, 450 feet north and 300 feet west of bridge where Laclede Station Road crosses Deer Creek; UTM coordinates, zone 15, 4,276,055 meters N. and 732,290 meters E.

A1—0 to 1 inch; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; many brown (7.5YR 4/4) flecks; moderate fine granular structure; friable; many fine roots; medium acid; abrupt smooth boundary.

C1—1 to 8 inches; brown (7.5YR 4/4) silt loam, pale brown (10YR 6/3) dry; few medium distinct pale brown (10YR 6/3) mottles; moderate fine and medium fragments; firm; common fine roots; few pieces of glass; neutral; abrupt wavy boundary.

C2—8 to 34 inches; very dark grayish brown (10YR 3/2) silt loam, mixed with brown (10YR 4/3 and 7.5YR 4/4) and yellowish brown (10YR 5/4) material; common medium and large pockets and discontinuous bands of brown (7.5YR 4/4) silt loam;

moderate medium and fine fragments; firm; common fine roots; 20 percent fine and medium pebbles and pieces of cinders, china, brick, glass, concrete, and metal; neutral; abrupt irregular boundary.

C3—34 to 47 inches; brown (7.5YR 4/4) silt loam; common medium and coarse grayish brown (10YR 5/2) mottles; weak medium fragments; firm; few roots; few black concretions of iron and manganese oxides; neutral; abrupt wavy boundary.

IIA1b—47 to 54 inches; mottled grayish brown (10YR 5/2) and brown (10YR 5/3) silt loam; medium thin platy structure; firm; few roots; common black and reddish brown concretions of iron and manganese oxides; common dark reddish brown and reddish brown stains; neutral; abrupt wavy boundary.

IIC4b—54 to 60 inches; mottled grayish brown (10YR 5/2), brown (10YR 5/3), and dark yellowish brown (10YR 4/4) silt loam; massive; friable; few fine concretions of iron and manganese oxides; few medium pale brown (10YR 6/3) and strong brown (7.5YR 5/6) stains; common thin silt lamellae; neutral.

The solum is less than 8 inches thick. Depth to bedrock is more than 6 feet.

The A horizon has value of 3 or 4 and chroma of 2 or 3. Some pedons do not have an A horizon. The C horizon has hue of 7.5YR and 10YR, value of 3 to 5, and chroma of 2 to 4. It has strata and pockets of soil material from various sources. In most pedons, 20 percent or less of the C horizon consists of manmade materials, such as glass, cinders, and bricks. Commonly, thickness of the horizon varies considerably within short distances.

Freeburg series

The Freeburg series consists of deep, somewhat poorly drained soils on stream terraces. These soils formed in loess and alluvium, possibly mixed with colluvium in some places. Permeability is moderately slow. Slope ranges from 0 to 5 percent.

Freeburg soils are similar to Weller soils. They are commonly adjacent to Ashton and Weller soils on terraces and Elsah, Haymond, and Wilbur soils on flood plains. The well drained Ashton soils have a mollic epipedon. The moderately well drained Weller soils have more clay in the control section than Freeburg soils. The Elsah and Wilbur soils do not have a B horizon, and the Haymond soils have a weakly developed, silt loam B horizon. The Elsah, Wilbur, and Haymond soils occupy a lower position on the landscape than Freeburg soils.

Typical pedon of Freeburg silt loam, 0 to 2 percent slopes; about 1,700 feet west and 150 feet south of fork in Horneker Road; UTM coordinates, zone 15, 4,262,045 meters N. and 702,285 meters E.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam; moderate very fine granular structure; friable; common roots; few small black concretions of iron and manganese oxides; slightly acid; abrupt smooth boundary.

A2—7 to 14 inches; pale brown (10YR 6/3) silt loam; common medium faint light brownish gray (10YR 6/2) and common medium distinct brown (10YR 4/3) mottles; weak very fine subangular blocky structure; friable; few fine roots; common black concretions of iron and manganese oxides; slightly acid; clear wavy boundary.

B21t—14 to 26 inches; brown (10YR 5/3) silty clay loam; common medium faint yellowish brown (10YR 5/4) and grayish brown (10YR 5/2) mottles; moderate fine subangular blocky structure; firm; few fine roots; thin discontinuous clay films; common small and medium black concretions of iron and manganese oxides; strongly acid; clear wavy boundary.

B22t—26 to 44 inches; yellowish brown (10YR 5/4) silty clay loam; common medium faint pale brown (10YR 6/3) and common fine faint grayish brown (10YR 5/2) mottles; moderate very fine subangular blocky structure; firm; thin discontinuous clay films; common medium black concretions of iron and manganese oxides; strongly acid; gradual smooth boundary.

B3—44 to 60 inches; mottled grayish brown (10YR 5/2) and yellowish brown (10YR 5/4) silty clay loam; common fine distinct dark brown (7.5YR 4/4) mottles and stains; weak fine subangular blocky structure; firm; common medium black concretions of iron and manganese oxides; strongly acid.

The solum ranges from 36 to 60 inches or more in thickness. Depth to bedrock is more than 10 feet. The clay content of the control section averages between 28 and 35 percent.

The Ap horizon has value of 4 and chroma of 2 or 3. The A2 horizon has value of 5 or 6 and chroma of 2 or 3. The B horizon has value of 5 or 6 and chroma of 2 to 4.

Gasconade series

The Gasconade series consists of shallow, somewhat excessively drained, flaggy soils on uplands. These soils formed in residuum derived from limestone and dolomite rock that is low in chert. Permeability is moderately slow. Slope ranges from 5 to 50 percent.

Gasconade soils are commonly adjacent to Clarksville, Crider, Goss, and Menfro soils on uplands. The Clarksville and Goss soils are cherty throughout, and they occupy higher positions on the landscape than Gasconade soils. The Crider and Menfro soils are deep and well drained. They are at the same elevation as Gasconade soils but predominantly occupy north- and east-facing slopes.

Typical pedon of Gasconade flaggy silty clay loam from an area of Gasconade-Rock outcrop complex, 14 to 50 percent slopes; 2,620 feet north and 1,950 feet west of the southeast corner sec. 33, T. 44 N., R. 4 E.; UTM coordinates, zone 15, 4,264,835 meters N. and 711,430 meters E.

A1—0 to 5 inches; very dark brown (10YR 2/2) flaggy silty clay loam, dark grayish brown (10YR 4/2) dry; moderate very fine subangular blocky structure; firm; common fine tree roots; 20 percent ground cover of limestone flagstones; few fine chert fragments; neutral; clear wavy boundary.
B1—5 to 10 inches; dark brown (7.5YR 3/2) flaggy silty clay loam, dark grayish brown (10YR 4/2) dry; moderate very fine subangular blocky structure; firm; common fine tree roots; 30 percent limestone flagstones; common fine chert fragments; neutral; clear wavy boundary.
B2—10 to 17 inches; dark brown (7.5YR 3/2) flaggy clay, dark brown (7.5YR 4/2) dry; weak fine and very fine angular blocky structure; firm; few fine tree roots; 50 percent limestone fragments; common fine chert fragments; neutral; abrupt wavy boundary.
R—17 inches; fractured limestone bedrock with clayey material in the cracks.

The solum is 10 to 20 inches thick. Depth to bedrock is the same as the thickness of the solum. In places, few to common chert fragments are throughout the solum.

The A1 horizon has 15 to 40 percent limestone fragments, and the B horizon has 35 to 60 percent.

Goss series

The Goss series consists of deep, well drained, moderately permeable, cherty soils on uplands. These soils formed in cherty limestone residuum. Slope ranges from 5 to 45 percent.

Goss soils are commonly adjacent to Crider, Gasconade, Menfro, Union, and Winfield soils. The Crider and Gasconade soils are at a lower position on the landscape than the Goss soils. The Gasconade soils have limestone bedrock at a depth of less than 20 inches, and the Crider soils do not have chert in the upper part of the solum. The Menfro and Winfield soils are on the wider ridgetops and the steep, north- and east-facing side slopes. They do not have chert. The Union soils are on moderately wide ridgetops. They have a cherty fragipan at a depth of 24 to 40 inches.

Typical pedon of Goss cherty silt loam, 14 to 45 percent slopes; 2,500 feet north and 1,875 feet west of the southeast corner sec. 18, T. 44 N., R. 4 E.; UTM coordinates, zone 15, 4,269,690 meters N. and 708,140 meters E.

A1—0 to 2 inches; dark grayish brown (10YR 4/2) cherty silt loam; moderate very fine granular structure; very friable; many fine tree roots; 35 percent chert fragments; slightly acid; abrupt wavy boundary.
A2—2 to 16 inches; light yellowish brown (10YR 6/4) cherty silt loam; moderate very fine granular structure; friable; common small tree roots; 40 percent chert fragments; medium acid; clear wavy boundary.
B21t—16 to 28 inches; strong brown (7.5YR 5/6) very cherty silty clay loam; common pockets of brown (7.5YR 5/4) material; moderate very fine subangular blocky structure; friable; few fine roots; thin discontinuous clay films; 50 percent chert fragments; medium acid; gradual wavy boundary.
B22t—28 to 40 inches; brown (7.5YR 5/4) cherty silty clay; common medium prominent yellowish red (5YR 5/6) mottles; moderate very fine subangular blocky structure; firm; few fine roots; thin continuous clay films; 40 percent chert fragments; medium acid; gradual wavy boundary.
B23t—40 to 55 inches; red (2.5YR 4/6) cherty clay; common fine distinct yellowish red (5YR 5/6) mottles; moderate fine and very fine angular blocky structure; very firm; few fine roots; 45 percent chert fragments; medium acid; clear wavy boundary.
B3—55 to 60 inches; reddish brown (2.5YR 4/4) and brownish yellow (10YR 6/6) clay; weak fine and very fine angular blocky structure; firm; few fine roots; slightly acid.

The solum thickness and depth to bedrock are more than 60 inches.

The A1 horizon has value of 3 or 4 and chroma of 2. The A2 horizon has value of 5 or 6 and chroma of 3 or 4. The B2 horizon has hue of 2.5YR to 7.5YR, value of 4 or 5, and chroma of 4 to 6. The chert content of the A horizon ranges from less than 10 percent to about 50 percent. The chert content of the B horizon ranges from about 40 percent to 80 percent, and the average clay content is more than 35 percent.

Harvester series

The Harvester series consists of deep, moderately well drained soils on uplands. These soils formed in 12 to 40 inches of reworked loess fill material over truncated or buried loess soils. Permeability is moderately slow. Slope ranges from 0 to 20 percent.

Harvester soils are commonly adjacent to complexes of Fishpot-Urban land, Menfro-Urban land, Iva-Urban land, Winfield-Urban land, and Urban land, upland. The Fishpot-Urban land soils are on flood plains and terraces. The Menfro-Urban land, Iva-Urban land, and Winfield-Urban land soils are on the same positions on the landscape as Harvester soils, but the Urban land makes up less than 50 percent of the surface area and the soil profile has undergone less disturbance by construction equipment. The Urban land, upland, is on the same positions as the Harvester soils, but more than 85 percent of the surface is covered by impervious materials.

Typical pedon of Harvester silt loam, from an area of Urban land-Harvester complex, 0 to 2 percent slopes; on the grounds of the St. Louis Christian Children's Home at 3033 North Euclid; about 200 feet east of the Kingshighway entrance, or 20 feet east of the wood lightpole south of the driveway east of the Kingshighway entrance; UTM coordinates, zone 15, 4,283,795 meters N. and 738,940 meters E.

A1—0 to 4 inches; brown (10YR 4/3) silt loam, brown (10YR 5/3) dry; moderate very fine subangular blocky structure; friable; very dark grayish brown (10YR 3/2) coatings on surfaces of peds; many fine roots; neutral; abrupt wavy boundary.

C1—4 to 18 inches; mixed yellowish brown (10YR 5/4) and brown (10YR 4/3) silt loam and silty clay loam; moderate fine blocky fragments; friable; common fine roots; slightly acid; clear wavy boundary.

C2—18 to 37 inches; mixed dark grayish brown (10YR 4/2), dark yellowish brown (10YR 4/4), light gray (10YR 7/2), and strong brown (7.5YR 5/6) silt loam and silty clay loam; moderate fine blocky fragments; firm; few fine roots; common black concretions; common pieces of cinder, glass, and brick; neutral; abrupt smooth boundary.

B21tb—37 to 44 inches; dark yellowish brown (10YR 4/4) silty clay loam; common medium distinct grayish brown (10YR 5/2) mottles, thick very pale brown (10YR 7/3) silt coating on peds; moderate fine subangular blocky structure; firm; thin patchy clay films on surfaces of peds; common black concretions; neutral; clear wavy boundary.

B22tb—44 to 60 inches; dark yellowish brown (10YR 4/4) silty clay loam; common fine distinct yellowish brown (10YR 5/6) and common fine prominent light gray (10YR 7/2) mottles; moderate medium prismatic structure parting to weak fine subangular blocky; firm; thin patchy clay films on surfaces of peds; few fine black concretions; neutral.

The solum is less than 10 inches thick. Depth to bedrock is more than 5 feet.

The A horizon has value of 3 or 4 and chroma of 2 to 4. Some pedons do not have an A horizon. The C horizon has hue of 10YR and 7.5YR, value of 4 or 5, and chroma of 2 to 4. The buried B horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 3 or 4. Thickness of the C horizon varies considerably within short distances, and in places the C horizon is discontinuous. In some pedons, the C horizon is made up of as much as 15 percent fragments of brick, glass, cinders, and other manmade materials.

Haymond series

The Haymond series consists of deep, well drained, moderately permeable soils on flood plains. These soils formed in silty alluvium derived from loess covered uplands. Slope ranges from 0 to 2 percent.

Haymond soils are similar to Wilbur soils and commonly adjacent to Ashton, Elsah, Freeburg, and Wilbur soils. The well drained Ashton soils have a B horizon and occupy low positions on terraces. The very cherty, somewhat excessively drained Elsah soils occupy the same positions on the landscape as Haymond soils. The somewhat poorly drained Freeburg soils have a B horizon and occupy positions on terraces. The Wilbur soils are moderately well drained.

Typical pedon of Haymond silt loam; about 1,850 feet north of the junction of Tesson Ferry Road and 75 feet east of Butler Hill Road; UTM coordinates, zone 15, 4,260,740 meters N. and 725,750 meters E.

Ap—0 to 5 inches; brown (10YR 4/3) silt loam; moderate very fine granular structure; very friable; few roots; slightly acid; abrupt smooth boundary.

C1—5 to 9 inches; stratified brown (10YR 4/3) silt loam with pale brown (10YR 6/3) silt lenses; moderate very fine granular structure; friable; few roots; neutral; abrupt wavy boundary.

C2—9 to 34 inches; brown thinly stratified (10YR 4/3) silt loam; weak very fine subangular blocky structure; friable; common pores; neutral; clear wavy boundary.

C3—34 to 52 inches; brown (10YR 4/3) silt loam; weak very fine subangular blocky structure; friable; dark grayish brown (10YR 4/2) coatings on surfaces of peds; few pores; neutral; gradual smooth boundary.

C4—52 to 60 inches; mottled brown (10YR 4/3), yellowish brown (10YR 5/4), and gray (10YR 5/1) silt loam; weak very fine subangular blocky structure; friable; neutral.

The solum is less than 10 inches thick. Depth to bedrock is more than 5 feet.

The A horizon has value of 4 and chroma of 2 or 3. The C horizon has value of 4 or 5 and chroma of 3 or 4.

Iva series

The Iva series consists of deep, somewhat poorly drained, moderately permeable soils on uplands. These soils formed in silty loess. Slope ranges from 1 to 3 percent.

Iva soils are adjacent to Winfield soils. The Winfield soils do not have mottles with chroma of 2 in the upper 10 inches of the subsoil, and they occupy more rolling parts of the landscape.

Typical pedon of Iva silt loam, 1 to 3 percent slopes; 650 feet east and 1,100 feet north of the southwest corner sec. 32, T. 45 N., R. 4 E.; UTM coordinates, zone 15, 4,274,160 meters N. and 708,820 meters E.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam; moderate very fine granular structure; very friable; many fine roots; many fine yellowish brown (10YR 5/6) stains; few very fine black concretions of iron and manganese oxides; slightly acid; abrupt smooth boundary.

A2—9 to 13 inches; brown (10YR 5/3) silt loam; a few pockets of pale brown (10YR 6/3) and yellowish brown (10YR 5/4) soil material; light gray (10YR 7/2) silt coats, dry; weak very fine subangular blocky structure parting to very fine granular; friable; common fine roots; many fine black concretions of iron and manganese oxides; slightly acid; abrupt smooth boundary.

B21t—13 to 20 inches; grayish brown (10YR 5/2) silty clay loam; moderate fine subangular blocky structure; firm; common fine roots; discontinuous brown (10YR 4/3) clay films; light yellowish brown (10YR 6/4) silt coats on surfaces of peds, light gray (10YR 7/2) dry; common fine and very fine black concretions of iron and manganese oxides; strongly acid; clear smooth boundary.

B22t—20 to 41 inches; mottled grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) silty clay loam; moderate fine subangular blocky structure; firm; few fine roots; thin continuous clay films; few very fine yellowish brown (10YR 5/8) stains; common fine and very fine black concretions of iron and manganese oxides; medium acid; clear smooth boundary.

B3t—41 to 55 inches; mottled light brownish gray (10YR 6/2), grayish brown (10YR 5/2), dark grayish brown (10YR 4/2), and yellowish brown (10YR 5/6) silty clay loam; moderate fine subangular blocky structure; firm; few fine roots; discontinuous clay films; common black stains; common fine and very fine black concretions of iron and manganese oxides; medium acid; clear smooth boundary.

C—55 to 60 inches; mixed brown (10YR 5/3), yellowish brown (10YR 5/4), and dark yellowish brown (10YR 4/4) silt loam; few fine faint grayish brown (10YR 5/2) mottles; massive, firm; few fine roots; common black stains; neutral.

The solum is 40 to 60 inches thick. Depth to rock is more than 6 feet.

The A1 or Ap horizon has value of 4 or 5 and chroma of 2. The A2 horizon has value of 5 or 6 and chroma of 3. The B2 horizon has value of 5 and chroma of 2 to 6 but has mottles that have value of 4 to 6 and chroma of 2 to 6. The clay content of the B2 horizon averages between 30 and 35 percent. The mottled C horizon has value of 5 or 6 and chroma of 2 to 4.

Menfro series

The Menfro series consists of deep, well drained, moderately permeable soils on uplands. These soils formed in thick loess. Slope ranges from 2 to 45 percent.

Menfro soils are similar to Crider and Winfield soils and commonly adjacent to Clarksville, Crider, Gasconade, Goss, and Winfield soils. The Clarksville and Goss soils are cherty and typically occupy south- and west-facing slopes. The Crider soils have a redder B horizon and more clay in the lower part of the B horizon than Menfro soils. The Gasconade soils are shallow to limestone bedrock and are on positions similar to those of Menfro soils. The Winfield soils have mottles that have chroma of 2 in the lower part of the B horizon.

Typical pedon of Menfro silt loam, 5 to 9 percent slopes; about 4,950 feet north and 1,260 feet east of the junction of Bellefountaine Road and the Chicago, Burlington, and Quincy Railroad tracks; UTM coordinates, zone 15, 4,300,925 meters N. and 742,115 meters E.

A1—0 to 7 inches; brown (10YR 4/3) silt loam; moderate very fine granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

A2—7 to 13 inches; brown (10YR 4/3) silt loam; weak medium platy structure; friable; common fine roots; slightly acid; abrupt smooth boundary.

B1—13 to 17 inches; brown (7.5YR 4/4) silty clay loam; moderate very fine subangular blocky structure; friable; common fine roots; medium acid; clear wavy boundary.

B2t—17 to 30 inches; brown (7.5YR 4/4) silty clay loam; moderate medium prismatic structure parting to moderate very fine subangular blocky; firm; few fine roots; thin discontinuous clay films; strongly acid; gradual wavy boundary.

B3t—30 to 55 inches; brown (7.5YR 4/4) silty clay loam; moderate medium prismatic structure parting to weak very fine subangular blocky; friable; few fine roots; thin discontinuous clay films; slightly acid; diffuse wavy boundary.

C—55 to 60 inches; yellowish brown (10YR 5/4) silt loam; moderate medium prismatic structure; friable; neutral.

The solum is 40 to 60 inches thick. Depth to rock is 5 to 10 feet or more. The clay content of the control section averages between 28 and 35 percent.

The A1 horizon has value of 4 and chroma of 2 or 3. The A2 horizon has value of 4 or 5 and chroma of 3 or 4. Total thickness of the A horizon is 10 to 16 inches. The B2 horizon has value of 4 and chroma of 3 or 4. The C horizon has value of 4 or 5 and chroma of 4.

Nevin series

The Nevin series consists of deep, somewhat poorly drained, moderately permeable soils in basins on uplands. These soils formed in silty lacustrine deposits. Slope ranges from 0 to 2 percent.

Nevin soils in the survey area have distinct mottles in the lower part of the mollic epipedon. Mottles are not definitive for the Nevin series. This difference, however, does not significantly alter the usefulness and behavior of these soils.

Nevin soils are commonly adjacent to Menfro and Winfield soils. The well drained Menfro soils and moderately well drained Winfield soils are on positions upslope from the Nevin soils.

Typical pedon of Nevin silt loam; about 2,175 feet southeast of junction of Shackleford and Wiedhaupt Roads and 150 feet southwest of Wiedhaupt Road; UTM coordinates, zone 15, 4,300,630 meters N. and 732,030 meters E.

Ap—0 to 11 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; moderate very fine granular structure; friable; common fine roots; few fine black concretions of iron and manganese oxides; slightly acid; abrupt smooth boundary.

A12—11 to 19 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; moderate very fine subangular blocky structure parting to weak very fine granular; friable; common fine roots; few fine black concretions of iron and manganese oxides; slightly acid; clear wavy boundary.

A3—19 to 24 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; moderate medium prismatic structure parting to moderate very fine subangular blocky; friable; common fine roots; common fine black concretions of iron and manganese oxides; neutral; clear wavy boundary.

B21t—24 to 36 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; common medium distinct yellowish brown (10YR 5/4), few fine prominent yellowish brown (10YR 5/6), and common medium faint very dark gray (10YR 3/1) mottles; moderate medium prismatic structure parting to moderate fine subangular blocky; firm; few fine roots; thin continuous clay films; common black concretions of iron and manganese oxides; neutral; gradual wavy boundary.

B22t—36 to 45 inches; mottled brownish yellow (10YR 6/6), yellowish brown (10YR 5/6), and light brownish gray (2.5Y 6/2) silty clay loam; moderate medium prismatic structure; firm; few fine roots; thin discontinuous clay films; dark gray (10YR 4/1) material on surfaces of peds; few medium black concretions of iron and manganese oxides; neutral; clear wavy boundary.

C1—45 to 51 inches; light brownish gray (2.5Y 6/2) silt loam; weak coarse prismatic structure; friable; few fine roots; dark grayish brown (10YR 4/2) material on surfaces of peds; neutral; clear wavy boundary.

C2—51 to 60 inches; light brownish gray (2.5Y 6/2) silt loam; common fine prominent brownish yellow (10YR 6/6) mottles; massive; friable; few fine roots; common yellowish red (5YR 5/6) iron stains; neutral.

The solum is 40 to 60 inches thick. Depth to rock is more than 10 feet.

The Ap and A1 horizons have value of 2 or 3 and chroma of 1 or 2. Total thickness of the A horizon is 18 to 27 inches. The B2 horizon has hue of 10YR or 2.5Y, value of 3 to 5, and chroma of 2 or 3. It has mottles that are higher or lower in chroma. The clay content of the B2 horizon averages between 27 and 35 percent.

Parkville series

The Parkville series consists of deep, somewhat poorly drained soils on flood plains. These soils formed in recently deposited alluvium. Permeability is very slow in the upper part of the profile and moderately rapid in the lower part. Slope ranges from 0 to 2 percent.

Parkville soils are commonly adjacent to Blake, Eudora, and Waldron soils. The somewhat poorly drained Blake soils are less clayey in the upper part of the profile and more clayey in the lower part than Parkville soils. The well drained Eudora soils have less clay in the A horizon and are on higher positions on the landscape than Parkville soils. The somewhat poorly drained Waldron soils are more clayey in the lower part and are on slightly lower positions or on positions similar to those of Parkville soils.

Typical pedon of Parkville clay; about 200 feet north and 175 feet west of the junction of Riverglen Drive and the northbound lanes of the Earth City Expressway; UTM coordinates, zone 15, 4,293,345 meters N. and 721,040 meters E.

Ap—0 to 9 inches; very dark gray (10YR 3/1) clay, dark gray (10YR 4/1) dry; moderate fine angular and subangular blocky structure; firm; common fine roots; 1/2 inch sand lens at bottom of horizon; neutral; abrupt smooth boundary.

A12—9 to 18 inches; very dark gray (10YR 3/1) clay, dark gray (10YR 4/1) dry; common fine faint very dark grayish brown (10YR 3/2) mottles; few fine distinct brown (10YR 5/3) pockets of the IIC1 horizon material; moderate fine angular blocky structure; firm; few fine roots; neutral; abrupt wavy boundary.

IIC1—18 to 23 inches; mottled light brownish gray (10YR 6/2), light yellowish brown (10YR 6/4), and brown (10YR 4/3) very fine sandy loam; weak thin platy structure; friable; few fine roots; slight effervescence; mildly alkaline; clear wavy boundary.

IIC2—23 to 50 inches; brown (10YR 5/3) very fine sandy loam; single grain; very friable; few fine roots; slight effervescence; mildly alkaline; abrupt wavy boundary.

IIC3—50 to 53 inches; thinly stratified dark gray (10YR 4/1), gray (10YR 5/1), and dark yellowish brown (10YR 4/4) very fine sandy loam; massive, laminated; friable; strong effervescence; mildly alkaline; abrupt wavy boundary.

IIC4—53 to 60 inches; brown (10YR 5/3) loamy very fine sand; single grain; very friable; strong effervescence; mildly alkaline.

The solum is less than 20 inches thick.

The Ap horizon has value of 3 and chroma of 1 or 2. The IIC horizon has value of 4 or 5 and chroma of 2 or 3.

Sarpy series

The Sarpy series consists of deep, excessively drained, rapidly permeable soils on flood plains. These soils formed in recently deposited alluvium. Slope ranges from 0 to 2 percent.

Sarpy soils are commonly adjacent to Blake, Eudora, and Waldron soils. The somewhat poorly drained Blake soils have more clay and are at an intermediate elevation below Sarpy soils. The well drained Eudora soils have a silt loam A horizon. They are on old, natural levees farther from the rivers and at a slightly lower elevation than Sarpy soils. The somewhat poorly drained Waldron soils have more clay throughout and are in old stream channels that are separated from the Sarpy landscape position by a short, steep slope.

Typical pedon of Sarpy loamy fine sand, rarely flooded; about 12,950 feet east and 250 feet north of the junction of Columbia Bottom Road and Larimore Road; UTM coordinates, zone 15, 4,297,605 meters N. and 748,710 meters E.

Ap—0 to 6 inches; brown (10YR 5/3) loamy fine sand; single grain; very friable; few roots; neutral; abrupt smooth boundary.

C1—6 to 31 inches; brown (10YR 5/3) loamy fine sand; single grain; very friable; few thin lenses of loamy very fine sand; strong effervescence; mildly alkaline; clear wavy boundary.

C2—31 to 57 inches; yellowish brown (10YR 5/4) loamy fine sand; single grain; very friable; few light brownish gray (10YR 6/2) and yellowish brown (10YR 5/6) strata; strong effervescence; mildly alkaline; abrupt wavy boundary.

C3—57 to 60 inches; very dark gray (10YR 3/1) loamy very fine sand and thin strata of silty clay; massive; firm; common dead roots; strong effervescence; mildly alkaline.

The solum is 1 to 6 inches thick.

The Ap horizon has value of 4 or 5 and chroma of 2 or 3. The C horizon has value of 5 and chroma of 2 to 4 but has lenses and thin strata lower in value. Some pedons contain lenses of finer textured materials that are variable in color.

Union series

The Union series consists of deep, moderately well drained soils that have a fragipan. These soils formed in 24 to 36 inches of loess and the underlying cherty limestone residuum. Permeability is slow. Slope ranges from 9 to 14 percent.

Union soils are commonly adjacent to Clarksville, Goss, Menfro, and Winfield soils. The Clarksville and Goss soils are cherty throughout and are on side slopes and on narrower ridges than Union soils. The Menfro and Winfield soils do not have a fragipan and are on the wider ridges that have thicker loess.

Typical pedon of Union silt loam, 9 to 14 percent slopes; 1,250 feet west and 1,150 feet north of the southeast corner sec. 27, T. 44 N., R. 4 E.; UTM coordinates, zone 15, 4,266,075 meters N. and 713,280 meters E.

A1—0 to 2 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine subangular blocky structure parting to moderate very fine granular; friable; common fine tree roots; slightly acid; abrupt wavy boundary.

A2—2 to 5 inches; yellowish brown (10YR 5/4) silt loam, light yellowish brown (10YR 6/4) dry; weak fine subangular blocky structure parting to weak fine granular; friable; common fine tree roots; strongly acid; clear wavy boundary.

B21t—5 to 8 inches; brown (7.5YR 5/4) silty clay loam; moderate very fine subangular blocky structure; firm; common fine tree roots; thin patchy clay films; very strongly acid; clear wavy boundary.

B22t—8 to 21 inches; strong brown (7.5YR 5/6) silty clay loam; moderate fine and very fine subangular blocky structure, firm; few fine tree roots; thin continuous clay films; very strongly acid; gradual wavy boundary.

B23t—21 to 35 inches; brown (7.5YR 5/4) silty clay loam; moderate fine and very fine subangular blocky structure; firm; few fine tree roots; thin continuous clay films; common prominent very pale brown (10YR 7/3) silt coatings on peds; common black concretions of iron and manganese; 2 percent fine chert; very strongly acid; clear wavy boundary.

IIBx1—35 to 50 inches; brown (7.5YR 5/4) very cherty silty clay loam; few fine prominent light brownish gray (10YR 6/2) mottles; massive; very firm; few fine tree roots along polygonal cracks; few distinct light yellowish brown (10YR 6/4) silt coats on chert fragments; 60 percent fine to coarse chert; brittle; very strongly acid; clear wavy boundary.

IIBx2—50 to 60 inches; brown (7.5YR 5/4) very cherty silty clay loam; common fine prominent light brownish gray (10YR 6/2) mottles; massive; extremely firm; few fine tree roots along polygonal cracks; thick silt coatings and common dark red stains on chert fragments; 80 percent fine to coarse chert; brittle; very strongly acid.

The solum ranges from 40 to 60 inches or more in thickness. Depth to bedrock is 5 to 10 feet.

The Ap horizon in cleared areas has value of 4 or 5 and chroma of 3 or 4. The A2 horizon, if present, has value of 5 or 6 and chroma of 4. The B2 horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. The horizons above the fragipan are relatively chert free. The chert content of the fragipan is 55 to 80 percent.

Waldron series

The Waldron series consists of deep, somewhat poorly drained, slowly permeable soils on flood plains. These soils formed in recently deposited alluvium. Slope ranges from 0 to 2 percent.

Waldron soils are commonly adjacent to Blake, Booker, Eudora, Parkville, and Sarpy soils. The somewhat poorly drained Blake soils are less clayey and occupy a slightly higher position on the landscape than Waldron soils. The very poorly drained Booker soils are more clayey and occupy depressional slackwater areas. The well drained Eudora and the excessively drained Sarpy soils are on natural levees and the highest positions on the flood plain. The somewhat poorly drained Parkville soils have more sand in the lower part and are on slightly higher positions or on positions similar to those of Waldron soils.

Typical pedon of Waldron silty clay; about 1,650 feet north and 575 feet west of the Interstate 40 bridge over Bonhomme Creek; UTM coordinates, zone 15, 4,282,680 meters N. and 710,950 meters E.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silty clay; moderate fine angular and subangular blocky structure; firm; few fine roots; mildly alkaline; abrupt smooth boundary.

C1—7 to 13 inches; dark grayish brown (10YR 4/2) silty clay; moderate very fine angular and subangular blocky structure; firm; few fine roots; slight effervescence; neutral; clear wavy boundary.

C2—13 to 23 inches; dark grayish brown (10YR 4/2) silty clay; moderate very fine angular blocky structure; firm; few fine roots; grayish brown (10YR 5/2) coatings on surfaces of peds; common fine prominent red (10R 4/6) stains; slight effervescence; mildly alkaline; clear wavy boundary.

C3—23 to 39 inches; stratified dark grayish brown (10YR 4/2) silty clay, grayish brown (10YR 5/2) silt loam, and brown (10YR 5/3) silty clay loam; common fine distinct brown (7.5YR 4/4) and common fine prominent reddish brown (5YR 4/4) mottles; moderate very fine angular and subangular blocky structure; firm; strong effervescence; mildly alkaline; abrupt wavy boundary.

C4—39 to 52 inches; stratified brown (10YR 5/3) clay and grayish brown (10YR 5/2) silt loam; few fine faint brown (10YR 4/3) mottles; moderate fine angular blocky structure; firm; common fine distinct dark yellowish brown (10YR 4/4) stains; mildly alkaline; strong effervescence; abrupt wavy boundary.

C5—52 to 60 inches; brown (10YR 4/3) clay; strong fine angular blocky structure; firm; grayish brown (10YR 5/2) coatings on surfaces of peds; strong effervescence; mildly alkaline.

The solum is less than 10 inches thick.

The Ap horizon has value of 2 or 3 and chroma of 2. The C horizon has value of 3 through 5 and chroma of 2 or 3 but has mottles that are higher in value and chroma.

Weller series

The Weller series consists of deep, moderately well drained, slowly permeable soils on high terraces of streams. These soils formed in loess over alluvium. Slope ranges from 0 to 5 percent.

Weller soils are similar to Freeburg soils. The Freeburg soils are on a lower position on the landscape than Weller soils. They have less clay in the B horizon and have mottles with chroma of 2 in the upper part of the B horizon.

Typical pedon of Weller silt loam, 2 to 5 percent slopes; 100 feet south and 1,800 feet west of the northeast corner sec. 16, T. 44 N., R. 5 E.; UTM coordinates, zone 15, 4,270,765 meters N. and 721,290 meters E.

Ap—0 to 4 inches; dark grayish brown (10YR 4/2) silt loam; moderate fine granular structure; friable; few black concretions of iron and manganese oxides; few pebbles; medium acid; abrupt smooth boundary.

A21—4 to 7 inches; grayish brown (10YR 5/2) silt loam; common fine faint light brownish gray (10YR 6/2) mottles; moderate thin platy structure; friable; common black concretions of iron and manganese oxides; strongly acid; abrupt wavy boundary.

A22—7 to 13 inches; brown (10YR 5/3) silt loam; weak thin platy structure; friable; common black concretions of iron and manganese oxides; strongly acid; abrupt wavy boundary.

B1—13 to 16 inches; brown (10YR 5/3) silty clay loam; strong very fine subangular blocky structure; friable; thick light brownish gray (10YR 6/2) silt coatings on peds; common black concretions of iron and manganese oxides; strongly acid; clear wavy boundary.

B21t—16 to 27 inches; yellowish brown (10YR 5/4) silty clay; common fine distinct yellowish brown (10YR 5/6) and few fine distinct light brownish gray (10YR 6/2) mottles; moderate very fine subangular blocky structure; firm; thin discontinuous brown (10YR 5/3) clay films; common black concretions of iron and manganese oxides; strongly acid; gradual smooth boundary.

B22t—27 to 47 inches; yellowish brown (10YR 5/4) silty clay; common medium distinct yellowish brown (10YR 5/6) and common medium distinct light brownish gray (10YR 6/2) mottles; moderate very fine subangular blocky structure; firm; thin continuous brown (10YR 5/3) clay films; common black concretions of iron and manganese oxides; medium acid; gradual smooth boundary.

B3—47 to 60 inches; grayish brown (10YR 5/2) silty clay loam; common medium distinct dark yellowish brown

(10YR 4/4) mottles; moderate medium prismatic structure; firm; common black concretions of iron and manganese oxides; common soft brown iron masses and stains; slightly acid.

The solum is more than 60 inches thick. Depth to bedrock is more than 10 feet. Clay content of the control section averages between 35 and 40 percent.

The Ap horizon has value of 4 or 5 and chroma of 2 or 3. The A2 horizon has value of 5 and chroma of 2 or 3. The B horizon has mottles that have value of 4 to 6 and chroma of 2 to 6.

Wilbur series

The Wilbur series consists of deep, moderately well drained, moderately permeable soils on flood plains. These soils formed in alluvium derived from loess covered uplands. Slope ranges from 0 to 2 percent.

Wilbur soils are similar to Haymond soils and commonly adjacent to Ashton, Elsah, Freeburg, and Haymond soils. The well drained Ashton soils have a B horizon and occupy low positions on terraces. The very cherty, somewhat excessively drained Elsah soils occupy the same positions as the Wilbur soils. The somewhat poorly drained Freeburg soils have more clay in the B horizon and occupy positions on terraces. The Haymond soils do not have gray mottles in the upper part of the C horizon.

Typical pedon of Wilbur silt loam; about 975 feet east and 450 feet north of the Creve Coeur Mill Road bridge over Creve Coeur Creek; UTM coordinates, zone 15, 4,285,530 meters N. and 717,905 meters E.

A1—0 to 6 inches; stratified dark grayish brown (10YR 4/2) and brown (10YR 4/3 and 10YR 5/3) silt loam; moderate very fine granular structure; very friable; common fine roots; neutral; clear wavy boundary.

C1—6 to 12 inches; stratified brown (10YR 4/3 and 10YR 5/3) silt loam; common fine distinct gray (10YR 5/1) mottles; massive; friable; few fine roots; neutral; clear wavy boundary.

C2—12 to 50 inches; brown (10YR 5/3) silt loam; few fine distinct gray (10YR 5/1), few medium distinct dark brown (10YR 3/3), and common medium faint dark yellowish brown (10YR 4/4) mottles; massive; friable; few fine roots; neutral; diffuse smooth boundary.

C3—50 to 60 inches; stratified brown (10YR 5/3), grayish brown (10YR 5/2), and dark gray (10YR 4/1) silt loam; common yellowish red (5YR 4/6) stains between strata; massive; friable; slight effervescence; mildly alkaline.

The solum is less than 12 inches thick. Depth to bedrock is more than 5 feet.

The A1 horizon has value of 4 or 5 and chroma of 2 or 3. The C horizon has value of 4 or 5 and chroma of 2 to 4. It has mottles that are higher in value and lower in chroma.

Winfield series

The Winfield series consists of deep, moderately well drained, moderately permeable soils on uplands. These soils formed in loess. Slope ranges from 2 to 14 percent.

Winfield soils are similar to Menfro soils and commonly adjacent to Clarksville, Goss, Iva, Menfro, and Union soils. The Clarksville and Goss soils are cherty. They typically occupy steeper slopes and a lower position on the landscape than Winfield soils. The Iva soils have mottles with chroma of 2 In the upper 10 inches of the B horizon, and they occupy only the generally gently sloping parts of the landscape. The Menfro soils do not have mottles with chroma of 2 in the B horizon. The Union soils are on ridgetops and have a very cherty fragipan.

Typical pedon of Winfield silt loam, 5 to 9 percent slopes; 450 feet east and 200 feet south of the northwest corner sec. 26, T. 45 N., R. 3 E.; UTM coordinates, zone 15, 4,276,995 meters N. and 703,930 meters E.

Ap—0 to 5 inches; brown (10YR 4/3) silt loam; moderate fine and very fine granular structure; friable; many fine roots; neutral; clear smooth boundary.

A2—5 to 9 inches; dark yellowish brown (10YR 4/4) silt loam, moderate very fine granular structure; friable; common fine roots; neutral; clear wavy boundary.

B21t—9 to 16 inches; brown (7.5YR 4/4) silt loam; moderate very fine subangular blocky structure; friable; common fine roots; thin discontinuous clay films; common fine black concretions of iron and manganese oxides; few gray silt coatings on peds in lower part; neutral; clear wavy boundary.

B22t—16 to 25 inches; brown (7.5YR 4/4) silty clay loam; moderate fine and very fine subangular blocky structure; firm; few fine roots; thin discontinuous clay films; common fine black concretions of iron and manganese oxides; thick gray silt coatings on peds in upper part; medium acid; gradual wavy boundary.

B23t—25 to 36 inches; brown (7.5YR 4/4) silty clay loam; few fine and medium prominent light brownish gray (10YR 6/2) and pale brown (10YR 6/3) mottles; weak and medium very fine subangular blocky structure; firm; few fine roots; thin discontinuous clay films; common fine black concretions of iron and manganese oxides; very strongly acid; gradual wavy boundary.

B3t—36 to 49 inches; brown (7.5YR 5/4) silty clay loam; many medium faint brown (7.5YR 4/4) and common medium distinct light brownish gray (10YR 6/2) mottles; moderate medium prismatic structure parting to weak very fine subangular blocky; firm; common black stains; strongly acid; diffuse smooth boundary.

C—49 to 60 inches; mottled dark yellowish brown (10YR 4/4) and light brownish gray (10YR 6/2) silt loam; massive; firm; common black stains; neutral.

The solum ranges from 40 to 60 inches in thickness. Depth to rock is 5 to 10 feet.

The Ap horizon has value of 4 and chroma of 2 or 3. The A2 horizon has value of 4 or 5 and chroma of 3 or 4. The A horizon ranges from 9 to 16 inches in thickness. The B2 horizon has value of 4 or 5 and chroma of 4. It has mottles that have value of 4 to 6 and chroma of 2 to 4. The clay content of the B2 horizon averages between 30 and 35 percent. The C horizon has value of 4 and chroma of 3 or 4.

formation of the soils

This section describes the factors of soil formation and how they relate to the formation of soils in the survey area.

factors of soil formation

Soil formation is the result of the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time. Therefore, the characteristics of the soil at any given point are determined by (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 on and in the soil, (4) the relief, or lay of the land, and (5) the length of time the forces of soil formation have acted on the soil material (*8*). It is easy to see how soils can vary considerably over a rather small area.

Climate and plant and animal life are active factors of soil formation. They act on the earthy parent material and slowly change it to a natural body that has genetically related horizons. The effects of climate and plant and animal life are conditioned by relief. The parent material also affects the kind of soil profile that is formed and in extreme cases determines it almost entirely. Finally, time is needed for changing the parent material into a soil that has distinct horizons. Although it varies, some time is always required for differentiation of soil horizons. Generally, a long time is required for distinct horizons to form.

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

parent material

Parent material is the unconsolidated mass in which a soil forms. It determines the limits of the chemical and mineral composition of the soil. The soils in St. Louis County and St. Louis City formed in loess, alluvium, and residual material or in a combination of these materials.

Loess is wind-deposited silty material. Its primary source in this soil survey area was the Missouri River flood plains. Probably, small amounts also came from the Mississippi and Meramec River flood plains. At one time, loess blanketed all of the uplands. It has been eroded off of many of the side slopes and a few of the ridgetops in the western and southwestern parts of St. Louis County. On the rest of the uplands, the loess cap is several feet to more than 20 feet thick. The thickest deposits are adjacent to the Missouri River bluffs. The Menfro, Winfield, Iva, and Harvester soils and their associated Urban land complexes formed in loess.

Alluvium is soil material that was transported by water and deposited on the nearly level flood plains of streams. In the Missouri and Mississippi River flood plains, most of this material came from out of the area, and much of it came from out of the state. The alluvium ranges from clay and silt to fine sand. Sarpy soils formed in the sandy materials, Booker and Waldron soils formed in the clayey materials, and Eudora and Blake soils formed in the silty and loamy materials.

The alluvial material in the tributary stream flood plains and the Meramec River flood plains came primarily from the surrounding loess and residuum exposures on the uplands. The Elsah, Haymond, and Wilbur soils formed in this material.

Stream terraces are former flood plains that have been abandoned because of downcutting of the stream to a lower elevation. The rather extensive terrace systems along the Meramec River and tributary streams consist of loess over silty, loamy, or clayey alluvium. The Freeburg, Bremer, Ashton, and Weller soils formed on these stream terraces.

Nevin soils formed in lacustrine material in old lakebeds. These lakebed deposits appear to have been loess that was blown or washed into the shallow lake water.

Residual material in St. Louis County consists primarily of material that weathered from thick beds of cherty and chert free limestone rock, separated by thinner beds of shale and sandstone (*12*). The Clarksville and Goss soils formed in the cherty limestone residuum, and Gasconade soils formed in the chert free limestone residuum. The Union soils formed in loess and the underlying cherty limestone residuum, and Crider soils formed in loess and the underlying chert free limestone residuum.

climate

Climate has been an important factor in formation of the soils in the survey area. In the past several hundred thousand years, variations in the climate have drastically affected the area (*14*).

St. Louis County and St. Louis City have a subhumid, midcontinental climate that has changed little, except for minor fluctuations, in the past 8,000 years. This period was favorable for the growth of the forest vegetation that the settlers found when they first arrived.

Thousands of years of cooler and more moist climatic conditions, followed by thousands of years of warmer temperatures, much like the present, were responsible for the advance and retreat of the continental glaciers. The last great ice sheet is thought to have come close to, but not into, St. Louis County. The area was certainly affected by the close proximity of the ice sheet which started melting more than 20,000 years ago (*15*). A few areas of glacial gravel are in the county, notably the "Grover gravel" which was exposed in a road cut on Highway 100 east of the junction of Highway T, and in some gravel pits along the north side of Rockwoods Reservation (*6*). Also, a glacial gravel deposit is exposed on the ridgetop behind the Claymont Shopping Center. These areas are at high points in the landscape, and the gravel could have floated in as part of large blocks of ice. At times during the glacial melting, the Missouri River was at least partially dammed by iceflows. The size of the lower Meramec River valley suggests that in these times it could have carried part of the Missouri River overflow while the Missouri River was partially blocked.

In the winter when the melting ceased and the water levels dropped, large mudflats were exposed along the streams that carried melt water. The prevailing westerly winds picked up dust, or loess, from the mudflats and deposited it on the uplands. This continued for several centuries.

Local conditions can modify the influence of the general climate in a region. For example, south- and west-facing slopes are warmer and dryer than north- and east-facing slopes. This has a noticeable effect on the quality of timber on ridges in the southwestern part of St. Louis County. Also, low lying poorly drained bottom lands stay wetter and cooler longer in the spring than the higher and better drained soils around them. These local climatic differences contribute to the observable differences in the soils.

plants and animals

Plants, burrowing animals, insects, bacteria, and fungi are important in the formation of soils (*16*). They affect the organic matter, plant nutrients, structure, and porosity of soils. Most of the soils in the survey area were formed under forest vegetation. They had a high accumulation of organic matter on or near the surface. When the soil was cleared for farming, this organic layer was mixed with the plow layer and was soon oxidized. Therefore, cultivated forested soils characteristically have a gray or light brown surface horizon and very low organic matter content. Exceptions are the dark colored, clayey soils on bottom lands and terraces, such as the Booker and Bremer soils.

The Nevin soils are in old lakebeds (*6*). Before they were cultivated, they were probably covered with tall prairie grasses and, prior to that, marsh grasses. They have relatively high organic matter content to a depth of 2 feet or more.

Worms, insects, burrowing animals, and large animals affect and disturb the soil. Bacteria and fungi contribute more toward the formation of soils than do animals. Bacteria and fungi cause rotting of organic materials, improve tilth, and fix nitrogen in the soils. The population of soil organisms is directly related to the rate of decomposition of organic material in the soil. The kinds of organisms in a given area and their activity are determined by the differences in vegetation.

Man has had a tremendous effect on the soils in the survey area during the past 175 years. First, the timber was cleared for farming and to furnish building materials. The soils in the northeastern two-thirds of the area have the potential to produce moderately high to high crop yields, but they have been almost completely converted to urban uses. Man has cut, filled, reshaped, and graded the soils, until in many parts of the county an undisturbed soil profile is difficult to find.

relief

Relief influences soil formation mostly through its effect on drainage, runoff, and erosion.

The amount of water entering and passing through the soil depends on the steepness of the slope, the permeability of the soil material, and the amount and intensity of rainfall. Because runoff is rapid on steep slopes, very little water passes through the soil material, resulting in little development of distinct horizons. Runoff is slight on the gently sloping or nearly level soils, and most of the water passes through the soil material. Such soils have maximum profile development. On similar slopes, soils that have rapid permeability form more slowly than soils that have slow permeability.

Geologic erosion occurs independently of the actions of man. Its rate depends primarily on the amount of slope, the kind of material at the surface, the type of vegetation, and the aspect or direction that the land slopes. The survey area was nearly all forested, so the effects of different kinds of vegetation are negated.

In the survey area, steep south- and west-facing slopes receive more direct sunrays than north- and east-facing slopes, so they are more droughty. Timber stands are thinner and the growth rate is slower on the south- and west-facing slopes. This leaves the soil more exposed to rainfall and more subject to erosion. Therefore, the loess cap has been completely eroded off of many south- and west-facing slopes in the western part of St. Louis County, but it remains on the corresponding north- and east-facing slopes.

Geologic erosion proceeds quite slowly on level and nearly level areas. For example, Iva soils formed in loess about 12 feet thick on the broad divides in the central part of the county. This loess covers a buried soil that is much older and has a thicker and more clayey subsoil than Iva soils. Probably, the Iva soils formed on the present land surface as a result of the restricted movement of water through the subsoil of the buried soil.

Where the buried soil is absent, soils that differ from Iva soils formed.

time

The degree of profile development of a soil is reflected by the length of time that the parent material has been in place and subject to weathering. Young soils show little profile development or horizon differentiation. Old soils show the effects of clay movement and leaching, and they have distinct horizons.

Alluvial soils and the manmade Harvester and Fishpot soils are the youngest soils in the survey area. Alluvial soils on the Missouri River side of the levees and on the small stream flood plains have material added to the surface with each flood. They have little or no profile development. Areas of Harvester and Fishpot soils are being created almost daily as new subdivisions are being built. Most of the acreage of Harvester and Fishpot soils is less than 100 years old.

The soils on the loess-covered uplands and terraces are intermediate in age. They formed after the loess deposition ceased, about 15,000 years ago. The soils that formed in loess on the steeper slopes are somewhat younger. The lacustrine soils formed after the lakes were drained, and they are comparable in age to the soils that developed on the steeper loess-covered uplands.

The oldest soils in the survey area formed in cherty limestone residuum. Examples are the Clarksville and Goss soils. Some of these soils that formed in residual materials are probably more than 100,000 years old. To establish the age for the Gasconade soils, which are thin and have little profile development, is difficult.

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glossary

ABC soil. A soil having an A, a B, and a C horizon.

Ablation till. Loose, permeable till deposited during the final downwasting of glacial ice. Lenses of crudely sorted sand and gravel are common.

AC soil. A soil having only an A and a C horizon. Commonly such soil formed in recent alluvium or on steep rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	More than 12

Basal till. Compact glacial till deposited beneath the ice.

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bedding planes. Fine stratifications, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediments.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Broad-base terrace. A ridge-type terrace built to control erosion by diverting runoff along the contour at a nonscouring velocity. The terrace is 10 to 20 inches high and 15 to 30 feet wide and has gently sloping sides, a rounded crown, and a dish-shaped channel along the upper side. It may be nearly level or have a grade toward one or both ends.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Chiseling. Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface. A form of emergency tillage to control soil blowing.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

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

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15.2 to 38.1 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

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

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

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

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Compressible (in tables). Excessive decrease in volume of soft soil under load.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

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

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Excess lime (in tables). Excess carbonates in the soil that restrict the growth of some plants.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grains are grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, and clay.

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

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist, 6 to 15 inches (15 to 37.5 centimeters) long.

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

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

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

Fragile (in tables). A soil that is easily damaged by use or disturbance.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

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

Gilgai. Commonly a succession of microbasins and microknolls in nearly level areas or of microvalleys and microridges parallel with the slope. Typically, the microrelief of Vertisols—clayey soils having a high coefficient of expansion and contraction with changes in moisture content.

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

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial melt water.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciofluvial deposits (geology). Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial melt water. Many deposits are interbedded or laminated.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Graded stripcropping. Growing crops in strips that grade toward a protected waterway.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

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

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual*. The major horizons of mineral soil are as follows:

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

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

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

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

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake in inches per hour is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Intermediate Regional flood. A flood having an average frequency of occurrence of 1 in 100 years, although the flood may occur in any year. It is based on statistical analyses of stream flow records available for the watershed and on analyses of rainfall and runoff characteristics in the "general region of the watershed."

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

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

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

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

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

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

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

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

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

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

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

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

Low strength. The soil is not strong enough to support loads.

Mechanically aided aeration system. A one or two stage septic tank system that contains an electric pump. The pump increases the rate of aerobic decomposition, thus the size and efficiency requirements for a filter field are reduced. This type of waste treatment system can be used in places where community sewers are not available. It can also be used if the soil is not suitable or the available area is too small for standard septic tanks and filter fields, also where sanitary lagoons are impractical or prohibited.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Sandy loam and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Narrow-base terrace. A terrace no more than 4 to 8 feet wide at the base. A narrow-base terrace is similar to a broad-base terrace, except for the width of the ridge and channel.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Open space. A relatively undeveloped green or wooded area provided mainly within an urban area to minimize feelings of congested living.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash, glacial. Stratified sand and gravel produced by glaciers and carried, sorted, and deposited by glacial melt water.

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

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan*.

Parent material. The unconsolidated organic and mineral material in which soil forms.

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

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

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.20 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. The water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor filter (in tables). Because of rapid permeability or an impermeable layer near the surface, the soil may not adequately filter effluent from a waste disposal system.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

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

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

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

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rippable. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

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

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and runoff water.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silica-sesquioxide ratio. The ratio of the number of molecules of silica to the number of molecules of alumina and iron oxide. The more highly weathered soils or their clay fractions in warm-temperate, humid regions, and especially those in the tropics, generally have a low ratio.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slippage (in tables). Soil mass susceptible to movement downslope when loaded, excavated, or wet.

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

Slope (in tables). Slope is great enough that special practices are required to insure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

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

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

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

Soil separates. Mineral particles less than 2 mm in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Standard Project flood. The flood that may be expected from the most severe combination of meteorological and hydrological conditions that are considered reasonably characteristic of the geographical area in which the drainage basin is located, excluding extremely rare combinations. Peak discharges for these floods are generally about 40 to 60 percent of the probable maximum floods for the same basins. Such floods, as used by the Corps of Engineers, are intended as practicable—expressions of degree of protection that should be sought in the design of flood control works, the failure of which might be disastrous.

Stone line. A concentration of coarse fragments in a soil. Generally it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A1, A2, or A3) below the surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Surface soil. The A horizon. Includes all subdivisions of this horizon (A1, A2, and A3).

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

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

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

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

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

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

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, are in soils in extremely small amounts. They are essential to plant growth.

Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

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

Urban density. Urban density denotes structures per acre. *High* indicates more than 3; *medium,* 1 to 3; and *low,* 1.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial melt water. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

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

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

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

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

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

tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1951-76 at St. Louis]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[1]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	39.0	21.0	30.0	71	-7	0	1.73	.71	2.55	4	4.3
February---	44.2	25.6	34.9	74	0	9	2.19	.89	3.24	5	3.9
March------	53.4	32.9	43.2	85	10	68	3.00	1.82	4.04	7	4.6
April------	67.0	45.1	56.1	90	25	210	3.59	2.03	4.86	8	.4
May--------	76.2	54.6	65.4	93	34	482	3.67	2.00	5.03	7	.0
June-------	85.2	64.3	74.8	98	48	744	3.85	1.67	5.62	7	.0
July-------	88.8	68.5	78.7	101	53	890	3.51	1.68	5.00	6	.0
August-----	87.3	66.4	76.9	101	52	834	2.52	.96	3.77	5	.0
September--	80.3	58.5	69.4	97	40	582	2.73	1.20	3.97	6	.0
October----	69.1	47.1	58.2	89	28	282	2.27	.89	3.37	5	.0
November---	53.8	35.0	44.4	78	12	33	2.45	1.09	3.55	5	1.6
December---	42.4	25.8	34.1	72	-1	11	2.30	.76	3.52	6	3.0
Yearly:											
Average--	65.6	45.4	55.5	---	---	---	---	---	---	---	---
Extreme--	---	---	---	104	-8	---	---	---	---	---	---
Total----	---	---	---	---	---	4,145	33.81	28.12	39.25	71	17.8

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

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Recorded in the period 1951-76 at St. Louis]

Probability	Temperature: 24° F or lower	Temperature: 28° F or lower	Temperature: 32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	April 7	April 12	April 25
2 years in 10 later than--	April 1	April 8	April 20
5 years in 10 later than--	March 22	March 31	April 11
First freezing temperature in fall:			
1 year in 10 earlier than--	November 1	October 23	October 12
2 years in 10 earlier than--	November 6	October 28	October 17
5 years in 10 earlier than--	November 14	November 5	October 27

TABLE 3.--GROWING SEASON

[Recorded in the period 1951-76 at St. Louis]

Probability	Daily minimum temperature during growing season: Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	217	200	176
8 years in 10	223	206	184
5 years in 10	236	219	198
2 years in 10	249	231	213
1 year in 10	256	237	220

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

Map symbol	Soil name	Acres	Percent
1B	Winfield silt loam, 2 to 5 percent slopes	2,310	0.6
1C	Winfield silt loam, 5 to 9 percent slopes	5,418	1.5
1D	Winfield silt loam, 9 to 14 percent slopes	9,844	2.5
2B	Menfro silt loam, 2 to 5 percent slopes	3,726	1.0
2C	Menfro silt loam, 5 to 9 percent slopes	10,897	2.8
2D	Menfro silt loam, 9 to 14 percent slopes	13,386	3.5
2E	Menfro silt loam, 14 to 20 percent slopes	10,959	2.9
2F	Menfro silt loam, 20 to 45 percent slopes	17,837	4.7
3D	Clarksville cherty silt loam, 5 to 14 percent slopes	852	0.2
3F	Clarksville cherty silt loam, 14 to 50 percent slopes	4,313	1.2
4D	Union silt loam, 9 to 14 percent slopes	951	0.3
5A	Iva silt loam, 1 to 3 percent slopes	631	0.2
6A	Urban land, bottom land, 0 to 3 percent slopes	5,828	1.6
7B	Urban land, upland, 0 to 5 percent slopes	13,952	3.7
8E	Goss silt loam, 14 to 20 percent slopes	2,502	0.7
10D	Gasconade-Rock outcrop complex, 5 to 14 percent slopes	287	0.1
10F	Gasconade-Rock outcrop complex, 14 to 50 percent slopes	9,806	2.6
12	Nevin silt loam	908	0.3
13D	Goss cherty silt loam, 5 to 14 percent slopes	958	0.3
13F	Goss cherty silt loam, 14 to 45 percent slopes	9,910	2.6
14C	Menfro silt loam, karst, 2 to 14 percent slopes	5,861	1.6
14E	Menfro silt loam, karst, 9 to 30 percent slopes	3,471	1.0
16C	Urban land-Harvester complex, karst, 2 to 9 percent slopes	13,511	3.6
16D	Urban land-Harvester complex, karst, 9 to 20 percent slopes	2,145	0.6
17D	Crider-Menfro silt loams, 5 to 14 percent slopes	410	0.1
17F	Crider-Menfro silt loams, 14 to 30 percent slopes	6,341	1.8
18A	Urban land-Harvester complex, 0 to 2 percent slopes	9,990	2.6
18C	Urban land-Harvester complex, 2 to 9 percent slopes	63,002	16.8
18D	Urban land-Harvester complex, 9 to 20 percent slopes	24,164	6.4
19C	Urban land-Goss complex, 2 to 9 percent slopes	368	0.1
19D	Urban land-Goss complex, 9 to 20 percent slopes	801	0.2
20B	Fishpot-Urban land complex, 0 to 5 percent slopes	13,076	3.3
21B	Winfield-Urban land complex, 2 to 5 percent slopes	4,546	1.3
21C	Winfield-Urban land complex, 5 to 9 percent slopes	7,105	2.0
21D	Winfield-Urban land complex, 9 to 20 percent slopes	2,324	0.6
22A	Iva-Urban land complex, 1 to 3 percent slopes	2,129	0.6
23B	Menfro-Urban land complex, 2 to 5 percent slopes	710	0.2
23C	Menfro-Urban land complex, 5 to 9 percent slopes	4,343	1.2
23D	Menfro-Urban land complex, 9 to 20 percent slopes	1,480	0.4
24	Nevin-Urban land complex	8,055	2.1
27	Pits, sand and gravel	775	0.2
28	Pits, quarry	1,453	0.4
29	Dumps-Orthents complex	258	0.1
31	Elsah silt loam	1,636	0.5
32	Haymond silt loam	3,127	0.9
33	Wilbur silt loam	5,305	1.5
40	Eudora silt loam	3,985	1.1
41	Booker clay	1,091	0.3
42	Blake silty clay loam	12,166	3.2
43	Waldron silty clay	3,424	1.0
44	Sarpy loamy fine sand, rarely flooded	936	0.3
45	Sarpy loamy fine sand, frequently flooded	1,670	0.5
46	Parkville clay	208	0.1
49	Blake-Eudora-Waldron complex	7,731	2.1
52A	Freeburg silt loam, 0 to 2 percent slopes	3,612	1.0
52B	Freeburg silt loam, 2 to 5 percent slopes	3,765	1.0
53A	Bremer silt loam, 1 to 3 percent slopes	273	0.1
55A	Ashton silt loam, 0 to 2 percent slopes	2,862	0.8
55B	Ashton silt loam, 2 to 5 percent slopes	3,214	0.9
56A	Weller silt loam, 0 to 2 percent slopes	555	0.2
56B	Weller silt loam, 2 to 5 percent slopes	450	0.1
	Water areas less than 40 acres	1,181	0.3
	Water areas larger than 40 acres	13,696	3.6
	Total	372,480	100.0

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Corn	Soybeans	Winter wheat	Grain sorghum	Smooth brome	Grass-legume hay
	Bu	Bu	Bu	Bu	AUM*	Ton
1B---------- Winfield	98	38	42	90	8.8	4.4
1C---------- Winfield	92	36	40	82	8.2	4.1
1D---------- Winfield	82	32	35	75	7.4	3.7
2B---------- Menfro	92	35	38	88	8.0	4.2
2C---------- Menfro	84	31	35	78	7.4	4.0
2D---------- Menfro	74	28	32	70	6.8	3.6
2E---------- Menfro	63	22	30	58	6.0	3.0
2F---------- Menfro	---	---	---	---	5.4	---
3D---------- Clarksville	---	---	---	---	---	---
3F---------- Clarksville	---	---	---	---	---	---
4D---------- Union	55	22	30	50	5.8	3.2
5A---------- Iva	95	36	38	84	6.8	4.1
6A**, 7B**. Urban land						
8E---------- Goss	---	---	---	---	5.5	2.7
10D---------- Gasconade-Rock outcrop	---	---	---	---	---	---
10F---------- Gasconade-Rock outcrop	---	---	---	---	---	---

See footnotes at end of table.

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

Soil name and map symbol	Corn	Soybeans	Winter wheat	Grain sorghum	Smooth brome	Grass-legume hay
	Bu	Bu	Bu	Bu	AUM*	Ton
12------------------------ Nevin	108	40	45	100	8.0	4.8
13D----------------------- Goss	---	---	---	---	---	---
13F----------------------- Goss	---	---	---	---	---	---
14C----------------------- Menfro	78	31	35	72	7.4	3.7
14E----------------------- Menfro	---	---	---	---	6.0	3.0
16C----------------------- Urban land-Harvester	---	---	---	---	---	---
16D----------------------- Urban land-Harvester	---	---	---	---	---	---
17D----------------------- Crider-Menfro	74	28	32	70	6.8	3.4
17F----------------------- Crider-Menfro	---	---	---	---	---	---
18A----------------------- Urban land-Harvester	---	---	---	---	---	---
18C----------------------- Urban land-Harvester	---	---	---	---	---	---
18D----------------------- Urban land-Harvester	---	---	---	---	---	---
19C----------------------- Urban land-Goss	---	---	---	---	---	---
19D----------------------- Urban land-Goss	---	---	---	---	---	---
20B----------------------- Fishpot-Urban land	---	---	---	---	---	---
21B----------------------- Winfield-Urban land	---	---	---	---	---	---
21C----------------------- Winfield-Urban land	---	---	---	---	---	---

See footnotes at end of table.

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

Soil name and map symbol	Corn	Soybeans	Winter wheat	Grain sorghum	Smooth brome	Grass-legume hay
	Bu	Bu	Bu	Bu	AUM*	Ton
21D------------------------ Winfield-Urban land	---	---	---	---	---	---
22A------------------------ Iva-Urban land	---	---	---	---	---	---
23B------------------------ Menfro-Urban land	---	---	---	---	---	---
23C------------------------ Menfro-Urban land	---	---	---	---	---	---
23D------------------------ Menfro-Urban land	---	---	---	---	---	---
24------------------------- Nevin-Urban land	---	---	---	---	---	---
27**, 28**. Pits						
29------------------------- Dumps-Orthents	---	---	---	---	---	---
31------------------------- Elsah	60	23	35	50	5.1	2.7
32------------------------- Haymond	105	39	42	97	7.6	4.3
33------------------------- Wilbur	100	36	40	90	7.3	4.1
40------------------------- Eudora	105	45	50	100	7.5	4.3
41------------------------- Booker	55	25	28	60	7.3	2.5
42***---------------------- Blake	98	37	41	90	6.3	3.9
43***---------------------- Waldron	92	35	38	80	7.6	3.8
44------------------------- Sarpy	---	---	20	---	1.8	1.5
45------------------------- Sarpy	---	---	15	---	1.8	0.9

See footnotes at end of table.

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

Soil name and map symbol	Corn	Soybeans	Winter wheat	Grain sorghum	Smooth brome	Grass-legume hay
	Bu	Bu	Bu	Bu	AUM*	Ton
46***: Parkville	83	28	34	75	7.3	3.8
49: Blake-Eudora-Waldron	92	36	43	85	6.3	4.2
52A: Freeburg	92	35	38	80	7.3	4.0
52B: Freeburg	86	33	36	75	7.1	3.8
53A: Bremer	90	35	38	80	6.3	4.5
55A, 55B: Ashton	100	40	45	95	7.8	4.5
56A: Weller	90	34	36	80	6.9	4.0
56B: Weller	84	30	33	75	6.5	4.0

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.
** See description of the map unit for composition and behavior characteristics of the map unit.
*** Yields are for areas protected from flooding.

TABLE 6.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

[The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil]

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of-- <8	8-15	16-25	26-35	>35
1B, 1C, 1D: Winfield	---	Amur honeysuckle, Amur privet, silky dogwood, American cranberrybush.	Northern white-cedar, blue spruce, white fir, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
2B, 2C, 2D, 2E, 2F: Menfro	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	Northern white-cedar, Washington hawthorn, blue spruce, white fir.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
3D, 3F. Clarksville					
4D: Union	---	American cranberrybush, Tatarian honeysuckle, Amur honeysuckle, Washington hawthorn, Amur privet, eastern redcedar, arrowwood.	Green ash, osageorange, Austrian pine.	Eastern white pine, pin oak.	---
5A: Iva	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
6A*, 7B*. Urban land					
8E: Goss	Siberian peashrub	Lilac, Amur honeysuckle, autumn-olive, Tatarian honeysuckle, eastern redcedar, Washington hawthorn, radiant crabapple.	Eastern white pine, jack pine, red pine, Austrian pine.	---	---
10D*, 10F*: Gasconade.					
Rock outcrop.					
12: Nevin	---	Silky dogwood, Amur privet, American cranberrybush, Amur honeysuckle.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.

See footnote at end of table.

TABLE 6.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
13D, 13F: Goss	Siberian peashrub	Lilac, Amur honeysuckle, autumn-olive, Tatarian honeysuckle, eastern redcedar, Washington hawthorn, radiant crabapple.	Eastern white pine, jack pine, red pine, Austrian pine.	---	---
14C, 14E: Menfro	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	Northern white-cedar, Washington hawthorn, blue spruce, white fir.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
16C*, 16D*: Urban land.					
Harvester	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, northern white-cedar, blue spruce, white fir.	Austrian pine, Norway spruce.	Eastern white pine, pin oak.
17D*, 17F*: Crider	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
Menfro	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	Northern white-cedar, Washington hawthorn, blue spruce, white fir.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
18A*, 18C*, 18D*: Urban land.					
Harvester	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, northern white-cedar, blue spruce, white fir.	Austrian pine, Norway spruce.	Eastern white pine, pin oak.
19C*, 19D*: Urban land.					
Goss	Siberian peashrub	Lilac, Amur honeysuckle, autumn-olive, Tatarian honeysuckle, eastern redcedar, Washington hawthorn, radiant crabapple.	Eastern white pine, jack pine, red pine, Austrian pine.	---	---
20B*: Fishpot	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, northern white-cedar, blue spruce, white fir, Austrian pine.	Norway spruce	Eastern white pine, pin oak.

See footnote at end of table.

TABLE 6.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
20B*: Urban land.					
21B*, 21C*, 21D*: Winfield	---	Amur honeysuckle, Amur privet, silky dogwood, American cranberrybush.	Northern white-cedar, blue spruce, white fir, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
Urban land.					
22A*: Iva	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
Urban land.					
23B*, 23C*, 23D*: Menfro	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	Northern white-cedar, Washington hawthorn, blue spruce, white fir.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
Urban land.					
24*: Nevin	---	Silky dogwood, Amur privet, American cranberrybush, Amur honeysuckle.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
Urban land.					
27*, 28*. Pits					
29*: Dumps.					
Orthents.					
31 Elsah	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
32 Haymond	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
33 Wilbur	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.

See footnote at end of table.

TABLE 6.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of-- <8	8-15	16-25	26-35	>35
40 Eudora	---	Tatarian honeysuckle, Siberian peashrub.	Green ash, osageorange, eastern redcedar, northern white-cedar, white spruce, nannyberry viburnum, Washington hawthorn.	Black willow	---
41 Booker	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
42 Blake	---	Tatarian honeysuckle, Siberian peashrub.	Green ash, osageorange, eastern redcedar, northern white-cedar, white spruce, nannyberry viburnum, Washington hawthorn.	Black willow	Eastern cottonwood.
43 Waldron	---	Siberian peashrub, Tatarian honeysuckle.	Washington hawthorn, nannyberry viburnum, eastern redcedar, white spruce, northern white-cedar, green ash, osageorange.	Black willow	Eastern cottonwood.
44 Sarpy	Siberian peashrub	Amur honeysuckle, autumn-olive, eastern redcedar, radiant crabapple, Washington hawthorn, lilac, Tatarian honeysuckle.	---	---	---
45 Sarpy	---	Tatarian honeysuckle, Siberian peashrub.	Osageorange, northern white-cedar, white spruce, nannyberry viburnum, eastern redcedar, Washington hawthorn, green ash.	Black willow	Eastern cottonwood.

See footnote at end of table.

TABLE 6.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of-- <8	8-15	16-25	26-35	>35
46. Parkville	---	Tatarian honeysuckle, Siberian peashrub.	Green ash, osageorange, eastern redcedar, northern white-cedar, white spruce, nannyberry viburnum, Washington hawthorn.	Black willow	Eastern cottonwood.
49*:					
Blake	---	Tatarian honeysuckle, Siberian peashrub.	Green ash, osageorange, eastern redcedar, northern white-cedar, white spruce, nannyberry viburnum, Washington hawthorn.	Black willow	Eastern cottonwood.
Eudora	---	Tatarian honey-suckle, Siberian peashrub.	Green ash, osageorange, eastern redcedar, northern white-cedar, white spruce, nanny-berry viburnum, Washington hawthorn.	Black willow	---
Waldron	---	Siberian peashrub, Tatarian honeysuckle.	Washington hawthorn, nannyberry viburnum, eastern redcedar, white spruce, northern white-cedar, green ash, osageorange.	Black willow	Eastern cottonwood.
52A, 52B. Freeburg	---	American cranberrybush, Amur honeysuckle, silky dogwood, Amur privet.	Northern white-cedar, white fir, blue spruce, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
53A. Bremer	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	Norway spruce, Austrian pine, blue spruce, white fir, northern white-cedar, Washington hawthorn.	Eastern white pine	Pin oak.
55A, 55B. Ashton	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.

See footnote at end of table.

TABLE 6.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
56A, 56B---------- Weller	---	American cranberrybush, Tatarian honeysuckle, Amur honeysuckle, arrowwood, Washington hawthorn, Amur privet, eastern redcedar.	Osageorange, green ash, Austrian pine.	Pin oak, eastern white pine.	---

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

TABLE 7.--RECREATIONAL DEVELOPMENT

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

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
1B: Winfield	Slight	Slight	Moderate: slope.	Severe: erodes easily.	Slight.
1C: Winfield	Slight	Slight	Severe: slope.	Severe: erodes easily.	Slight.
1D: Winfield	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
2B: Menfro	Slight	Slight	Moderate: slope.	Severe: erodes easily.	Slight.
2C: Menfro	Slight	Slight	Severe: slope.	Severe: erodes easily.	Slight.
2D: Menfro	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
2E: Menfro	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
2F: Menfro	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
3D: Clarksville	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Severe: small stones.	Severe: small stones.
3F: Clarksville	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: small stones, slope.
4D: Union	Moderate: slope, wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: wetness, slope.
5A: Iva	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Severe: erodes easily.	Moderate: wetness.
6A*, 7D*. Urban land					
8E: Goss	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: droughty, slope.
10D*:					
Gasconade	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: large stones.	Severe: large stones, thin layer.
Rock outcrop.					
10F*:					
Gasconade	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: large stones, slope.	Severe: large stones, slope, thin layer.
Rock outcrop.					

See footnote at end of table.

TABLE 7.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
12------------------- Nevin	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Slight-----------	Slight
13D------------------ Goss	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight-----------	Severe: droughty.
13F------------------ Goss	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: droughty, slope.
14C------------------ Menfro	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
14E------------------ Menfro	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
16C*: Urban land.					
Harvester-----------	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight-----------	Slight.
16D*: Urban land.					
Harvester-----------	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
17D*: Crider--------------	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight-----------	Moderate: slope.
Menfro--------------	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
17F*: Crider--------------	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Menfro--------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
18A*: Urban land.					
Harvester-----------	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly.	Slight-----------	Slight.
18C*: Urban land.					
Harvester-----------	Moderate: percs slowly.	Moderate: percs slowly	Moderate: slope, percs slowly.	Slight-----------	Slight.
18D*: Urban land.					
Harvester-----------	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
19C*: Urban land.					
Goss----------------	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight-----------	Severe: droughty.

See footnote at end of table.

TABLE 7.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
19D*:					
Urban land.					
Goss	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: droughty, slope.
20B*:					
Fishpot	Severe: floods.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: erodes easily.	Slight.
Urban land.					
21B*:					
Winfield	Slight	Slight	Moderate: slope.	Severe: erodes easily.	Slight.
Urban land.					
21C*:					
Winfield	Slight	Slight	Severe: slope.	Severe: erodes easily.	Slight.
Urban land.					
21D*:					
Winfield	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Urban land.					
22A*:					
Iva	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Severe: erodes easily.	Moderate: wetness.
Urban land.					
23B*:					
Menfro	Slight	Slight	Moderate: slope.	Severe: erodes easily.	Slight.
Urban land.					
23C*:					
Menfro	Slight	Slight	Severe: slope.	Severe: erodes easily.	Slight.
Urban land.					
23D*:					
Menfro	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Urban land.					
24*:					
Nevin	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Slight	Slight.
Urban land.					
27*, 28*. Pits					

See footnote at end of table.

TABLE 7.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
29*: Dumps.					
Orthents.					
31 Elsah	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.	Severe: floods.
32 Haymond	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.	Severe: floods.
33 Wilbur	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.	Severe: floods.
40 Eudora	Severe: floods.	Slight	Slight	Slight	Slight.
41 Booker	Severe: floods, ponding, percs slowly.	Severe: ponding, too clayey, percs slowly.	Severe: too clayey, ponding.	Severe: ponding, too clayey.	Severe: ponding, too clayey.
42 Blake	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Slight	Slight.
43 Waldron	Severe: wetness, too clayey.	Severe: too clayey.	Severe: too clayey, wetness.	Severe: too clayey.	Severe: too clayey.
44 Sarpy	Severe: floods.	Slight	Slight	Slight	Moderate: droughty.
45 Sarpy	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.	Severe: floods.
46 Parkville	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Severe: too clayey.	Severe: too clayey.
49*: Blake	Severe: floods.	Moderate: wetness, floods.	Severe: floods.	Moderate: floods.	Severe: floods.
Eudora	Severe: floods.	Slight	Moderate: floods.	Slight	Moderate: floods.
Waldron	Severe: floods, wetness.	Moderate: floods, wetness.	Severe: wetness, floods.	Moderate: wetness, floods.	Severe: floods.
52A Freeburg	Severe: floods.	Moderate: wetness, percs slowly.	Moderate: wetness, floods.	Severe: erodes easily.	Moderate: wetness, floods.
52B Freeburg	Severe: floods.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, floods.	Severe: erodes easily.	Moderate: wetness, floods.
53A Bremer	Severe: wetness, floods.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
55A, 55B Ashton	Severe: floods.	Slight	Moderate: floods.	Slight	Moderate: floods.

See footnote at end of table.

TABLE 7.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
56A-------------------- Weller	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: erodes easily.	Slight.
56B-------------------- Weller	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: erodes easily.	Slight.

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

TABLE 8.--WILDLIFE HABITAT

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

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
1B Winfield	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
1C, 1D Winfield	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
2B Menfro	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
2C, 2D Menfro	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
2E Menfro	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
2F Menfro	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
3D Clarksville	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
3F Clarksville	Very poor.	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
4D Union	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
5A Iva	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
6A*, 7B*. Urban land										
8E Goss	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
10D*, 10F*: Gasconade	Very poor.	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Rock outcrop.										
12 Nevin	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
13D Goss	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
13F Goss	Very poor.	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
14C Menfro	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
14E Menfro	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
16C*, 16D*: Urban land.										
Harvester.										

See footnote at end of table.

TABLE 8.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
17D*:										
Crider	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Menfro	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
17F*:										
Crider	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Menfro	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
18A*, 18C*, 18D*: Urban land.										
Harvester.										
19C*, 19D*: Urban land.										
Goss	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
20B*: Fishpot.										
Urban land.										
21B*:										
Winfield	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Urban land.										
21C*, 21D*:										
Winfield	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Urban land.										
22A*:										
Iva	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Urban land.										
23B*:										
Menfro	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Urban land.										
23C*, 23D*:										
Menfro	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Urban land.										
24*:										
Nevin	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Urban land.										
27*, 28*. Pits										

See footnote at end of table.

TABLE 8.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba-ceous plants	Hardwood trees	Conif-erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
29*: Dumps.										
Orthents.										
31-----------------Elsah	Fair	Fair	Fair	Good	Fair	Poor	Poor	Fair	Good	Poor.
32-----------------Haymond	Poor	Fair	Fair	Good	Good	Poor	Poor	Fair	Good	Poor.
33-----------------Wilbur	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
40-----------------Eudora	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
41-----------------Booker	Poor	Poor	Fair	Poor	Poor	Poor	Good	Poor	Poor	Fair.
42-----------------Blake	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good.
43-----------------Waldron	Fair	Fair	Poor	Good	Good	Poor	Fair	Fair	Fair	Poor.
44, 45-------------Sarpy	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
46-----------------Parkville	Fair	Fair	Fair	Good	Good	Poor	Fair	Fair	Good	Poor.
49*: Blake--------------	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good.
Eudora------------	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Waldron-----------	Fair	Fair	Poor	Good	Good	Poor	Fair	Fair	Fair	Poor.
52A, 52B-----------Freeburg	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
53A----------------Bremer	Good	Good	Good	Fair	Poor	Good	Good	Good	Fair	Good.
55A, 55B-----------Ashton	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
56A----------------Weller	Good	Good	Fair	Fair	Fair	Poor	Poor	Good	Fair	Poor.
56B----------------Weller	Good	Good	Fair	Fair	Fair	Poor	Poor	Good	Fair	Poor.

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

TABLE 9.--BUILDING SITE DEVELOPMENT

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

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
1B Winfield	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
1C Winfield	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
1D Winfield	Moderate: wetness, slope.	Moderate: shrink-swell, slope.	Moderate: wetness, slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
2B Menfro	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: frost action, low strength.	Slight.
2C Menfro	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Severe: frost action, low strength.	Slight.
2D Menfro	Moderate: slope.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: frost action, low strength.	Moderate: slope.
2E, 2F Menfro	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: frost action, low strength, slope.	Severe: slope.
3D Clarksville	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Severe: small stones.
3F Clarksville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
4D Union	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: wetness.	Severe: slope.	Severe: low strength.	Moderate: wetness, slope.
5A Iva	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
6A*, 7B*. Urban land						
8E Goss	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
10D*:						
Gasconade	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: large stones, thin layer.
Rock outcrop.						
10F*:						
Gasconade	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: large stones, slope, thin layer.

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
10F*:						
Rock outcrop.						
12---------------- Nevin	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: frost action, low strength.	Slight.
13D--------------- Goss	Moderate: too clayey, large stones, slope.	Moderate: shrink-swell, slope, large stones.	Moderate: slope, shrink-swell, large stones.	Severe: slope.	Moderate: low strength, slope, frost action.	Severe: droughty.
13F--------------- Goss	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
14C--------------- Menfro	Moderate: slope.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: frost action, low strength.	Moderate: slope.
14E--------------- Menfro	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: frost action, low strength, slope.	Severe: slope.
16C*:						
Urban land.						
Harvester--------	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
16D*:						
Urban land.						
Harvester--------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
17D*:						
Crider-----------	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
Menfro-----------	Moderate: slope.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: frost action, low strength.	Moderate: slope.
17F*:						
Crider-----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Menfro-----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: frost action, low strength, slope.	Severe: slope.
18A*:						
Urban land.						
Harvester--------	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
18C*:						
Urban land.						
Harvester	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
18D*:						
Urban land.						
Harvester	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
19C*:						
Urban land.						
Goss	Moderate: too clayey, large stones.	Moderate: shrink-swell, large stones.	Moderate: shrink-swell, large stones.	Moderate: shrink-swell, slope, large stones.	Moderate: low strength, frost action.	Severe: droughty.
19D*:						
Urban land.						
Goss	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
20B*:						
Fishpot	Severe: wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: low strength, frost action.	Slight.
Urban land.						
21B*:						
Winfield	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
Urban land.						
21C*:						
Winfield	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
Urban land.						
21D*:						
Winfield	Moderate: wetness, slope.	Moderate: shrink-swell, slope.	Moderate: wetness, slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
Urban land.						
22A*:						
Iva	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Urban land.						

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
23B*:						
Menfro	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: frost action, low strength.	Slight.
Urban land.						
23C*:						
Menfro	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Severe: frost action, low strength.	Slight.
Urban land.						
23D*:						
Menfro	Moderate: slope.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: frost action, low strength.	Moderate: slope.
Urban land.						
24*:						
Nevin	Severe: wetness.	Moderate: wetness, shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: wetness, shrink-swell.	Severe: frost action, low strength.	Slight.
Urban land.						
27*, 28*. Pits						
29*:						
Dumps.						
Orthents.						
31 Elsah	Severe: cutbanks cave, large stones.	Severe: floods, large stones.	Severe: floods, large stones.	Severe: floods, large stones.	Severe: floods, large stones.	Severe: floods.
32 Haymond	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods, frost action.	Severe: floods.
33 Wilbur	Moderate: wetness, floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods, frost action.	Severe: floods.
40 Eudora	Slight	Slight	Slight	Slight	Severe: frost action.	Slight.
41 Booker	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding.	Severe: ponding, too clayey.
42 Blake	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Severe: frost action, low strength.	Slight.
43 Waldron	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, frost action.	Severe: too clayey.
44 Sarpy	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.	Moderate: droughty.
45 Sarpy	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
46 Parkville	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness, frost action.	Severe: too clayey.

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
49*:						
Blake	Severe: wetness.	Severe: floods.	Severe: wetness, floods.	Severe: floods.	Severe: floods, low strength, frost action.	Severe: floods.
Eudora	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods, frost action.	Moderate: floods.
Waldron	Severe: wetness.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: low strength, floods, frost action.	Severe: floods.
52A, 52B Freeburg	Severe: wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: low strength, floods, frost action.	Moderate: wetness, floods.
53A Bremer	Severe: wetness.	Severe: wetness, shrink-swell, floods.	Severe: wetness, shrink-swell, floods.	Severe: wetness, shrink-swell, floods.	Severe: low strength, frost action.	Moderate: wetness.
55A, 55B Ashton	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods, low strength.	Moderate: floods.
56A, 56B Weller	Severe: wetness.	Severe: shrink-swell.	Severe: shrink-swell, wetness.	Severe: shrink-swell.	Severe: shrink-swell, frost action, low strength.	Slight.

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

TABLE 10.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1B Winfield	Severe: wetness.	Severe: wetness.	Moderate: wetness, too clayey.	Moderate: wetness.	Fair: too clayey, wetness.
1C Winfield	Severe: wetness.	Severe: slope, wetness.	Moderate: wetness, too clayey.	Moderate: wetness.	Fair: too clayey, wetness.
1D Winfield	Severe: wetness.	Severe: slope, wetness.	Moderate: wetness, slope, too clayey.	Moderate: wetness, slope.	Fair: too clayey, slope, wetness.
2B Menfro	Slight	Moderate: slope, seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
2C Menfro	Slight	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
2D Menfro	Moderate: slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: slope, too clayey.
2E, 2F Menfro	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
3D Clarksville	Moderate: slope.	Severe: seepage, slope.	Severe: seepage, too clayey.	Severe: seepage.	Poor: too clayey, small stones.
3F Clarksville	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope, too clayey.	Severe: seepage, slope.	Poor: too clayey, small stones, slope.
4D Union	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Moderate: wetness, slope.	Poor: too clayey.
5A Iva	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
6A*, 7B*. Urban land					
8E Goss	Severe: slope.	Severe: seepage, slope.	Severe: slope, too clayey, large stones.	Severe: seepage, slope.	Poor: too clayey, small stones, slope.
10D*:					
Gasconade	Severe: depth to rock.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, large stones.
Rock outcrop.					

See footnote at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
10F*:					
Gasconade	Severe: depth to rock, slope.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, large stones.
Rock outcrop.					
12 Nevin	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
13D Goss	Moderate: percs slowly, slope, large stones.	Severe: seepage, slope.	Severe: too clayey, large stones.	Severe: seepage.	Poor: too clayey, small stones.
13F Goss	Severe: slope.	Severe: seepage, slope.	Severe: slope, too clayey, large stones.	Severe: seepage, slope.	Poor: too clayey, small stones. slope.
14C Menfro	Moderate: slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: slope, too clayey.
14E Menfro	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
16C*:					
Urban land.					
Harvester	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
16D*:					
Urban land.					
Harvester	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
17D*:					
Crider	Moderate: slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Menfro	Moderate: slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: slope, too clayey.
17F*:					
Crider	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Menfro	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
18A*:					
Urban land.					
Harvester	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
18C*:					
Urban land.					

See footnote at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
18C*: Harvester	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
18D*: Urban land.					
Harvester	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
19C*: Urban land.					
Goss	Moderate: percs slowly, large stones.	Severe: seepage.	Severe: too clayey, large stones.	Severe: seepage.	Poor: too clayey, small stones.
19D*: Urban land.					
Goss	Severe: slope.	Severe: seepage, slope.	Severe: slope, too clayey, large stones.	Severe: seepage, slope.	Poor: too clayey, small stones, slope.
20B*: Fishpot	Severe: wetness, percs slowly.	Severe: floods, wetness.	Moderate: floods, wetness.	Moderate: floods, wetness.	Fair: wetness.
Urban land.					
21B*: Winfield	Severe: wetness.	Severe: wetness.	Moderate: wetness, too clayey.	Moderate: wetness.	Fair: too clayey, wetness.
Urban land.					
21C*: Winfield	Severe: wetness.	Severe: slope, wetness.	Moderate: wetness, too clayey.	Moderate: wetness.	Fair: too clayey, wetness.
Urban land.					
21D*: Winfield	Severe: wetness.	Severe: slope, wetness.	Moderate: wetness, slope, too clayey.	Moderate: wetness, slope.	Fair: too clayey, slope, wetness.
Urban land.					
22A*: Iva	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Urban land.					
23B*: Menfro	Slight	Moderate: slope, seepage.	Moderate: too clayey.	Slight	Fair: too clayey.

See footnote at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
23B*:					
Urban land.					
23C*:					
Menfro	Slight	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Urban land.					
23D*:					
Menfro	Moderate: slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: slope, too clayey.
Urban land.					
24*:					
Nevin	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
Urban land.					
27*, 28*. Pits					
29*:					
Dumps.					
Orthents.					
31 Elsah	Severe: floods, large stones.	Severe: seepage, floods, large stones.	Severe: floods, seepage, large stones.	Severe: floods, seepage.	Poor: seepage, large stones.
32 Haymond	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Good.
33 Wilbur	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Fair: wetness.
40 Eudora	Moderate: floods.	Slight	Moderate: floods.	Moderate: floods.	Good.
41 Booker	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
42 Blake	Severe: wetness.	Severe: wetness, seepage.	Severe: wetness, seepage.	Severe: wetness, seepage.	Fair: wetness.
43 Waldron	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
44 Sarpy	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
45 Sarpy	Severe: floods, poor filter.	Severe: seepage, floods.	Severe: floods, seepage, too sandy.	Severe: floods, seepage.	Poor: seepage, too sandy.

See footnote at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
46 Parkville	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Poor: wetness.
49*:					
Blake	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Fair: wetness.
Eudora	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Good.
Waldron	Severe: floods, wetness, percs slowly.	Severe: floods, wetness.	Severe: floods, wetness, too clayey.	Severe: floods, wetness.	Poor: too clayey, hard to pack, wetness.
52A, 52B Freeburg	Severe: floods, wetness, percs slowly.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods.	Fair: too clayey, wetness.
53A Bremer	Severe: percs slowly, wetness.	Severe: wetness, floods.	Severe: wetness.	Severe: wetness.	Poor: wetness.
55A, 55B Ashton	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Fair: too clayey.
56A Weller	Severe: percs slowly, wetness.	Slight	Severe: too clayey, wetness.	Severe: wetness.	Poor: too clayey, hard to pack.
56B Weller	Severe: percs slowly, wetness.	Moderate: slope.	Severe: too clayey, wetness.	Severe: wetness.	Poor: too clayey, hard to pack.

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

TABLE 11.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
1B, 1C---------------- Winfield	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
1D-------------------- Winfield	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
2B, 2C---------------- Menfro	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
2D-------------------- Menfro	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope, too clayey.
2E-------------------- Menfro	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
2F-------------------- Menfro	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
3D-------------------- Clarksville	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
3F-------------------- Clarksville	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
4D-------------------- Union	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
5A-------------------- Iva	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
6A*, 7B*. Urban land				
8E-------------------- Goss	Fair: low strength, large stones, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
10D*:				
Gasconade------------	Poor: area reclaim, large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, large stones.
Rock outcrop.				
10F*:				
Gasconade------------	Poor: area reclaim, large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, large stones, slope.
Rock outcrop.				
12-------------------- Nevin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
13D------------------- Goss	Fair: low strength, large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
13F------------------- Goss	Poor: slope	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
14C------------------- Menfro	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope, too clayey.
14E------------------- Menfro	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
16C*: Urban land.				
Harvester------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
16D*: Urban land.				
Harvester------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
17D*: Crider---------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
Menfro---------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope, too clayey.
17F*: Crider---------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Menfro---------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
18A*: Urban land.				
Harvester------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
18C*: Urban land.				
Harvester------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
18D*: Urban land.				
Harvester------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
19C*: Urban land.				
Goss-----------------	Fair: low strength, large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
19D*:				
Urban land.				
Goss	Fair: low strength, large stones, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
20B*:				
Fishpot	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Urban land.				
21B*, 21C*:				
Winfield	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Urban land.				
21D*:				
Winfield	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
Urban land.				
22A*:				
Iva	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Urban land.				
23B*, 23C*:				
Menfro	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Urban land.				
23D*:				
Menfro	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope, too clayey.
Urban land.				
24*:				
Nevin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Urban land.				
27*, 28*. Pits				
29*:				
Dumps.				
Orthents.				
31 Elsah	Poor: large stones.	Improbable: small stones, large stones.	Improbable: large stones.	Poor: large stones, area reclaim.
32 Haymond	Good	Improbable: excess fines.	Improbable: excess fines.	Good.

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
33 Wilbur	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
40 Eudora	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
41 Booker	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
42 Blake	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
43 Waldron	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
44, 45 Sarpy	Good	Probable	Improbable: too sandy.	Fair: too sandy.
46 Parkville	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
49*:				
Blake	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Eudora	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Waldron	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
52A, 52B Freeburg	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
53A Bremer	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
55A, 55B Ashton	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
56A, 56B Weller	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.

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

TABLE 12.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
1B, 1C------------ Winfield	Moderate: seepage, slope.	Moderate: thin layer, wetness.	Frost action, slope.	Wetness, slope, erodes easily.	Erodes easily, wetness.	Erodes easily.
1D---------------- Winfield	Severe: slope.	Moderate: thin layer, wetness.	Frost action, slope.	Wetness, slope, erodes easily.	Slope, erodes easily, wetness.	Slope, erodes easily.
2B, 2C------------ Menfro	Moderate: slope, seepage.	Slight---------	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
2D, 2E, 2F-------- Menfro	Severe: slope.	Slight---------	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
3D, 3F------------ Clarksville	Severe: seepage, slope.	Moderate: large stones.	Deep to water	Droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
4D---------------- Union	Severe: slope.	Moderate: thin layer, piping, wetness.	Percs slowly, slope.	Wetness, percs slowly, rooting depth.	Slope, erodes easily, wetness.	Slope, erodes easily, rooting depth.
5A---------------- Iva	Moderate: seepage.	Severe: thin layer, wetness.	Percs slowly, frost action.	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
6A*, 7B*. Urban land						
8E---------------- Goss	Severe: slope.	Severe: large stones.	Deep to water	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
10D*, 10F*:						
Gasconade--------	Severe: depth to rock, slope.	Severe: large stones.	Deep to water	Large stones: droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Rock outcrop.						
12---------------- Nevin	Moderate: seepage.	Moderate: wetness.	Frost action---	Wetness--------	Erodes easily, wetness.	Erodes easily.
13D, 13F---------- Goss	Severe: slope.	Severe: large stones.	Deep to water	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
14C, 14E---------- Menfro	Severe: slope.	Slight---------	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
16C*: Urban land.						
Harvester--------	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope----------	Favorable------	Favorable.
16D*: Urban land.						
Harvester--------	Severe: slope.	Severe: piping.	Deep to water	Slope----------	Slope----------	Slope.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
17D*, 17F*:						
Crider	Moderate: seepage.	Severe: piping.	Deep to water	Slope	Slope	Slope.
Menfro	Severe: slope.	Slight	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
18A*:						
Urban land.						
Harvester	Moderate: seepage.	Severe: piping.	Deep to water	Wetness, erodes easily.	Favorable	Favorable.
18C*:						
Urban land.						
Harvester	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope	Favorable	Favorable.
18D*:						
Urban land.						
Harvester	Severe: slope.	Severe: piping.	Deep to water	Slope	Slope	Slope.
19C*:						
Urban land.						
Goss	Moderate: seepage, slope.	Severe: large stones.	Deep to water	Large stones, droughty, slope.	Large stones	Large stones, droughty.
19D*:						
Urban land.						
Goss	Severe: slope.	Severe: large stones.	Deep to water	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
20B*:						
Fishpot	Slight	Moderate: piping, wetness.	Frost action	Wetness, erodes easily.	Erodes easily, wetness.	Erodes easily.
Urban land.						
21B*, 21C*:						
Winfield	Moderate: seepage, slope.	Moderate: thin layer, wetness.	Frost action, slope.	Wetness, slope, erodes easily.	Erodes easily, wetness.	Erodes easily.
Urban land.						
21D*:						
Winfield	Severe: slope.	Moderate: thin layer, wetness.	Frost action, slope.	Wetness, slope, erodes easily.	Slope, erodes easily, wetness.	Slope, erodes easily.
Urban land.						
22A*:						
Iva	Moderate: seepage.	Severe: thin layer, wetness.	Percs slowly, frost action.	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Urban land.						

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
23B*, 23C*:						
Menfro	Moderate: slope, seepage.	Slight	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
Urban land.						
23D*:						
Menfro	Severe: slope.	Slight	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
Urban land.						
24*:						
Nevin	Moderate: seepage.	Moderate: wetness.	Frost action	Wetness	Erodes easily, wetness.	Erodes easily.
Urban land.						
27*, 28*. Pits						
29*:						
Dumps.						
Orthents.						
31 Elsah	Severe: seepage.	Severe: seepage, large stones.	Deep to water	Large stones	Large stones, erodes easily.	Large stones, erodes easily.
32 Haymond	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily, floods.	Erodes easily	Erodes easily.
33 Wilbur	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily, floods.	Erodes easily	Erodes easily.
40 Eudora	Moderate: seepage.	Severe: piping.	Deep to water	Favorable	Erodes easily	Erodes easily.
41 Booker	Slight	Severe: hard to pack, ponding.	Ponding, percs slowly, floods.	Ponding, slow intake, percs slowly.	Ponding, percs slowly.	Wetness, percs slowly.
42 Blake	Severe: seepage.	Severe: piping.	Frost action	Wetness, erodes easily.	Wetness, erodes easily.	Erodes easily.
43 Waldron	Slight	Severe: hard to pack.	Percs slowly, frost action.	Wetness, slow intake, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
44, 45 Sarpy	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
46 Parkville	Moderate: seepage.	Severe: piping, wetness.	Percs slowly, cutbanks cave.	Wetness, slow intake, percs slowly.	Wetness	Wetness, percs slowly.
49*:						
Blake	Severe: seepage.	Severe: piping.	Frost action, floods.	Floods, erodes easily, wetness.	Wetness, erodes easily.	Erodes easily.
Eudora	Moderate: seepage.	Severe: piping.	Deep to water	Floods	Erodes easily	Erodes easily.
Waldron	Slight	Severe: hard to pack.	Percs slowly, floods, frost action.	Wetness, percs slowly, floods.	Wetness, percs slowly.	Wetness, percs slowly.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
52A---------------- Freeburg	Slight----------	Moderate: wetness.	Floods, frost action.	Wetness, erodes easily.	Erodes easily, wetness.	Erodes easily.
52B---------------- Freeburg	Moderate: slope.	Moderate: wetness.	Floods, frost action, slope.	Wetness, slope, erodes easily.	Erodes easily, wetness.	Erodes easily.
53A---------------- Bremer	Slight----------	Severe: wetness, hard to pack.	Frost action---	Wetness--------	Wetness--------	Wetness.
55A, 55B---------- Ashton	Moderate: seepage.	Severe: piping.	Deep to water	Floods---------	Erodes easily	Erodes easily.
56A---------------- Weller	Slight----------	Moderate: hard to pack, wetness.	Percs slowly, frost action.	Percs slowly, wetness.	Wetness, erodes easily.	Percs slowly, erodes easily.
56B---------------- Weller	Moderate: slope.	Moderate: hard to pack, wetness.	Slope, percs slowly, frost action.	Wetness, percs slowly, slope.	Wetness, erodes easily.	Percs slowly, erodes easily.

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

TABLE 13.--ENGINEERING INDEX PROPERTIES

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

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
1B, 1C, 1D------- Winfield	0-16	Silt loam--------	CL	A-6	0	100	100	95-100	90-100	25-40	10-20
	16-49	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	95-100	35-45	20-25
	49-60	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	95-100	90-100	25-35	5-15
2B, 2C, 2D, 2E, 2F-------------- Menfro	0-13	Silt loam--------	CL	A-6	0	100	100	95-100	92-100	25-35	11-20
	13-55	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	95-100	35-45	20-25
	55-60	Silt loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	100	100	95-100	92-100	25-35	5-15
3D--------------- Clarksville	0-14	Cherty silt loam	GC, SC, SM-SC, GP-GC	A-2-4, A-2-6, A-1-A	5-20	30-70	10-60	5-50	5-35	20-40	5-15
	14-66	Very cherty silty clay loam, very cherty silt loam.	GC, SC, SP-SC, GP-GC	A-2-6, A-6	5-20	30-70	10-60	10-50	5-45	30-40	15-25
3F--------------- Clarksville	0-14	Very cherty silt loam.	GC, SC, SM-SC, GP-GC	A-2-4, A-2-6, A-1-A	5-20	30-70	10-60	5-50	5-35	20-40	5-15
	14-66	Very cherty silty clay loam, very cherty silt loam.	GC, SC, SP-SC, GP-GC	A-2-6, A-6	5-20	30-70	10-60	10-50	5-45	30-40	15-25
4D--------------- Union	0-5	Silt loam--------	CL-ML, CL	A-4, A-6	0-5	85-100	85-100	80-95	60-75	22-35	5-15
	5-35	Silty clay loam, silty clay.	CL	A-6, A-7	0-10	85-95	80-90	75-85	65-75	35-50	15-30
	35-60	Silt loam, cherty silt loam, very cherty silty clay loam.	CL	A-7, A-6	0-20	85-95	70-90	65-85	55-75	25-45	8-22
5A--------------- Iva	0-13	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-35	5-15
	13-55	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	80-100	35-50	15-30
	55-60	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
6A*, 7B*. Urban land											
8E--------------- Goss	0-20	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0-5	95-100	90-100	85-100	80-100	22-32	8-20
	20-66	Cherty silty clay loam, cherty silty clay, cherty clay.	GC	A-7	10-45	45-70	40-65	40-50	35-45	50-70	30-40
10D*, 10F*: Gasconade-------	0-10	Flaggy silty clay loam.	CL	A-6	20-70	75-90	70-85	60-75	55-65	30-40	15-25
	10-17	Flaggy silty clay, flaggy clay.	GC	A-2-7	20-70	45-55	40-50	30-40	20-35	55-65	35-45
	17	Unweathered bedrock.									
Rock outcrop.											
12--------------- Nevin	0-24	Silt loam--------	CL, OL	A-6, A-7	0	100	100	100	90-95	35-45	10-20
	24-45	Silty clay loam	CL	A-7	0	100	100	95-100	90-95	40-50	20-30
	45-60	Silty clay loam, silt loam.	CL	A-7	0	100	100	95-100	90-95	40-50	20-30

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
13D, 13F--------- Goss	0-16	Cherty silt loam	ML, CL, CL-ML	A-4	0-10	65-90	65-90	65-90	65-85	20-30	2-8
	16-28	Cherty silt loam, very cherty silty clay loam.	GM, GC, GM-GC	A-2	10-40	40-60	35-55	30-50	25-35	20-30	2-8
	28-55	Cherty silty clay loam, cherty silty clay, cherty clay.	GC	A-7	10-45	45-70	40-65	40-50	35-45	50-70	30-40
	55-60	Silty clay, clay	CL, CH	A-7	0-10	70-100	70-100	70-95	70-95	45-65	20-35
14C, 14E--------- Menfro	0-13	Silt loam--------	CL	A-6	0	100	100	95-100	92-100	25-35	11-20
	13-55	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	95-100	35-45	20-25
	55-60	Silt loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	100	100	95-100	92-100	25-35	5-15
16C*, 16D*: Urban land.											
Harvester-------	0-4	Silt loam--------	CL	A-4, A-6	0	100	100	95-100	90-100	25-35	9-19
	4-37	Silty clay loam, silt loam.	CL	A-6, A-7-6	0	100	100	95-100	90-100	35-45	20-25
	37-60	Silty clay loam, silt loam.	CL	A-6, A-7-6	0	100	98-100	92-98	90-95	35-45	20-25
17D*, 17F*: Crider----------	0-5	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	95-100	90-100	85-100	25-35	4-12
	5-43	Silt loam, silty clay loam.	CL, ML, CL-ML	A-7, A-6, A-4	0	100	95-100	90-100	85-100	25-42	4-20
	43-60	Silty clay, clay, silty clay loam.	CL, CH	A-7, A-6	0-5	85-100	75-100	70-100	60-100	35-65	15-40
Menfro----------	0-13	Silt loam--------	CL	A-6	0	100	100	95-100	92-100	25-35	11-20
	13-55	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	95-100	35-45	20-25
	55-60	Silt loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	100	100	95-100	92-100	25-35	5-15
18A*, 18C*, 18D*: Urban land.											
Harvester-------	0-4	Silt loam--------	CL	A-4, A-6	0	100	100	95-100	90-100	25-35	9-19
	4-37	Silty clay loam, silt loam.	CL	A-6, A-7-6	0	100	100	95-100	90-100	35-45	20-25
	37-60	Silty clay loam, silt loam.	CL	A-6, A-7-6	0	100	98-100	92-98	90-95	35-45	20-25
19C*: Urban land.											
Goss------------	0-11	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0-5	95-100	90-100	85-95	80-90	22-32	8-20
	11-31	Cherty silt loam, cherty silty clay loam.	GM, GC, GM-GC	A-2	10-40	40-60	35-55	30-50	25-35	20-30	2-8
	31-60	Cherty silty clay loam, cherty silty clay, cherty clay.	GC	A-7	10-45	45-70	40-65	40-50	35-45	50-70	30-40
19D*: Urban land.											
Goss------------	0-15	Cherty silt loam	ML, CL, CL-ML	A-4	0-10	65-90	65-90	65-90	65-85	20-30	2-8
	15-60	Cherty silty clay loam, cherty silty clay, cherty clay.	GC	A-7	10-45	45-70	40-65	40-50	35-45	50-70	30-40

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification Unified	Classification AASHTO	Fragments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
20B*:											
Fishpot----------	0-47	Silt loam--------	CL	A-6, A-7-6	---	100	100	95-100	92-99	20-45	10-25
	47-60	Silt loam, silty clay loam.	CL	A-6, A-7-6	---	100	100	95-100	92-99	30-45	15-25
Urban land.											
21B*, 21C*, 21D*:											
Winfield---------	0-16	Silt loam--------	CL	A-6	0	100	100	95-100	90-100	25-40	10-20
	16-49	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	95-100	35-45	20-25
	49-60	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	95-100	90-100	25-35	5-15
Urban land.											
22A*:											
Iva--------------	0-13	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-35	5-15
	13-55	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	80-100	35-50	15-30
	55-60	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
Urban land.											
23B*, 23C*, 23D*:											
Menfro-----------	0-13	Silt loam--------	CL	A-6	0	100	100	95-100	92-100	25-35	11-20
	13-55	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	95-100	35-45	20-25
	55-60	Silt loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	100	100	95-100	92-100	25-35	5-15
Urban land.											
24*:											
Nevin------------	0-24	Silt loam--------	CL, OL	A-6, A-7	0	100	100	100	90-95	35-45	10-20
	24-45	Silty clay loam	CL	A-7	0	100	100	95-100	90-95	40-50	20-30
	45-60	Silty clay loam, silt loam.	CL	A-7	0	100	100	95-100	90-95	40-50	20-30
Urban land.											
27*, 28*. Pits											
29*:											
Dumps.											
Orthents.											
31--------------- Elsah	0-7	Silt loam--------	CL	A-4, A-6	0-15	95-100	90-100	90-100	85-100	22-32	8-15
	7-33	Cherty loam, very cherty loam, very cherty silt loam.	SM, ML, CL, SC	A-2, A-4	15-60	80-90	70-85	60-80	30-70	<30	NP-8
	33-60	Very cherty loam, very cobbly loam.	GM, GP-GM	A-1	60-85	20-50	20-45	20-40	10-25	<30	NP-6
32--------------- Haymond	0-5	Silt loam--------	ML	A-4	0	100	100	90-100	80-90	27-36	4-10
	5-60	Silt loam--------	ML	A-4	0	100	100	90-100	80-90	27-36	4-10
33--------------- Wilbur	0-6	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
	6-60	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
40--------------- Eudora	0-12	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	100	95-100	60-98	20-35	2-11
	12-60	Silt loam, very fine sandy loam.	ML, CL, CL-ML	A-4	0	100	100	95-100	60-98	10-25	NP-10
41--------------- Booker	0-11	Clay-------------	CL, CH	A-7	0	100	100	95-100	95-100	45-70	30-45
	11-60	Clay-------------	CH	A-7	0	100	100	100	95-100	65-85	40-55

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct					Pct	
42----------------- Blake	0-23	Silty clay loam	CL	A-7, A-6	0	100	100	90-100	85-95	35-50	15-30
	23-60	Silt loam, loam, very fine sandy loam.	ML, CL	A-4, A-6	0	100	100	80-90	75-90	30-40	5-15
43----------------- Waldron	0-7	Silty clay--------	CL, CH	A-7	0	100	100	95-100	95-100	45-65	30-45
	7-60	Stratified silty clay loam to clay.	CL, CH	A-7	0	100	100	95-100	90-100	40-65	20-45
44,45------------- Sarpy	0-6	Loamy fine sand	SM	A-2-4	0	100	100	60-80	15-35	---	NP
	6-60	Fine sand, loamy fine sand, sand.	SM, SP, SP-SM	A-2-4, A-3	0	100	100	60-80	2-35	---	NP
46----------------- Parkville	0-18	Clay--------------	CH	A-7	0	100	100	97-100	95-100	55-80	30-55
	18-53	Stratified loamy fine sand to very fine sandy loam.	SM, SM-SC	A-2, A-4	0	100	100	60-95	20-50	<20	NP-5
49*:											
Blake------------	0-23	Silty clay loam	CL	A-7, A-6	0	100	100	90-100	85-95	35-50	15-30
	23-60	Silt loam, loam, very fine sandy loam.	ML, CL	A-4, A-6	0	100	100	80-90	75-90	30-40	5-15
Eudora-----------	0-12	Silt loam---------	ML, CL, CL-ML	A-4, A-6	0	100	100	95-100	60-98	20-35	2-11
	12-60	Silt loam, very fine sandy loam.	ML, CL, CL-ML	A-4	0	100	100	95-100	60-98	10-25	NP-10
Waldron----------	0-7	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	90-100	30-45	15-25
	7-60	Stratified silt loam to clay.	CL, CH, ML	A-7, A-6	0	100	100	95-100	85-100	30-65	15-45
52A, 52B--------- Freeburg	0-14	Silt loam---------	CL, CL-ML	A-4, A-6	0	100	100	90-100	90-100	15-35	5-15
	14-60	Silty clay loam	CL	A-6, A-7	0	100	100	85-100	85-100	30-45	15-25
53A--------------- Bremer	0-19	Silt loam, silty clay loam.	CH, CL	A-7	0	100	100	100	95-100	45-60	25-40
	19-42	Silty clay loam, silty clay.	CH, MH	A-7	0	100	100	95-100	95-100	40-60	25-40
	42-60	Silty clay loam	CH, CL	A-7	0	100	100	100	95-100	50-65	20-35
55A, 55B--------- Ashton	0-14	Silt loam---------	ML, CL	A-4	0	95-100	90-100	75-100	60-95	<35	NP-10
	14-42	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6, A-7	0	95-100	90-100	85-100	80-100	25-42	5-20
	42-60	Silt loam, loam, fine sandy loam.	ML, CL, SM, CL-ML	A-4, A-6	0-5	90-100	85-100	65-95	40-90	<40	NP-20
56A, 56B--------- Weller	0-13	Silt loam---------	ML, CL	A-6, A-4	0	100	100	100	95-100	30-40	5-15
	13-47	Silty clay loam, silty clay.	CH	A-7	0	100	100	100	95-100	50-65	30-40
	47-60	Silty clay loam	CH, CL	A-7	0	100	100	100	95-100	45-55	20-30

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

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH					Pct
1B, 1C, 1D------- Winfield	0-16	20-27	1.30-1.50	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.37	5	6	.5-2
	16-49	27-35	1.30-1.50	0.6-2.0	0.18-0.20	4.5-7.3	Moderate-----	0.37			
	49-60	20-27	1.30-1.50	0.6-2.0	0.20-0.22	5.1-7.3	Low----------	0.37			
2B, 2C, 2D, 2E, 2F-------------- Menfro	0-13	18-27	1.25-1.40	0.6-2.0	0.22-0.24	5.1-7.3	Low----------	0.37	5	6	.5-2
	13-55	27-35	1.35-1.50	0.6-2.0	0.18-0.20	5.1-7.3	Moderate-----	0.37			
	55-60	8-20	1.30-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Low----------	0.37			
3D, 3F---------- Clarksville	0-14	14-20	1.30-1.60	2.0-6.0	0.07-0.12	4.5-6.0	Low----------	0.28	2	8	1-2
	14-66	25-35	1.40-1.65	2.0-6.0	0.06-0.10	4.5-5.5	Low----------	0.28			
4D-------------- Union	0-5	10-27	1.35-1.45	0.6-2.0	0.13-0.21	5.1-6.5	Moderate-----	0.43	4	7	.5-2
	5-35	27-45	1.30-1.40	0.6-2.0	0.13-0.21	4.5-5.5	Moderate-----	0.43			
	35-60	15-35	1.60-1.80	0.06-0.2	0.03-0.05	3.6-5.0	High---------	0.43			
5A-------------- Iva	0-13	18-27	1.25-1.40	0.6-2.0	0.22-0.24	5.1-7.3	Low----------	0.43	4	5	1-3
	13-55	22-30	1.35-1.55	0.6-2.0	0.18-0.20	4.5-6.0	Moderate-----	0.43			
	55-60	10-20	1.35-1.55	0.6-2.0	0.20-0.22	5.6-7.3	Low----------	0.43			
6A*, 7B*. Urban land											
8E-------------- Goss	0-20	10-27	1.30-1.45	2.0-6.0	0.06-0.17	4.5-7.3	Low----------	0.24	2	6	1-2
	20-66	35-60	1.30-1.50	0.6-2.0	0.04-0.09	4.5-7.3	Moderate-----	0.24			
10D*, 10F*: Gasconade-------	0-10	35-50	1.35-1.50	0.6-2.0	0.10-0.12	6.1-7.8	Moderate-----	0.20	2	8	2-4
	10-17	40-60	1.45-1.70	0.2-0.6	0.05-0.07	6.1-7.8	Moderate-----	0.20			
	17	---	---	---	---	---	-------------	----			
Rock outcrop.											
12-------------- Nevin	0-24	26-29	1.30-1.35	0.6-2.0	0.21-0.23	5.6-7.3	Moderate-----	0.32	5	7	4-6
	24-45	30-35	1.30-1.40	0.6-2.0	0.18-0.20	6.1-7.3	Moderate-----	0.43			
	45-60	25-36	1.40-1.45	0.6-2.0	0.18-0.20	6.6-7.3	Moderate-----	0.43			
13D, 13F--------- Goss	0-16	7-27	1.10-1.30	2.0-6.0	0.06-0.17	4.5-6.0	Low----------	0.24	2	6	1-2
	16-28	20-30	1.10-1.30	2.0-6.0	0.06-0.10	4.5-7.3	Low----------	0.24			
	28-55	35-60	1.30-1.50	0.6-2.0	0.04-0.09	4.5-7.3	Moderate-----	0.24			
	55-60	50-90	1.40-1.60	0.6-2.0	0.06-0.10	4.5-7.3	Moderate-----	0.24			
14C, 14E--------- Menfro	0-13	18-27	1.25-1.40	0.6-2.0	0.22-0.24	5.1-7.3	Low----------	0.37	5	6	.5-2
	13-55	27-35	1.35-1.50	0.6-2.0	0.18-0.20	5.1-7.3	Moderate-----	0.37			
	55-60	8-20	1.30-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Low----------	0.37			
16C*, 16D*: Urban land.											
Harvester-------	0-4	18-25	1.40-1.60	0.2-0.6	0.10-0.20	5.6-7.3	Low----------	0.32	5	6	.5-2
	4-37	18-35	1.35-1.60	0.2-0.6	0.10-0.20	5.6-7.3	Moderate-----	0.32			
	37-60	18-35	1.35-1.50	0.6-2.0	0.18-0.24	5.6-7.3	Moderate-----	0.32			
17D*, 17F*: Crider----------	0-5	15-27	1.20-1.40	0.6-2.0	0.19-0.23	5.1-7.3	Low----------	0.32	4	6	.5-2
	5-43	18-35	1.20-1.45	0.6-2.0	0.18-0.23	5.1-7.3	Low----------	0.28			
	43-60	30-60	1.20-1.55	0.6-2.0	0.12-0.18	4.5-6.5	Moderate-----	0.28			
Menfro----------	0-13	18-27	1.25-1.40	0.6-2.0	0.22-0.24	5.1-7.3	Low----------	0.37	5	6	.5-2
	13-55	27-35	1.35-1.50	0.6-2.0	0.18-0.20	5.1-7.3	Moderate-----	0.37			
	55-60	8-20	1.30-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Low----------	0.37			

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	G/cm³	In/hr	In/in	pH					Pct
18A*, 18C*, 18D*:											
Urban land.											
Harvester-------	0-4	18-25	1.40-1.60	0.2-0.6	0.10-0.20	5.6-7.3	Low----------	0.32	5	6	.5-2
	4-37	18-35	1.35-1.60	0.2-0.6	0.10-0.20	5.6-7.3	Moderate-----	0.32			
	37-60	18-35	1.35-1.50	0.6-2.0	0.18-0.24	5.6-7.3	Moderate-----	0.32			
19C*:											
Urban land.											
Goss------------	0-11	10-27	1.30-1.45	2.0-6.0	0.06-0.17	4.5-6.0	Low----------	0.24	2	6	1-2
	11-31	20-30	1.10-1.30	2.0-6.0	0.06-0.10	4.5-7.3	Low----------	0.24			
	31-60	35-60	1.30-1.50	0.6-2.0	0.04-0.09	4.5-7.3	Moderate-----	0.24			
19D*:											
Urban land.											
Goss------------	0-15	7-27	1.10-1.30	2.0-6.0	0.06-0.17	4.5-6.0	Low----------	0.24	2	6	1-2
	15-60	35-60	1.30-1.50	0.6-2.0	0.04-0.09	4.5-7.3	Moderate-----	0.24			
20B*:											
Fishpot---------	0-47	18-30	1.40-1.60	0.2-0.6	0.10-0.24	5.6-7.3	Moderate-----	0.37	5	6	.5-2
	47-60	18-35	1.30-1.45	0.2-0.6	0.18-0.20	5.6-7.3	Moderate-----	0.37			
Urban land.											
21B*, 21C*, 21D*:											
Winfield--------	0-16	20-27	1.30-1.50	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.37	5	6	.5-2
	16-49	27-35	1.30-1.50	0.6-2.0	0.18-0.20	4.5-7.3	Moderate-----	0.37			
	49-60	20-27	1.30-1.50	0.6-2.0	0.20-0.22	5.1-7.3	Low----------	0.37			
Urban land.											
22A*:											
Iva-------------	0-13	18-27	1.25-1.40	0.6-2.0	0.22-0.24	5.1-7.3	Low----------	0.43	4	5	1-3
	13-55	22-30	1.35-1.55	0.6-2.0	0.18-0.20	4.5-6.0	Moderate-----	0.43			
	55-60	10-20	1.35-1.55	0.6-2.0	0.20-0.22	5.6-7.3	Low----------	0.43			
Urban land.											
23B*, 23C*, 23D*:											
Menfro----------	0-13	18-27	1.25-1.40	0.6-2.0	0.22-0.24	5.1-7.3	Low----------	0.37	5	6	.5-2
	13-55	27-35	1.35-1.50	0.6-2.0	0.18-0.20	5.1-7.3	Moderate-----	0.37			
	55-60	8-20	1.30-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Low----------	0.37			
Urban land.											
24*:											
Nevin-----------	0-24	26-29	1.30-1.35	0.6-2.0	0.21-0.23	5.6-7.3	Moderate-----	0.32	5	7	4-6
	24-45	30-35	1.30-1.40	0.6-2.0	0.18-0.20	6.1-7.3	Moderate-----	0.43			
	45-60	25-36	1.40-1.45	0.6-2.0	0.18-0.20	6.6-7.3	Moderate-----	0.43			
Urban land.											
27*, 28*.											
Pits											
29*:											
Dumps.											
Orthents.											
31--------------	0-7	20-27	1.20-1.40	0.6-2.0	0.17-0.24	5.6-7.3	Low----------	0.37	3	5	1-2
Elsah	7-33	5-20	1.40-1.60	2.0-6.0	0.10-0.15	5.6-7.3	Low----------	0.17			
	33-60	5-15	1.50-1.70	2.0-6.0	0.06-0.11	5.6-7.3	Low----------	0.17			

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH					Pct
32----------------	0-5	10-18	1.30-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low-----------	0.37	5	5	1-3
Haymond	5-60	10-18	1.30-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Low-----------	0.37			
33----------------	0-6	10-17	1.30-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low-----------	0.37	5	5	1-3
Wilbur	6-60	10-17	1.30-1.45	0.6-2.0	0.20-0.22	5.6-7.8	Low-----------	0.37			
40----------------	0-12	5-18	1.30-1.50	0.6-2.0	0.20-0.24	6.1-7.8	Low-----------	0.32	5	5	1-4
Eudora	12-60	5-18	1.35-1.50	0.6-2.0	0.17-0.22	6.6-8.4	Low-----------	0.43			
41----------------	0-11	46-55	1.30-1.50	<0.06	0.12-0.14	5.6-7.3	Very high----	0.28	5	4	1-3
Booker	11-60	60-75	1.30-1.50	<0.06	0.09-0.11	5.6-7.3	Very high----	0.28			
42----------------	0-23	27-35	1.25-1.30	0.6-2.0	0.20-0.22	7.4-8.4	Moderate-----	0.37	5	4L	1-3
Blake	23-60	10-20	1.30-1.35	0.6-6.0	0.20-0.22	7.4-8.4	Low-----------	0.37			
43----------------	0-7	40-50	1.35-1.45	0.06-0.2	0.12-0.14	6.6-7.8	High----------	0.32	5	4	2-4
Waldron	7-60	35-50	1.45-1.60	0.06-0.2	0.10-0.18	7.4-8.4	High----------	0.32			
44, 45------------	0-6	2-5	1.20-1.50	>6.0	0.05-0.09	6.6-8.4	Low-----------	0.15	5	2	<1
Sarpy	6-60	2-5	1.20-1.50	>6.0	0.05-0.09	6.6-8.4	Low-----------	0.15			
46----------------	0-18	40-70	1.30-1.50	<0.06	0.11-0.13	6.6-8.4	High----------	0.28	5	4	1-3
Parkville	18-53	4-25	1.40-1.60	2.0-6.0	0.08-0.18	7.4-8.4	Low-----------	0.28			
49*:											
Blake------------	0-23	27-35	1.25-1.30	0.6-2.0	0.20-0.22	7.4-8.4	Moderate-----	0.37	5	4L	1-3
	23-60	10-20	1.30-1.35	0.6-6.0	0.20-0.22	7.4-8.4	Low-----------	0.37			
Eudora-----------	0-12	5-18	1.30-1.50	0.6-2.0	0.20-0.24	6.1-7.8	Low-----------	0.32	5	5	1-4
	12-60	5-18	1.35-1.50	0.6-2.0	0.17-0.22	6.6-8.4	Low-----------	0.43			
Waldron----------	0-7	30-35	1.35-1.50	0.2-0.6	0.21-0.23	6.6-7.8	Moderate-----	0.32	5	7	2-4
	7-60	35-50	1.45-1.60	0.06-0.2	0.10-0.18	7.4-8.4	High----------	0.32			
52A, 52B----------	0-14	12-25	1.20-1.45	0.6-2.0	0.22-0.24	6.1-7.3	Low-----------	0.37	5	6	.5-2
Freeburg	14-60	27-35	1.40-1.50	0.6-2.0	0.18-0.20	5.1-6.0	Moderate-----	0.37			
53A---------------	0-19	25-32	1.25-1.30	0.6-2.0	0.21-0.23	5.6-7.3	Moderate-----	0.28	5	7	5-7
Bremer	19-42	35-42	1.30-1.40	0.2-0.6	0.15-0.17	6.1-6.5	High----------	0.28			
	42-60	32-38	1.40-1.45	0.2-0.6	0.18-0.20	6.1-6.5	High----------	0.28			
55A, 55B----------	0-14	10-25	1.20-1.40	0.6-2.0	0.16-0.23	5.6-7.3	Low-----------	0.28	4	6	2-4
Ashton	14-42	18-34	1.20-1.50	0.6-2.0	0.18-0.23	5.6-7.3	Low-----------	0.43			
	42-60	10-40	1.25-1.55	0.6-2.0	0.14-0.20	5.6-7.3	Low-----------	0.43			
56A, 56B----------	0-13	16-27	1.35-1.45	0.6-2.0	0.22-0.24	4.5-7.3	Low-----------	0.43	3	6	1-2
Weller	13-47	28-48	1.35-1.50	0.06-0.2	0.12-0.18	4.5-6.0	High----------	0.43			
	47-60	28-40	1.40-1.55	0.2-0.6	0.18-0.20	5.1-6.0	High----------	0.43			

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

TABLE 15.--SOIL AND WATER FEATURES

[The definitions of "flooding" and "water table" in the Glossary explain terms such as "rare," "brief," "apparent," and "perched." The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
1B, 1C, 1D-------- Winfield	B	None--------	---	---	2.5-4.0	Perched	Nov-Apr	>60	---	High-----	Moderate	Moderate.
2B, 2C, 2D, 2E, 2F--------------- Menfro	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Low------	Moderate.
3D, 3F------------ Clarksville	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	High.
4D---------------- Union	C	None--------	---	---	1.5-3.0	Perched	Dec-Mar	>60	---	Moderate	High-----	High.
5A---------------- Iva	C	None--------	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Moderate.
6A*, 7B*. Urban land												
8E---------------- Goss	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
10D*, 10F*: Gasconade--------	D	None--------	---	---	>6.0	---	---	10-20	Hard	Moderate	High-----	Low.
Rock outcrop.												
12---------------- Nevin	B	None--------	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High-----	High-----	Low.
13D, 13F---------- Goss	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
14C, 14E---------- Menfro	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Low------	Moderate.
16C*, 16D*: Urban land.												
Harvester--------	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Low------	Low.
17D*, 17F*: Crider-----------	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Moderate	Moderate.
Menfro-----------	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Low------	Moderate.
18A*, 18C*, 18D*: Urban land.												
Harvester--------	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Low------	Low.

See footnote at end of table.

TABLE 15.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro- logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
19C*, 19D*:												
Urban land.												
Goss	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
20B*:												
Fishpot	C	Rare	---	---	2.0-5.0	Perched	Jan-May	>60	---	High	Moderate	Moderate.
Urban land.												
21B*, 21C*, 21D*:												
Winfield	B	None	---	---	2.5-4.0	Perched	Nov-Apr	>60	---	High	Moderate	Moderate.
Urban land.												
22A*:												
Iva	C	None	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High	High	Moderate.
Urban land.												
23B*, 23C*, 23D*:												
Menfro	B	None	---	---	>6.0	---	---	>60	---	High	Low	Moderate.
Urban land.												
24*:												
Nevin	B	None	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High	High	Low.
Urban land.												
27*, 28*. Pits												
29*:												
Dumps.												
Orthents.												
31 Elsah	B	Frequent	Brief	Dec-May	>6.0	---	---	>60	---	Moderate	Low	Moderate.
32 Haymond	B	Frequent	Brief	Jan-May	>6.0	---	---	>60	---	High	Low	Low.
33 Wilbur	C	Frequent	Brief	Oct-Jun	3.0-6.0	Apparent	Mar-Apr	>60	---	High	Moderate	Moderate.
40 Eudora	B	Rare	---	---	>6.0	---	---	>60	---	High	Low	Low.
41 Booker	D	Rare	---	---	+.5-1.0	Perched	Nov-May	>60	---	Moderate	High	Moderate.

See footnote at end of table.

TABLE 15.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
42-----------------Blake	B	Rare---------	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High-----	High-----	Low.
43-----------------Waldron	D	Rare---------	---	---	1.0-3.0	Perched	Nov-May	>60	---	High-----	High-----	Low.
44-----------------Sarpy	A	Rare---------	---	---	>6.0	---	---	>60	---	Low------	Low------	Low.
45-----------------Sarpy	A	Frequent----	Brief to long.	Nov-Jun	>6.0	---	---	>60	---	Low------	Low------	Low.
46-----------------Parkville	C	Rare---------	---	---	1.0-2.0	Apparent	Nov-Apr	>60	---	Moderate	High-----	Low.
49*:												
Blake-------------	B	Frequent----	Very brief	Feb-Nov	2.0-4.0	Apparent	Nov-Jul	>60	---	High-----	High-----	Low.
Eudora------------	B	Occasional	Very brief	Mar-Jun	>6.0	---	---	>60	---	High-----	Low------	Low.
Waldron-----------	D	Frequent----	Brief-----	Mar-Jun	1.0-3.0	Perched	Nov-May	>60	---	High-----	High-----	Low.
52A, 52B----------Freeburg	C	Occasional	Brief-----	Apr-Jul	1.5-3.0	Perched	Nov-May	>60	---	High-----	Moderate	High.
53A----------------Bremer	C	Rare---------	---	---	1.0-2.0	Apparent	Nov-Jul	>60	---	High-----	Moderate	Moderate.
55A, 55B----------Ashton	B	Occasional	Very brief	Jan-Apr	>6.0	---	---	>60	---	---	Low------	Low.
56A, 56B----------Weller	C	None---------	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High-----	High-----	High.

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

TABLE 16.--CLASSIFICATION OF THE SOILS

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

Soil name	Family or higher taxonomic class
Ashton	Fine-silty, mixed, mesic Mollic Hapludalfs
Blake	Fine-silty, mixed (calcareous), mesic Aquic Udifluvents
Booker	Very-fine, montmorillonitic, mesic Vertic Haplaquolls
Bremer	Fine, montmorillonitic, mesic Typic Argiaquolls
Clarksville	Loamy-skeletal, siliceous, mesic Typic Paleudults
Crider	Fine-silty, mixed, mesic Typic Paleudalfs
Elsah	Loamy-skeletal, mixed, nonacid, mesic Typic Udifluvents
Eudora	Coarse-silty, mixed, mesic Fluventic Hapludolls
Fishpot	Fine-loamy, mixed, nonacid, mesic Aquic Udorthents
Freeburg	Fine-silty, mixed, mesic Aquic Hapludalfs
Gasconade	Clayey-skeletal, mixed, mesic Lithic Hapludolls
Goss	Clayey-skeletal, mixed, mesic Typic Paleudalfs
Harvester	Fine-silty, mixed, nonacid, mesic Typic Udorthents
Haymond	Coarse-silty, mixed, nonacid, mesic Typic Udifluvents
Iva	Fine-silty, mixed, mesic Aeric Ochraqualfs
Menfro	Fine-silty, mixed, mesic Typic Hapludalfs
*Nevin	Fine-silty, mixed, mesic Aquic Argiudolls
Orthents	Fine-silty, mixed, nonacid, mesic Typic Udorthents
Parkville	Clayey over loamy, montmorillonitic, mesic Fluvaquentic Hapludolls
Sarpy	Mixed, mesic Typic Udipsamments
Union	Fine, mixed, mesic Typic Fragiudalfs
Waldron	Fine, montmorillonitic (calcareous), mesic Aeric Fluvaquents
Weller	Fine, montmorillonitic, mesic Aquic Hapludalfs
Wilbur	Coarse-silty, mixed, nonacid, mesic Aquic Udifluvents
Winfield	Fine-silty, mixed, mesic Typic Hapludalfs

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U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
MISSOURI AGRICULTURAL EXPERIMENT STATION

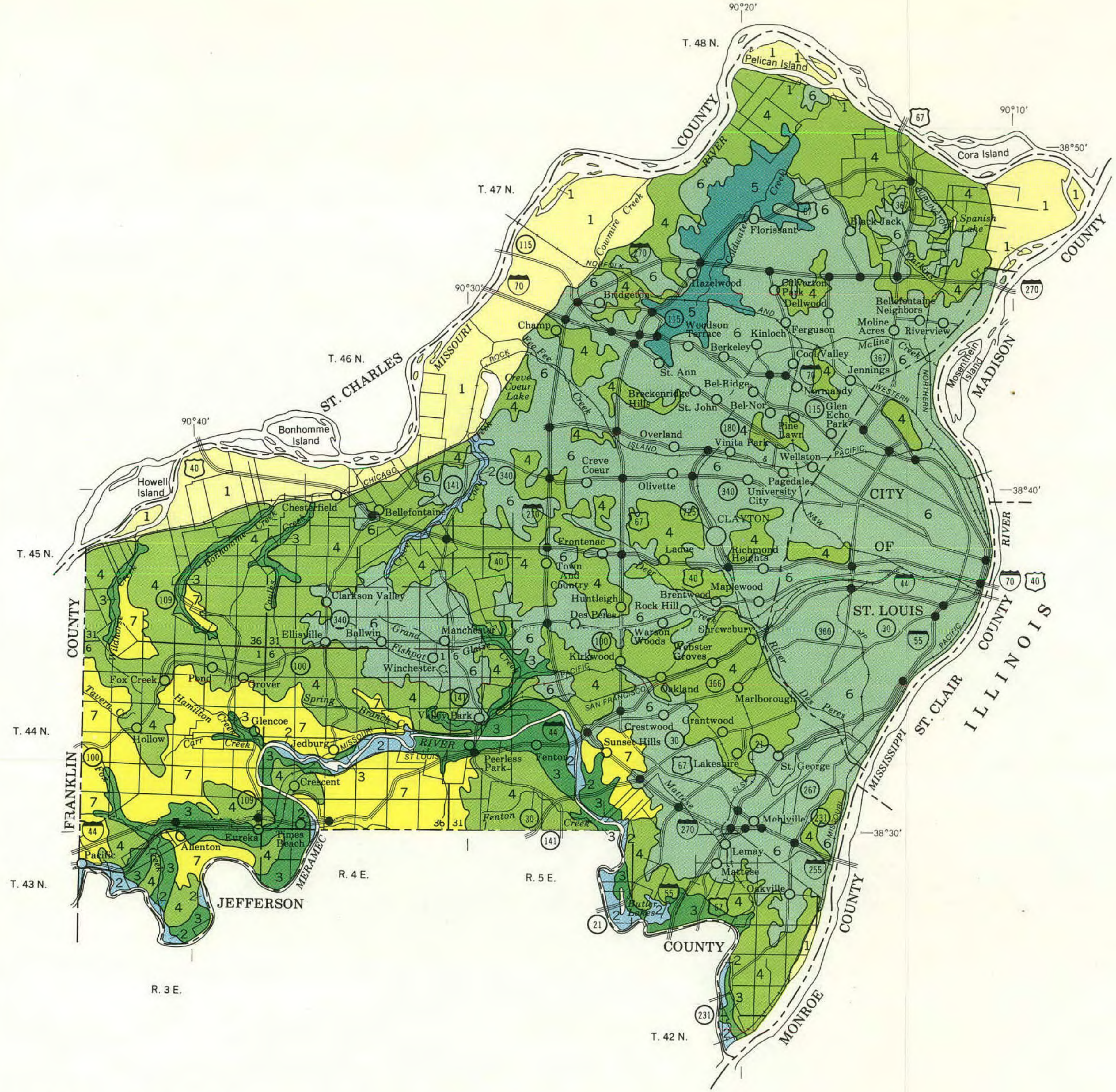
GENERAL SOIL MAP

ST. LOUIS COUNTY AND ST. LOUIS CITY, MISSOURI

Scale 1: 253,440

1 0 1 2 3 4 Miles

1 0 1 2 3 4 5 6 Kilometers



SOIL LEGEND

1. Blake-Eudora-Waldron association: Nearly level, somewhat poorly drained and well drained, deep soils formed in alluvial sediment; on flood plains
2. Wilbur-Haymond-Elsah association: Nearly level and gently sloping, moderately well drained to somewhat excessively drained, deep soils formed in alluvial sediment; on flood plains
3. Freeburg-Ashton-Weller association: Nearly level and gently sloping, somewhat poorly drained to well drained, deep soils formed in loess and alluvial sediment; on terraces
4. Menfro-Winfield-Urban land association: Gently sloping to very steep, well drained and moderately well drained, deep soils formed in loess, and Urban land; on uplands
5. Nevin-Urban land association: Nearly level, somewhat poorly drained, deep soils formed in loess or lacustrine sediment, and Urban land; on depressional uplands
6. Urban land-Harvester-Fishpot association: Urban land and nearly level to moderately steep, moderately well drained and somewhat poorly drained, deep soils formed in silty fill material, loess, and alluvium; on uplands, terraces, and bottom lands
7. Goss-Gasconade-Menfro association: Moderately sloping to very steep, well drained and somewhat excessively drained, deep and shallow soils formed in limestone residuum and loess; on uplands

Compiled 1981

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

SOIL LEGEND

Map symbols consist of numbers or a combination of numbers and a letter. The numbers represent the kind of soil. A capital letter following these numbers indicates the class of slope. Symbols without a slope letter are for nearly level soils or miscellaneous areas.

SYMBOL	NAME
1B	Winfield silt loam, 2 to 5 percent slopes
1C	Winfield silt loam, 5 to 9 percent slopes
1D	Winfield silt loam, 9 to 14 percent slopes
2B	Menfro silt loam, 2 to 5 percent slopes
2C	Menfro silt loam, 5 to 9 percent slopes
2D	Menfro silt loam, 9 to 14 percent slopes
2E	Menfro silt loam, 14 to 20 percent slopes
2F	Menfro silt loam, 20 to 45 percent slopes
3D	Clarksville cherty silt loam, 5 to 14 percent slopes
3F	Clarksville cherty silt loam, 14 to 50 percent slopes
4D	Union silt loam, 9 to 14 percent slopes
5A	Iva silt loam, 1 to 3 percent slopes
6A	Urban land, bottom land, 0 to 3 percent slopes
7B	Urban land, upland, 0 to 5 percent slopes
8E	Goss silt loam, 14 to 20 percent slopes
10D	Gasconade-Rock outcrop complex, 5 to 14 percent slopes
10F	Gasconade-Rock outcrop complex, 14 to 50 percent slopes
12	Nevin silt loam
13D	Goss cherty silt loam, 5 to 14 percent slopes
13F	Goss cherty silt loam, 14 to 45 percent slopes
14C	Menfro silt loam, karst, 2 to 14 percent slopes
14E	Menfro silt loam, karst, 9 to 30 percent slopes
16C	Urban land-Harvester complex, karst, 2 to 9 percent slopes
16D	Urban land-Harvester complex, karst, 9 to 20 percent slopes
17D	Crider-Menfro silt loams, 5 to 14 percent slopes
17F	Crider-Menfro silt loams, 14 to 30 percent slopes
18A	Urban land-Harvester complex, 0 to 2 percent slopes
18C	Urban land-Harvester complex, 2 to 9 percent slopes
18D	Urban land-Harvester complex, 9 to 20 percent slopes
19C	Urban land-Goss complex, 2 to 9 percent slopes
19D	Urban land-Goss complex, 9 to 20 percent slopes
20B	Fishpot-Urban land complex, 0 to 5 percent slopes
21B	Winfield-Urban land complex, 2 to 5 percent slopes
21C	Winfield-Urban land complex, 5 to 9 percent slopes
21D	Winfield-Urban land complex, 9 to 20 percent slopes
22A	Iva-Urban land complex, 1 to 3 percent slopes
23B	Menfro-Urban land complex, 2 to 5 percent slopes
23C	Menfro-Urban land complex, 5 to 9 percent slopes
23D	Menfro-Urban land complex, 9 to 20 percent slopes
24	Nevin-Urban land complex
27	Pits, sand and gravel
28	Pits, quarry
29	Dumps-Orthents complex
31	Elsah silt loam
32	Haymond silt loam
33	Wilbur silt loam
40	Eudora silt loam
41	Booker clay
42	Blake silty clay loam
43	Waldron silty clay
44	Sarpy loamy fine sand, rarely flooded
45	Sarpy loamy fine sand, frequently flooded
46	Parkville clay
49	Blake-Eudora-Waldron complex
52A	Freeburg silt loam, 0 to 2 percent slopes
52B	Freeburg silt loam, 2 to 5 percent slopes
53A	Bremer silt loam, 1 to 3 percent slopes
55A	Ashton silt loam, 0 to 2 percent slopes
55B	Ashton silt loam, 2 to 5 percent slopes
56A	Weller silt loam, 0 to 2 percent slopes
56B	Weller silt loam, 2 to 5 percent slopes

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES
- State
- County
- Reservation (state park, wildlife area)
- Land grant
- Neatline

AD HOC BOUNDARY (label)
- Cemetery

STATE COORDINATE TICK

LAND DIVISION CORNERS (sections)

ROAD EMBLEMS & DESIGNATIONS
- Interstate — 55
- Federal — 50
- State — 100
- County — W

LEVEES

DAMS
- Large (to scale)
- Medium or small — water, w

PITS
- Mine or quarry

WATER FEATURES

DRAINAGE
- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end

LAKES, PONDS AND RESERVOIRS
- Perennial — water, w

MISCELLANEOUS WATER FEATURES
- Marsh or swamp
- Spring
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS — 18C, 7B

ESCARPMENTS
- Bedrock (points down slope)
- Other than bedrock (points down slope)

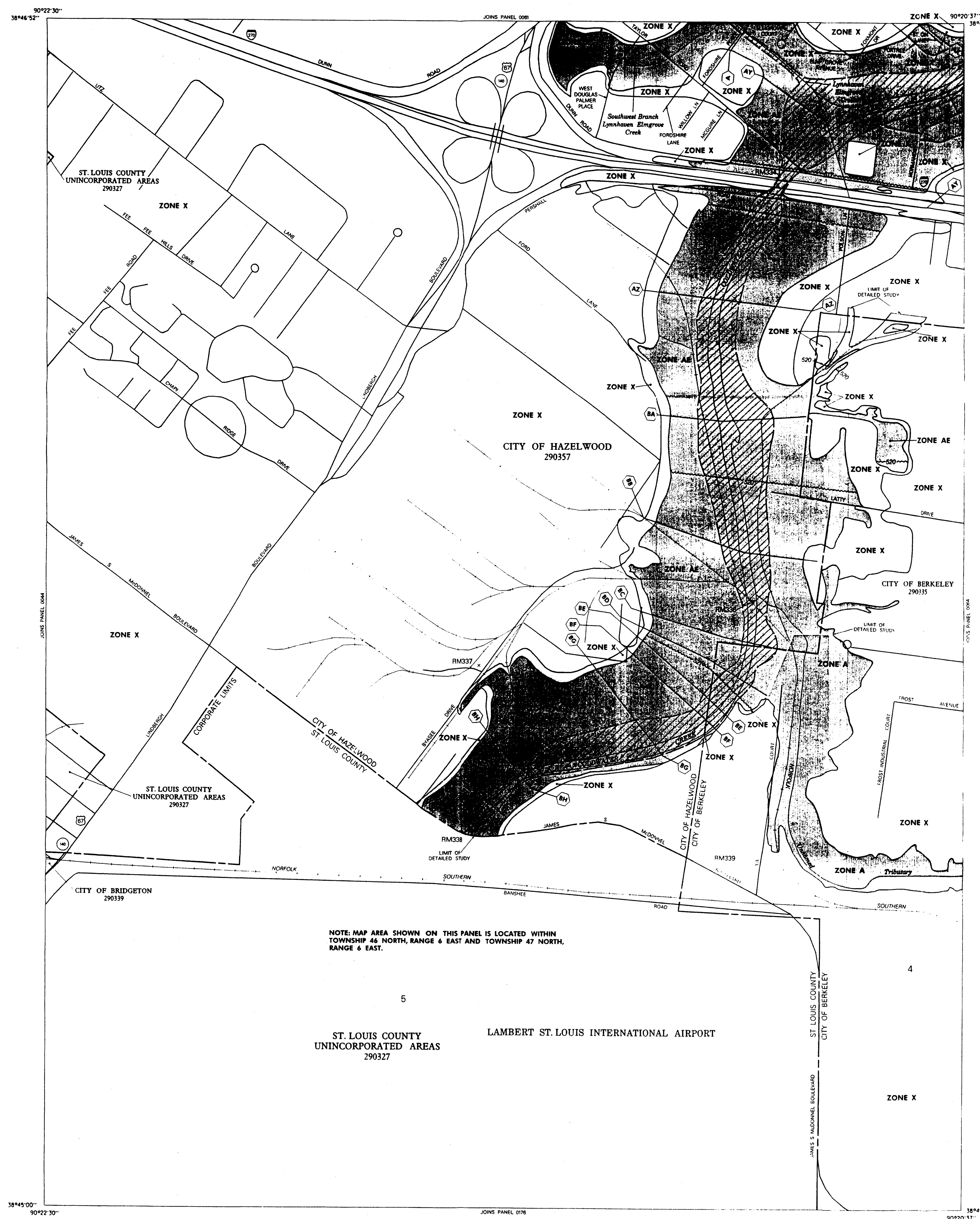
GULLY

DEPRESSION OR SINK

MISCELLANEOUS
- Gravelly spot
- Rock outcrop (includes sandstone and shale)
- Sandy spot

ELEVATION REFERENCE MARKS

REFERENCE MARK	ELEVATION (FEET NGVD)	DESCRIPTION OF LOCATION
RM334	515.42	Chiseled triangle on south end of northwest wingwall of Dunn Road bridge over Coldwater Creek.
RM336	518.45	Railroad spike in light pole by northeast corner of Norfolk & Western Railway bridge over Coldwater Creek.
RM337	529.19	"O" in OPEN on fire hydrant located on west side of Byasse Drive, 1,400 feet north of James S. McDonnel Blvd.
RM338	516.58	Chiseled square on curved curb on northwest corner of bridge by northwest wingwall of the James S. McDonnel Blvd. bridgeover Coldwater Creek.
RM339	532.29	Chiseled square on circular step of water fountain between baseball fields numbers 1 and 2 in Berkeley Khoury League Park near James S. McDonnel Blvd. and Eva Avenue.



LEGEND

SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD

ZONE A
ZONE AE
ZONE AH
ZONE AO
ZONE A99
ZONE V
ZONE VE

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

ZONE X

OTHER AREAS

ZONE X

ZONE D

UNDEVELOPED COASTAL BARRIERS

NOTES

MAP REPOSITORY

Refer to Repository Listing on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP

AUGUST 2, 1995

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

APPROXIMATE SCALE IN FEET

500 0 500

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

ST. LOUIS COUNTY, MISSOURI AND INCORPORATED AREAS

PANEL 63 OF 420

(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS COMMUNITY	NUMBER	PANEL	SUFFIX
BERKELEY CITY OF	290335	0063	H
BRIDGETON CITY OF	290339	0063	H
HAZELWOOD CITY OF	290357	0063	H
ST LOUIS COUNTY UNINCORPORATED AREAS	290327	0063	H

MAP NUMBER
29189C0063 H

EFFECTIVE DATE:
AUGUST 2, 1995

Federal Emergency Management Agency

2781
Maps

Maps
2781
1.6

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☐ Madison
☐ Downtown
☐ Iowa

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Administrative Record for the Formerly Utilized Sites Remedial Action Program (FUSRAP) North St. Louis County Sites

St. Louis County, Missouri

US Army Corps of Engineers
St. Louis District®

Volume 1.6b
Site Management –
Reference Documents

SLAP_000685