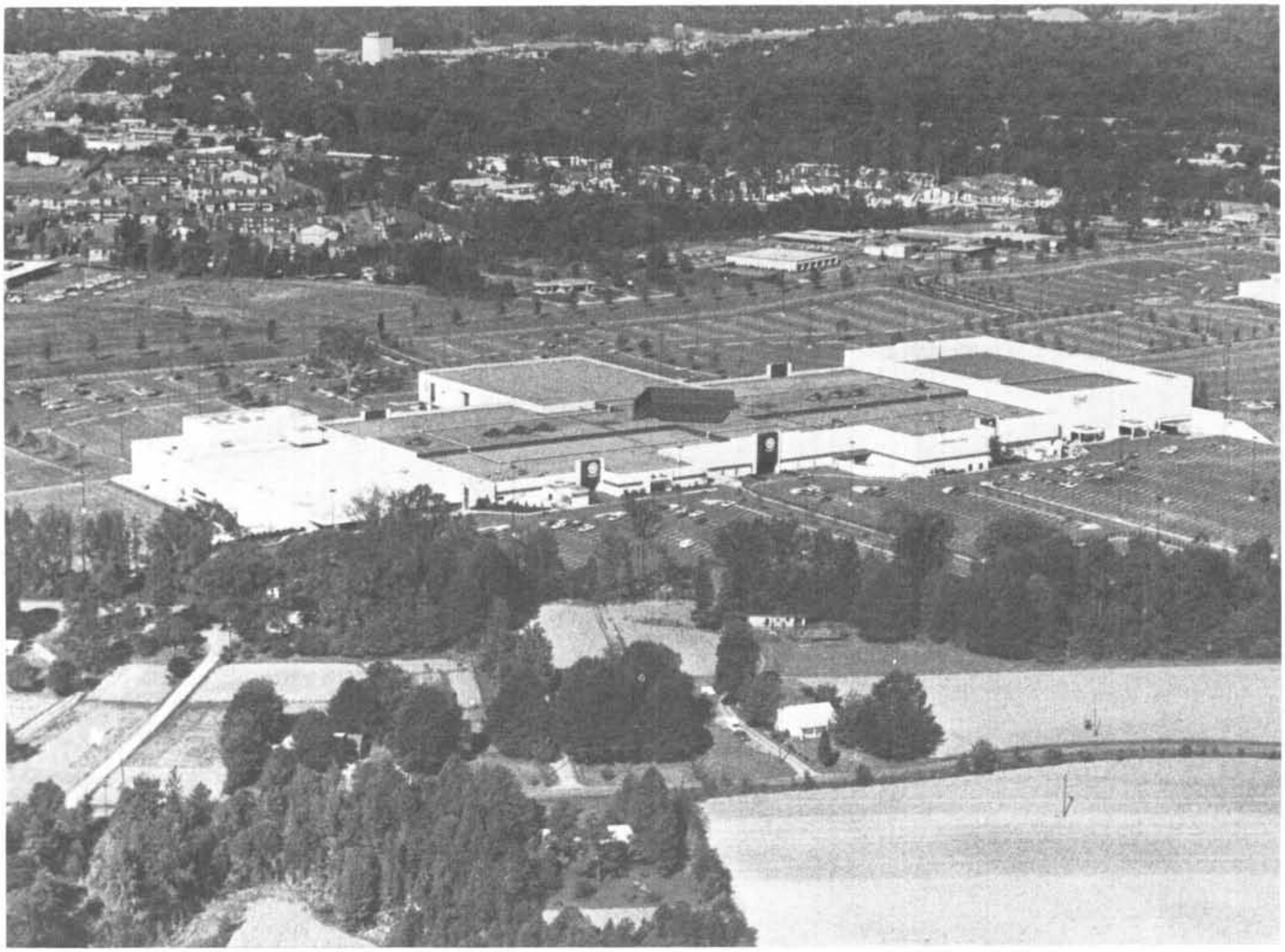
Soil survey of

Mecklenburg County, North Carolina



United States Department of Agriculture
Soil Conservation Service
in cooperation with
Mecklenburg County Board of Commissioners and
North Carolina Agricultural Experiment Station

How To Use This Soil Survey

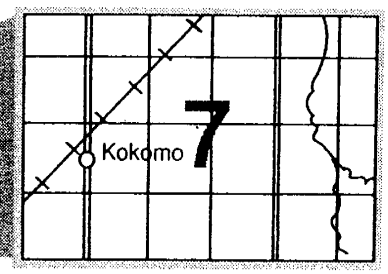
General Soil Map

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

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

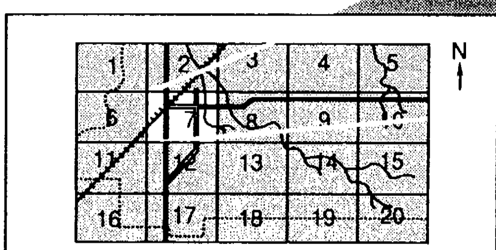
Detailed Soil Maps

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



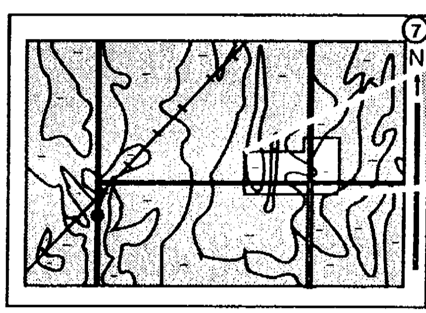
MAP SHEET

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

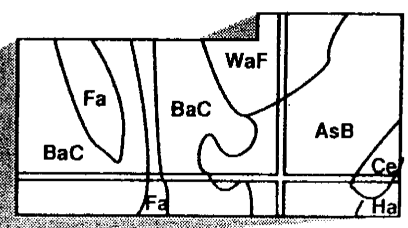


INDEX TO MAP SHEETS

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



MAP SHEET



AREA OF INTEREST

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

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

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

Major fieldwork for this soil survey was completed in the period 1972-77. Soil names and descriptions were approved in 1977. Unless otherwise indicated, statements in the publication refer to conditions in the survey area in 1977. This survey was made cooperatively by the Soil Conservation Service, the Mecklenburg County Board of Commissioners, and the North Carolina Agricultural Experiment Station. It is part of the technical assistance furnished to the Mecklenburg Soil and Water Conservation District.

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

Cover: Shopping mall in Mecklenburg County and adjacent farmland. Cecil sandy clay loam is the dominant soil in the foreground.

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Issued June 1980

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Foreword

The Soil Survey of Mecklenburg County contains much information useful in any land-planning program. Of prime importance are the predictions of soil behavior for selected land uses. Also highlighted are limitations or hazards to land uses that are inherent in the soil, improvements needed to overcome these limitations, and the impact that selected land uses will have on the environment.

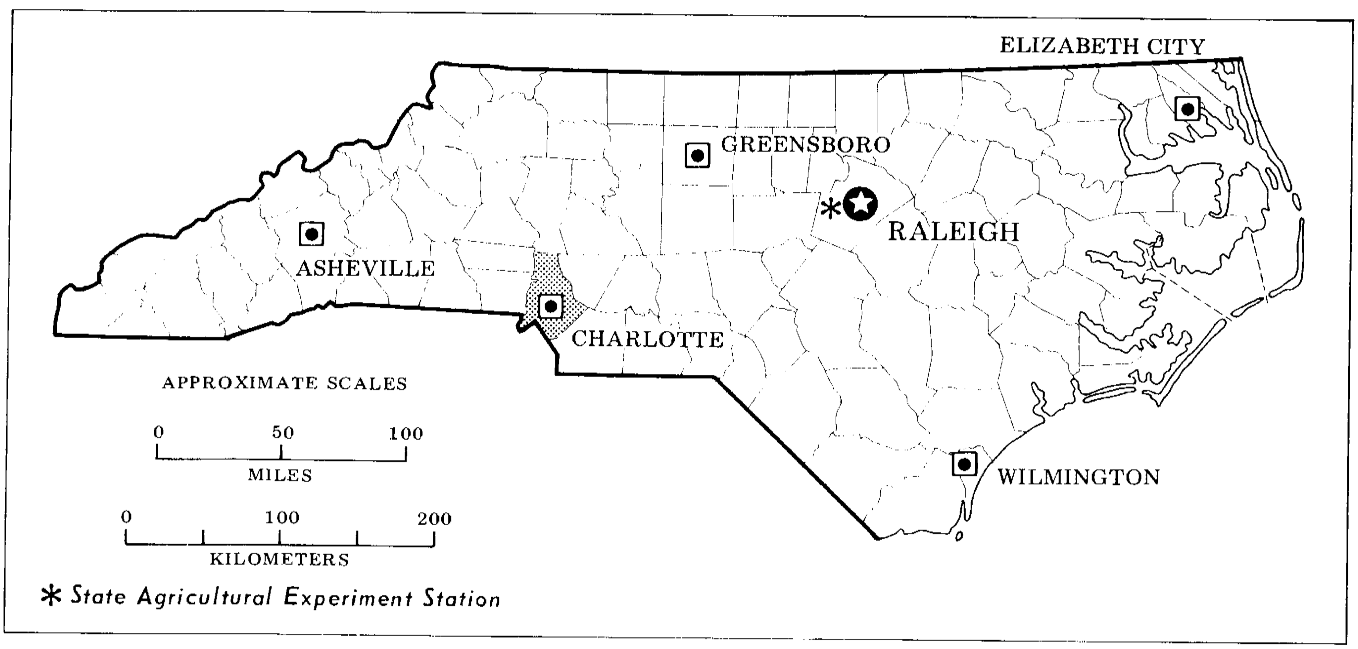
This soil survey has been prepared for many different users. Farmers, foresters, and agronomists can use it to determine the potential of the soil and the management practices required for food and fiber production. Planners, community officials, engineers, developers, builders, and homebuyers can use it to plan land use, select sites for construction, develop soil resources, or identify any special practices that may be needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the soil survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur even within short distances. Soils may be seasonally wet or subject to flooding. They may be shallow to bedrock. They may be too unstable to be used as a foundation for buildings or roads. Very clayey or wet soils are poorly suited to 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 kind of soil is shown on detailed soil maps. Each kind of soil in the survey area is described, and much information is given about each soil for specific uses. Additional information or assistance in using this publication can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

This soil survey can be useful in the conservation, development, and productive use of soil, water, and other resources.

Jessie L. Hicks
State Conservationist
Soil Conservation Service



Location of Mecklenburg County in North Carolina.

Soil survey of *Mecklenburg County, North Carolina*

United States Department of Agriculture
Soil Conservation Service
in cooperation with

Mecklenburg County Board of Commissioners and
North Carolina Agricultural Experiment Station

By Clifford M. Mc Cachren,
Soil Conservation Service

Soils surveyed by Clifford M. Mc Cachren,
William E. Woody, Jerry V. Stimpson,
Clarence E. Brandon, and Roger J. Leab,
Soil Conservation Service

MECKLENBURG is a highly urbanized county in the south-central part of North Carolina, adjoining York and Lancaster Counties, South Carolina. The county has a total area of 336,530 acres, or 525 square miles.

In 1977, the total population of Mecklenburg County was approximately 424,000, which is 7 percent of the population in the state. Charlotte, the county seat, has a population of approximately 339,200. It is the largest city in the state and the hub of the major trade, distribution, financial, and transportation center of the Southeast. Urbanization is claiming many acres of farmland in the county each year. More than 50 percent of the county is now in nonfarm use.

Farming is still a viable industry in the county. Hay, soybeans, and corn for grain and silage make up a large percentage of the harvested cropland. The rest is small grain. Beef cattle is the dominant livestock enterprise. Dairying also has a major impact on the agricultural economy. Swine and poultry enterprises are relatively unimportant.

General nature of the county

Mecklenburg County was established in 1762 from a part of Anson County and included, at that time, parts of what are now Cabarrus, Union, Lincoln, Rutherford, Cleveland, and Gaston Counties. The county, in its present boundaries, was established in 1842.

Settlers chose the name Mecklenburg for the county, hoping to gain favor with King George III of England whose wife, Queen Charlotte, was born in a German province of that name. The city of Charlotte, incorporated on November 7, 1768, was named for the queen.

Following the Revolutionary War in 1799, gold was discovered near Concord in Cabarrus County, then a part of Mecklenburg. Charlotte became the gold-mining capital of the United States until the discovery of gold in California in 1849. The quantity of rich ore led to the establishment of a branch of the United States Mint in Charlotte in 1836. Five million gold dollars were coined at the mint between 1837 and 1861.

By 1900, Mecklenburg had a population of 55,268. The population tripled by 1950 and then more than doubled by the 1970's. The Camp Green Army Base was established in 1917. The forerunner of Douglas Municipal Airport was opened in 1936 and the Charlotte Memorial Hospital in 1940. City and county schools were consolidated in 1959. Central Piedmont College opened in 1963 and the University of North Carolina at Charlotte in 1965.

Public and private educational facilities in the county have kept pace with the population growth. There are 94 elementary and junior high schools and 10 high schools in the Charlotte-Mecklenburg System. In addition, there are 14 state-approved parochial schools and a number of other private schools.

Institutions of higher education in the county include the University of North Carolina at Charlotte, Queens College, Johnson C. Smith University, Davidson College, and the Central Piedmont Community College, which offers a wide variety of vocational, junior college, and adult education programs.

Industrial and commercial development has been enhanced by excellent transportation facilities. Two interstate highways, I-77 and I-85, converge at Charlotte. There are 115 trucking firms in Charlotte, operating more than 5,000 tractor-trailers. Charlotte is the only major trucking point with overnight access to both New York and Florida. In addition, two railroad lines and five commercial airlines serve the area.

Physiography, relief, and drainage

Mecklenburg County is entirely within the Southern Piedmont physiographic region. It is characterized by broad, gently rolling interstream areas and by steeper slopes along the drainageways. No prominent hills stand out above the generally level uplands. The highest point in the county Cornelius, in the extreme northern part, is slightly more than 830 feet above sea level. The lowest is 520 feet at the State line south of Pineville. The Catawba River, with the impounded waters of three hydroelectric dams, forms the western boundary and drains approximately three-fourths of the county. The eastern side of the county is drained by tributaries of the Rocky River. The divide is a broad ridge extending generally from Davidson southward through Derita to Mint Hill.

Three large creeks—Irwin, Little Sugar, and Briar—drain most of the urban area of the city of Charlotte. These tributaries flow southward through the county and converge into Sugar Creek before it enters the Catawba River in Lancaster County, South Carolina. Rapid runoff from the urban areas during rainstorms has caused flooding and resulting property damage in low-lying areas. It has become increasingly severe in recent years.

Water supply

A valuable resource of Mecklenburg County is an abundant supply of good water. Most water used for municipal and industrial purposes is supplied by the Catawba River. This water, flowing from the southeastern slopes of the Blue Ridge Mountains, is of excellent quality.

Municipal water for most towns is obtained from lakes on the river. Lake Norman supplies Davidson, Cornelius, and Huntersville. Mountain Island Lake supplies Charlotte, Pineville, and Matthews. The amount of water taken from the lakes is less than 1 percent of the daily flow of the Catawba River.

Water for the town of Mint Hill is supplied by wells. Water to all other areas also is supplied by private or community wells. This ground water is of good quality.

Climate

Mecklenburg County is hot and is generally humid in summer. Winter is moderately cold but short because the mountains to the west protect the county against many cold waves. Precipitation is evenly distributed throughout the year and is adequate for all crops.

Table 1 gives data on temperature and precipitation for the survey area, as recorded at Charlotte, North Carolina for the period 1951 to 1975. 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 43 degrees F, and the average daily minimum temperature is 32 degrees. The lowest temperature on record, which occurred at Charlotte on December 13, 1962, is 2 degrees. In summer the average temperature is 77 degrees, and the average daily maximum temperature is 88 degrees. The highest recorded temperature, which occurred on September 6, 1954, is 104 degrees.

Growing degree days, shown in table 1, 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.

Of the total annual precipitation, 22 inches, or 50 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 19 inches. The heaviest rainfall during a 24 hour period was 5.41 inches at Charlotte on October 8 and 9, 1976. Thunderstorms occur on about 42 days each year, and most occur in summer.

Average seasonal snowfall is 6 inches. The greatest snow depth at any one time during the period of record was 12 inches. On the average, 2 days have at least 1 inch of snow on the ground, but 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 85 percent. The percentage of possible sunshine is 70 in summer and 60 in winter. The prevailing wind is from the southwest. Average windspeed is highest, 9 miles per hour, in spring.

Every few years in winter, heavy snow covers the ground for a few days to a week. Every few years late in summer or in autumn, a tropical storm moving inland from the Atlantic Ocean causes extremely heavy rain for 1 to 3 days.

Climatic data in this section were specially prepared for the Soil Conservation Service by the National Climatic Center, Asheville, North Carolina.

How this survey was made

Soil scientists made this survey to learn what kinds of soil are in the survey area, where they are, and how they can be used. The soil scientists went into the area knowing they likely would locate many soils they already knew something about and perhaps identify some they had never seen before. 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; the kinds of rock; and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material, which has been changed very little by leaching or by the action of plant roots.

The soil scientists recorded the characteristics of the profiles they studied, and they compared those profiles with others in counties nearby and in places more distant. Thus, through correlation, they classified and named the soils according to nationwide, uniform procedures.

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

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

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

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

The maps in this survey join those of the published surveys of Iredell County, North Carolina, and Lancaster and York Counties, South Carolina. The soil boundaries match, but as a result of updated concepts, some of the soil names have been changed.

In the map unit descriptions throughout the survey relative terms assigned to soil potential classes indicate the quality of a soil for a particular use compared with that of other soils in the county. The potential is based on the capability of the soil to produce crops or to support a given structure or activity. Determining the potential involves four basic steps: (1) identify for each soil use those properties and features that affect the anticipated use; (2) identify and evaluate the kinds of practices that can overcome the limiting soil features; (3) evaluate the level of performance or yield after installation of acceptable practices; and (4) arrange the soils in order according to performance, from the best to the poorest.

Soil potential is defined as high, moderately high, moderate, and low.

High potential indicates that production or performance is well above local standards, that the cost of overcoming the limitations is low as related to local standards, and that there are no continuing soil limitations.

Moderately high potential indicates that production or performance is at or above the level of local standards, that overcoming the soil limitations is judged locally to be economically feasible, and that continuing limitations after corrective practices are installed do not detract appreciably from environmental quality or economic returns.

Moderate potential indicates that production or performance is somewhat below local standards, or that the cost of overcoming limitations is high, or that limitations continuing after corrective practices are installed detract from environmental quality or economic returns.

Low potential indicates that production or performance is significantly below local standards, or that overcoming the limitations is costly, or that limitations continuing after corrective practices are installed detract appreciably from environmental quality or economic returns.

General soil map for broad land use planning

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

The general soil map provides a broad perspective of the soils and landscapes in the survey area. It provides a basis for comparing the potential of large areas for general kinds of land use. Areas that are, for the most part, suited to certain kinds of farming or to other land uses can be identified on the map. Likewise, areas of soils having properties that are distinctly unfavorable for certain land uses can be located.

Because of its small scale, the map does not show the kind of soil at a specific site. Thus, it 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 kinds of soil in any one map unit differ from place to place in slope, depth, stoniness, drainage, or other characteristics that affect their management.

1. Cecil

Gently sloping to strongly sloping, well drained soils that have a predominantly clayey subsoil; formed in residuum from acid igneous and metamorphic rock

This unit occurs throughout most of the county on broad smooth ridges and side slopes on the uplands. It makes up about 41 percent of the county. It is about 65 percent Cecil soils and 35 percent soils of minor extent.

Cecil soils have a yellowish red sandy clay loam surface layer and a red clay and clay loam subsoil.

Minor in this unit are areas of the steeper Pacolet soils, areas of Helena soils in depressions and around the heads of drainageways, and small scattered areas of Mecklenburg and Enon soils where the parent rock is less acid.

This unit is used mainly as cropland or pasture. Erosion is the main limitation in farming.

The Cecil soils in this unit have moderate potential for most row crops, moderate potential for woodland, and high potential for most urban uses.

2. Cecil-Urban land

Nearly level to strongly sloping urban areas on well drained soils that have a predominantly clayey subsoil; formed in residuum from acid igneous and metamorphic rock

This unit, the business and commercial district of downtown Charlotte and the commercial, industrial, and residential areas around the edges of the city, makes up about 18 percent of the county. It is about 52 percent the Cecil-Urban land complex, 20 percent Urban land, and 28 percent soils of minor extent.

The Cecil-Urban land complex part of this unit is 50 to 70 percent Cecil soils and 15 to 35 percent Urban land. It is mainly around the edges of the city. Cecil soils have a yellowish red sandy clay loam surface layer and a red clay and clay loam subsoil. Urban land is covered mostly by houses, paved streets and sidewalks, apartment buildings, small shopping centers, schools, churches, paved parking lots, and recreational areas.

The Urban land part of this unit consists of areas where more than 85 percent of the surface is covered by asphalt, concrete, buildings, or other impervious cover. It is mainly in the central business district of Charlotte and along major traffic arteries around the city.

Minor in this unit are scattered areas of Mecklenburg and Enon soils. These soils are underlain by thin strata of acidic and basic rocks and are thus less acid than Cecil soils. Also in this unit are reshaped areas, as a result of site preparation during construction, and cut and fill areas. In the cut areas most or all of the natural soil has been removed. In the fill areas the original surface is covered with more than 20 inches of fill material.

This unit is used almost entirely for urban purposes.

3. Iredell-Mecklenburg

Nearly level to strongly sloping, moderately well drained and well drained soils that have a predominantly clayey subsoil; formed in residuum from diorite, gabbro, and other rock high in ferromagnesian minerals

The largest areas of this unit are in the southwestern and south-central parts of the county. Other areas are in the northeastern and northwestern parts. The landscape is one of broad flats and gentle side slopes. The flats are broken by many large knolls of slightly higher elevation.

This unit makes up about 11 percent of the county. It is about 40 percent Iredell soils, 35 percent Mecklenburg soils, and 25 percent soils of minor extent.

Iredell soils are moderately well drained. They are on the broad flats and gentle side slopes. The surface layer is olive brown fine sandy loam, and the subsoil is light olive brown clay and clay loam.

Mecklenburg soils are well drained. They occupy the broad ridges, the gently sloping to strongly sloping side slopes, and the large knolls on the flat landscape. The surface layer is dark reddish brown fine sandy loam, and the subsoil is yellowish red clay.

The minor soils in this unit are mostly Wilkes and Davidson in the southern part of the county and Enon, Wilkes and Helena in the northern part.

This unit is used mainly as cropland and pasture. The wetter areas are mostly forest. Erosion and wetness are the main limitations in farming.

The major soils in this unit have moderately high potential for most crops, moderate potential for woodland, and low potential for most urban uses.

4. Wilkes-Enon

Gently sloping to steep, well drained soils that have a predominantly clayey subsoil; formed in residuum from diorite, hornblende schist, and other basic rock, or from mixed acidic and basic rock

This map unit occurs as scattered areas throughout the county on broad and narrow ridges and strongly sloping to steep side slopes. It makes up 13 percent of the county. It is about 40 percent Wilkes soils, 30 percent Enon soils, and 30 percent soils of minor extent.

Wilkes soils are on narrow ridges and moderately steep to steep side slopes adjacent to drainageways. The surface layer is dark grayish brown loam, and the subsoil is strong brown clay and clay loam.

Enon soils are on broad ridges and gently sloping to strongly sloping side slopes. The surface layer is brown sandy loam. The subsoil is yellowish brown sandy clay loam, clay, and clay loam.

The minor soils in this unit are mostly Mecklenburg and Iredell in the southern part of the county and Mecklenburg and Helena in the northern part.

This unit is used mainly as pasture and woodland. Some gently sloping areas are cropland. Erosion, slope, and the depth to bedrock are the main limitations in farming.

Wilkes soils have low potential for most crops. Enon soils, however, have moderately high or moderate potential. The potential is moderate for woodland and moderate or low for most urban uses.

5. Enon-Helena-Vance

Gently sloping to strongly sloping, well drained and moderately well drained soils that have a predominantly clayey subsoil; formed in residuum from mixed acidic and basic igneous and metamorphic rock

This map unit, in the northern part of the county, includes Coulwood and an area extending northeastward to Huntersville. It occurs as broad, gently sloping ridges and strongly sloping side slopes. It makes up 6 percent of the county. It is about 35 percent Enon soils, 20 percent Helena soils, 12 percent Vance soils, and 33 percent soils of minor extent.

The well drained Enon soils are on ridges and gently sloping to strongly sloping side slopes. The surface layer is brown sandy loam, and the subsoil is yellowish brown sandy clay loam, clay, and clay loam.

The moderately well drained Helena soils are on broad ridges, gentle side slopes, and in depressions and low areas around the heads of drainageways. The surface layer is light olive brown sandy loam. The subsoil is brownish yellow sandy clay loam, brownish yellow and yellowish brown clay, and mottled yellowish brown, light gray, and reddish brown clay loam.

The well drained Vance soils are on ridges and gently sloping to strongly sloping side slopes. The surface layer is yellowish brown sandy loam, and the subsoil is strong brown clay.

The minor soils are mostly Wilkes and Cecil and, to a lesser extent, Mecklenburg and Iredell. They occur as scattered areas throughout the unit.

This unit is used mainly as cropland and pasture. The steeper areas are forest. Erosion and wetness are the main limitations in farming.

The major soils in this unit have moderate or moderately high potential for most crops, moderate or moderately high potential for woodland, and low potential for most urban uses.

6. Pacolet-Cecil

Gently sloping to steep, well drained soils that have a predominantly clayey subsoil; formed in residuum from acid igneous and metamorphic rock

This map unit is at the southwest edge of the county. It consists of narrow ridges that have moderately steep and steep side slopes. It makes up 5 percent of the county. It is about 50 percent Pacolet soils, 30 percent Cecil soils, and 20 percent soils of minor extent.

The moderately steep to steep Pacolet soils are adjacent to drainageways. The surface layer is very dark grayish brown sandy loam, and the subsoil is red clay or clay loam.

Cecil soils are on ridges and strongly sloping side slopes. The surface layer is yellowish red sandy clay loam, and the subsoil is red clay and clay loam.

The minor soils in this unit are mostly Davidson and to a lesser extent Mecklenburg. They commonly occur as scattered areas throughout the unit.

This unit is mostly forest. Some gently sloping areas are used as cropland. Erosion and slope are the main limitations in farming.

Pacolet soils are not suited to most crops. Cecil soils, however, have moderate potential. Both have moderate potential for woodland. Pacolet soils have low potential for most urban uses. Cecil soils have high or moderate potential.

7. Monacan

Nearly level, somewhat poorly drained soils that have a predominantly loamy subsoil; formed in fluvial sediment on flood plains

This map unit occurs throughout the county as long, narrow bands parallel to streams and drainageways. It makes up about 4 percent of the county. It is about 80 percent Monacan soils and 20 percent soils of minor extent.

Monacan soils have a brown loam, fine sandy loam, or sandy loam surface layer. The subsoil is yellowish red loam, brown silty clay loam, dark brown fine sandy loam, dark gray and gray sandy clay loam, and light gray sandy clay.

Minor in this unit are areas of Helena soils on narrow base slopes adjacent to the flood plain. There are also areas where fill material has been added to elevate the surface.

This unit is used mainly as cropland and pasture. Wetness and flooding are the main limitations in farming.

The major soils in this unit have moderate potential for most crops, very high potential for woodland, and low potential for urban uses.

8. Georgeville-Goldston-Lignum

Gently sloping to strongly sloping, well drained and moderately well drained soils that have a clayey or loamy subsoil; formed in residuum from fine grained schist or slate

This map unit is in the eastern tip of the county on broad ridges and strongly sloping side slopes. It makes up about 2 percent of the county. It is about 45 percent Georgeville soils, 10 percent Goldston soils, 8 percent Lignum soils, and 37 percent soils of minor extent.

The well drained Georgeville soils are on broad ridges and strongly sloping side slopes. The surface layer is yellowish red silty clay loam, and the subsoil is red silty clay and red silty clay loam.

The well drained Goldston soils are on narrow ridges and strongly sloping side slopes. The surface layer is brown slaty silt loam, and the subsoil is brownish yellow slaty silt loam.

The moderately well drained Lignum soils are on gentle side slopes and in depressions and low areas around drainageways. The surface layer is yellowish brown gravelly silt loam. The subsoil is brownish yellow silty clay loam and strong brown, yellowish brown, or reddish yellow clay.

Minor soils in this unit are mostly Cecil, Enon, and Helena. They occur mainly as small scattered areas throughout the unit.

This unit is used mostly as woodland. Some gently sloping areas are used as cropland. Erosion, the depth to bedrock in the Goldston soil, and the wetness are the main limitations in farming.

The Georgeville and Lignum soils in this unit have high potential for crops. Goldston soils have low potential. All have moderate or moderately high potential for woodland. Georgeville soils have high to moderate potential for most urban uses. Goldston and Lignum soils have low potential.

Soil maps for detailed planning

The map units shown on the detailed soil maps at the back of this publication represent the kinds of soil in the survey area. They are described in this section. The descriptions together with the soil maps can be useful in determining the potential of a soil and in managing it for food and fiber production; in planning land use and developing soil resources; and in enhancing, protecting, and preserving the environment. More information for each map unit, or soil, is given in the section "Use and management of the soils."

Preceding the name of each map unit is the symbol that identifies the soil on the detailed soil maps. Each soil description includes general facts about the soil and a brief description of the soil profile. In each description, the principal hazards and limitations are indicated, and the management concerns and practices needed are discussed.

The map units on the detailed soil maps represent an area on the landscape made up mostly of the soil or soils for which the unit is named. Most of the delineations shown on the detailed soil map are phases of soil series.

Soils that have a profile that is almost alike make up a *soil series*. Except for allowable differences in texture of the surface layer or of the underlying substratum, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement in the profile. A soil series commonly is named for a town or geographic feature near the place where a soil of that series was first observed and mapped.

Soils of one series can differ in texture of the surface layer or in the underlying substratum and in slope, erosion, stoniness, salinity, wetness, or other characteristics that affect their use. On the basis of such differences, a soil series is divided into phases. The name of a *soil phase* commonly indicates a feature that affects use or management. For example. Cecil sandy clay loam, 2 to 8 percent slopes, eroded, is one of several phases within the Cecil series.

Some map units are made up of two or more dominant kinds of soil. Such map units are called soil complexes.

A *soil complex* consists of areas of two or more soils that are so intricately mixed or so small in size that they cannot be shown separately on the soil map. Each area includes some of each of the two or more dominant soils, and the pattern and proportion are somewhat similar in all areas. Helena-Urban land complex, 2 to 8 percent slopes is an example.

Most map units include small, scattered areas of soils other than those that appear in the name of the map unit. Some of these soils have properties that differ substantially from those of the dominant soil or soils and thus could significantly affect use and management of the map unit. These soils are described in the description of each map unit. Some of the more unusual or strongly contrasting soils that are included are identified by a special symbol on the soil map.

Most mapped areas include places that have little or no soil material and support little or no vegetation. Such places are called *miscellaneous areas*; they are delineated on the soil map and given descriptive names. Pits is an example. Some of these areas are too small to be delineated and are identified by a special symbol on the soil map.

The acreage and proportionate extent of each map unit are given in table 4, and additional information on properties, limitations, capabilities, and potentials for many soil uses is given for each kind of soil in other tables in this survey. (See "Summary of tables.") Many of the terms used in describing soils are defined in the Glossary.

ApB—Appling sandy loam, 2 to 8 percent slopes. This well drained soil is on broad, smooth ridges on the uplands. Mapped areas are commonly oblong and range from 6 to 80 acres.

Typically, the surface layer is yellowish brown sandy loam about 8 inches thick. The subsoil is 35 inches thick. The upper part is brownish yellow sandy loam, the middle part is yellowish brown clay, and the lower part is brownish yellow clay. The underlying material to a depth of 66 inches is red, brownish yellow, and white sandy clay loam.

Included with this soil in mapping are a few eroded areas where the surface layer is sandy clay loam and a few areas of similar soils that have a clayey subsoil slightly less than 24 inches thick. Also included are a few intermingled areas of Cecil and Vance soils. The included areas, each less than 5 acres, make up 10 to 20 percent of this map unit.

The organic matter content is low in the surface layer of this Appling soil. Permeability is moderate, the available water capacity is medium, the shrink-swell potential is moderate, and surface runoff is medium. The subsoil is strongly acid or very strongly acid. Depth to bedrock is more than 60 inches. The water table is below 6 feet.

Most of the acreage is used as cropland (fig. 1). Some areas are used for hay or pasture. The rest is forested.

This soil has high potential for corn, soybeans, small grain, pasture, hay, and horticultural crops. Good tilth can be maintained by returning crop residue to the soil. Erosion is a hazard if cultivated crops are grown. Minimum tillage and the use of cover crops, including grasses and legumes, reduce runoff and help to control erosion.

This soil has moderately high potential for broadleaf and needleleaf trees. The dominant trees are yellow-poplar, sweetgum, hickory, ash, white oak, red oak, loblolly pine, and shortleaf pine. The main understory species are dogwood, sourwood, redbud, and black cherry. There are no significant limitations in woodland use and management.

This soil has high potential for most urban uses. The moderate permeability is a limitation for septic tank absorption fields. This limitation can generally be overcome by modifying the field or by increasing the size of the absorption area, or both. The potential is dominantly high for recreation.

The capability subclass is IIe. The woodland group is 3o.

ApD—Appling sandy loam, 8 to 15 percent slopes. This well drained soil is on side slopes on the uplands. Mapped areas are commonly oblong and range from 4 to 25 acres.

Typically, the surface layer is yellowish brown sandy loam about 8 inches thick. The subsoil is 35 inches thick. The upper part is brownish yellow sandy loam, the middle part is yellowish brown clay, and the lower part is brownish yellow clay. The underlying material to a depth of 66 inches is red, brownish yellow, and white sandy clay loam.

Included with this soil in mapping are a few eroded areas where the surface layer is sandy clay loam and a few areas of similar soils that have a clayey subsoil slightly less than 24 inches thick. Also included are a few intermingled areas of Cecil and Vance soils. The included areas, each less than 5 acres, make up 10 to 20 percent of this map unit.

The organic matter content is low in the surface layer of this Appling soil. Permeability is moderate, the available water capacity is medium, the shrink-swell potential is moderate, and surface runoff is medium. The subsoil is strongly acid or very strongly acid. Depth to bedrock is more than 60 inches. The water table is below 6 feet.

Most of the acreage is forest. The rest is used for crops, hay, or pasture.

This soil has moderate potential for corn, soybeans, small grain, pasture, hay, and horticultural crops. Good tilth can be maintained by returning crop residue to the soil. Erosion is a hazard if cultivated crops are grown. Minimum tillage or the use of cover crops, including grasses and legumes, help to control erosion in cultivated areas.

The potential is moderately high for broadleaf and needleleaf trees. Dominant trees are yellow-poplar, sweetgum, hickory, ash, white oak, red oak, loblolly pine, and shortleaf pine. The main understory species are dogwood, sourwood, redbud, black cherry, and sassafras. There are no significant limitations in woodland use and management.

This soil has only moderate potential for most urban uses because of the slope and the moderate permeability. The slope limitation can be reduced or modified by special planning, design, and maintenance. The moderate permeability is a limitation for septic tank absorption fields. This limitation can generally be overcome by modifying the field or by increasing the size of the absorption area, or both. Erosion is a hazard if the ground cover is removed. The potential is low for playgrounds because of the slope. It is high for paths and trails and moderate for most other kinds of recreation.

The capability subclass is IVe. The woodland group is 3o.

CeB2—Cecil sandy clay loam, 2 to 8 percent slopes, eroded. This well drained soil is on broad, smooth ridges on the uplands. Mapped areas are oval and range from 6 to more than 1,000 acres.

Typically, the surface layer is yellowish red sandy clay loam about 6 inches thick. The subsoil is 47 inches thick. The upper part is red clay, and the lower part is red clay loam. The underlying material to a depth of 65 inches is red and yellow loam.

Included with this soil in mapping are a few uneroded areas where the surface layer is brown sandy loam and a few areas of soils that are similar to the Cecil soils but have a clayey subsoil less than 24 inches thick. Also included are many areas of rills and shallow gullies, a few areas of soils that are less acid than the Cecil soil, and a few intermingled areas of Appling, Mecklenburg, and Vance soils. The included areas, each less than 5 acres, make up to 35 percent of this map unit.

The organic matter content is low in the surface layer of this Cecil soil. Permeability is moderate, the available water capacity is medium, the shrink-swell potential is moderate, and surface runoff is medium. The subsoil is strongly acid or very strongly acid. Depth to bedrock is more than 60 inches. The water table is below 6 feet.

Most of the acreage is used as cropland. Some areas are used for hay and pasture. The rest is forested.

This soil has moderate potential for corn, soybeans, small grain, pasture, hay (fig. 2), and horticultural crops. Keeping this soil in good tilth is difficult because the surface layer is thin. The surface layer commonly forms a crust as it dries after a hard rain and becomes cloddy if worked when wet, both of which affect germination and cause poor or uneven crop growth. Minimum tillage, the return of crop residue to the soil, and the use of cover crops, including grasses and legumes, improve tilth, reduce runoff, and help to control erosion.

The potential is moderate for broadleaf and needleleaf trees. The dominant trees are loblolly pine, shortleaf pine, and Virginia pine. The main understory species are dogwood, sourwood, redbud, and black cherry. The clayey subsoil is the main limitation in woodland use and management.

This soil has high potential for most urban uses. The moderate permeability is a limitation for septic tank absorption fields. This limitation can generally be overcome by modifying the field or by increasing the size of the absorption area, or both. The potential is dominantly moderate for recreation because of the clayey subsoil.

The capability subclass is IIIe. The woodland group is 4c.

CeD2—Cecil sandy clay loam, 8 to 15 percent slopes, eroded. This well drained soil is on side slopes on the uplands. Mapped areas are oblong and range from 6 to 100 acres.

Typically, the surface layer is yellowish red sandy clay loam about 6 inches thick. The subsoil is 47 inches thick. The upper part is red clay, and the lower part is red clay loam. The underlying material to a depth of 65 inches is red and yellow loam.

Included with this soil in mapping are a few uneroded areas where the surface layer is thicker and browner than is typical and a few areas of similar soils that have a clayey subsoil less than 24 inches thick. Also included are many areas of rills and shallow gullies, a few areas of soils that are less acid than the Cecil soils, and a few intermingled areas of Appling, Mecklenburg, and Vance soils. The included areas, each less than 5 acres, make up 10 to 35 percent of this map unit.

The organic matter content is low in the surface layer of this Cecil soil. Permeability is moderate, the available water capacity is medium, the shrink-swell potential is moderate, and surface runoff is medium. The subsoil is strongly acid or very strongly acid. Depth to bedrock is more than 60 inches. The water table is below 6 feet.

Most of the acreage is used for hay or pasture. Some areas are used as cropland. The rest is forested.

This soil has moderate potential for corn, soybeans, small grain, pasture, hay, and horticultural crops. Because the surface layer is thin, this soil is difficult to keep in good tilth. Additional erosion is a severe hazard where cultivated crops are grown. Minimum tillage, the return of crop residue to the soil, and the use of cover crops, including grasses and legumes, improve tilth, reduce runoff, and help to control erosion.

The potential is moderate for broadleaf and needleleaf trees. The dominant trees are loblolly pine, shortleaf pine, and Virginia pine. The main understory species are dogwood, sourwood, redbud, and black cherry. The clayey subsoil is the main limitation in woodland use and management.

This soil has only moderate potential for most urban uses because of the slope and the moderate permeability. The slope limitation can be reduced or modified by special planning, design, or maintenance. The moderate permeability is a limitation for septic tank absorption fields. This limitation can generally be overcome by modifying the field or by increasing the size of the absorption area, or both. Erosion is a hazard if the ground cover is removed. The potential is dominantly moderate for recreation because of the slope and the clayey subsoil.

The capability subclass is VIe. The woodland group is 4c.

CuB—Cecil-Urban land complex, 2 to 8 percent slopes. This map unit consists of areas of Cecil soils and areas of Urban land primarily in the suburban areas of Charlotte. These areas are too small and too intricately mixed to be mapped separately. The undisturbed Cecil soil makes up 50 to 70 percent of each area, and Urban land makes up 15 to 35 percent. The rest of this unit consists of areas where most of the natural soil has been altered or covered as the result of grading and digging.

The undisturbed Cecil soil is well drained. Typically, the surface layer is yellowish red sandy clay loam about 6 inches thick. The subsoil is 47 inches thick. The upper part is red clay, and the lower part is red clay loam. The underlying material to a depth of 65 inches is red and yellow loam.

The organic matter content is low in the surface layer of this Cecil soil. Permeability is moderate, the available water capacity is medium, the shrink-swell potential is moderate, and surface runoff is medium. The subsoil is strongly acid or very strongly acid. Depth to bedrock is more than 60 inches. The water table is below 6 feet.

The Urban land part of this unit is covered with houses, paved streets, parking lots, driveways, small shopping centers, industrial buildings, schools, churches, and apartment complexes (fig. 3).

In some altered, or disturbed, areas the Cecil soil is covered with more than 20 inches of fill material. In others, more than two-thirds of the natural soil has been removed by cutting and grading.

Included in mapping are small areas of Appling, Enon, and Mecklenburg soils.

In disturbed areas erosion is a hazard because of the slope and the runoff. Surface runoff from rooftops and paved surfaces increases the hazard of flooding in lowlying areas downstream. The clayey subsoil is a limitation in landscaping. The moderate permeability is a limitation for septic tank absorption fields. This limitation generally can be overcome by modifying the field or by increasing the size of the absorption area, or both.

Onsite investigation is generally needed before planning the use and management of this unit.

This unit is not assigned to a capability subclass or to a woodland group.

CuD—Cecil-Urban land complex, 8 to 15 percent slopes. This map unit consists of areas of Cecil soils and areas of Urban land primarily in the suburban areas of Charlotte. These areas are too small and too intricately mixed to be mapped separately. The undisturbed Cecil soil makes up 50 to 70 percent of each area, and Urban land makes up 15 to 35 percent. The rest of this unit consists of areas where most of the natural soil has been altered or covered as the result of grading and digging.

The undisturbed Cecil soil is well drained. Typically, the surface layer is yellowish red sandy clay loam about 6 inches thick. The subsoil is 47 inches thick. The upper part is red clay, and the lower part is red clay loam. The underlying material to a depth of 65 inches is red and yellow loam.

The organic matter content is low in the surface layer of this Cecil soil. Permeability is moderate, the available water capacity is medium, the shrink-swell potential is moderate, and surface runoff is medium. The subsoil is strongly acid or very strongly acid. Depth to bedrock is more than 60 inches. The water table is below 6 feet.

The Urban land part of this unit is covered mostly with houses, paved streets, parking lots, driveways, small shopping centers, industrial buildings, churches, and apartment complexes.

In some altered, or disturbed, areas the Cecil soil is covered with more than 20 inches of fill material. In others, more than two-thirds of the natural soil has been removed by cutting and grading.

Included in mapping are small areas of Appling, Enon, and Mecklenburg soils.

If cover is not well established, soils on these areas have an erosion hazard. Grading is necessary for urban development. Surface runoff from rooftops and paved surfaces causes an increased hazard of flooding in lowlying areas downstream. The clayey subsoil is a limitation to landscaping. The moderate permeability is a limitation for septic tank absorption fields. This limitation generally can be overcome by modifying the field or by increasing the size of the absorption area, or both.

Onsite investigation is generally needed before planning use and management of this unit.

This unit is not assigned to a capability subclass or to a woodland group.

DaB—Davidson sandy clay loam, 2 to 8 percent slopes. This well drained soil is on broad ridges on the uplands. Mapped areas are commonly irregular and range from 4 to several hundred acres.

Typically, the surface layer is dark reddish brown sandy clay loam about 7 inches thick. The subsoil to a depth of 103 inches is dark red clay loam in the upper part and dark red clay in the lower part.

Included with this soil in mapping are a few areas of soils that have a loam surface layer, a few areas of soils that are less acid than is typical, a few areas where the lower part of the subsoil is lighter red, and a few small eroded areas where the surface layer is clay loam. Also included are a few small areas of Cecil and Mecklenburg soils. The included areas make up 25 to 40 percent of this map unit.

The organic matter content is low in the surface layer of this Davidson soil. Permeability is moderate, the available water capacity is high, the shrink-swell potential is low, and surface runoff is medium. The subsoil ranges from very strongly acid to medium acid. Depth to bedrock is more than 60 inches. The water table is below 6 feet.

Most of the acreage is used as woodland. The rest is cropland and pasture. Some areas along the Catawba River are used for recreation.

This soil has high potential for corn, soybeans, small grain, hay, pasture, and horticultural crops. Crop potential can be reduced through erosion. As the original surface layer is lost, the underlying sticky, clayey subsoil becomes part of the plow layer. This process lowers the overall tilth of the surface layer. Minimum tillage, the return of crop residue, and the use of cover crops, including grasses and legumes, reduce runoff and help to control erosion.

This soil has moderately high potential for broadleaf and needleleaf trees. The dominant trees are loblolly pine, shortleaf pine, yellow-poplar, hickory, white oak, red oak, sweetgum, and ash. The main understory species are dogwood, sourwood, redbud, black cherry, and holly. The clayey subsoil is the main limitation in woodland use and management.

This soil has high potential for most urban uses. Because of the moderate permeability, this soil is limited for septic tank absorption fields. This limitation can be overcome by modifying the field or by increasing the size of the absorption area, or both. This soil has only moderate potential for recreation because of the clayey subsoil.

The capability subclass is IIe. The woodland group is 3c.

DaD—Davidson sandy clay loam, 8 to 15 percent slopes. This well drained soil is on side slopes on the uplands. Mapped areas are oval and range from 4 to 80 acres.

Typically, the surface layer is dark reddish brown sandy clay loam about 7 inches thick. The subsoil to a depth of 103 inches is dark red clay loam in the upper part and dark red clay in the lower part.

Included with this soil in mapping are a few areas of soils that have a loam surface layer, a few areas of soils that are less acid than is typical, a few areas where the lower part of the subsoil is lighter red, and a few small eroded areas where the surface layer is clay loam. Also included are a few small areas of Cecil and Mecklenburg soils. The included areas make up 25 to 40 percent of this map unit.

The organic matter content is low in the surface layer of this Davidson soil. Permeability is moderate, the available water capacity is high, the shrink-swell potential is low, and surface runoff is rapid. The subsoil ranges from very strongly acid to medium acid. Depth to bedrock is more than 60 inches. The water table is below 6 feet.

Most of the acreage is used as woodland. The rest is cropland and pasture. Some small areas along the Catawba River are used for recreation.

This soil has moderate potential for corn, soybeans, small grain, hay, pasture, and horticultural crops. Good tilth can be maintained by returning crop residue to the soil. Erosion and the sticky and slippery nature of the soil, as a result of the high amount of clay, are hazards if cultivated crops are grown. Minimum tillage or the use of cover crops, including grasses and legumes, help to control erosion in cultivated areas.

The potential is moderately high for broadleaf and needleleaf trees. The dominant trees are loblolly pine, shortleaf pine, yellow-poplar, hickory, white oak, red oak, sweetgum, and ash, The main understory species are dogwood, sourwood, redbud, black cherry, and holly. The clayey subsoil is the main limitation in woodland use and management.

This soil has only moderate potential for most urban uses because of the slope and the moderate permeability. The slope limitation can be reduced or modified by special planning, design, or maintenance. The moderate permeability is a limitation for septic tank absorption fields. The effects of moderate permeability can generally be overcome by modifying the field or by increasing the size of the absorption area, or both. Erosion is a hazard if the ground cover is removed. The potential is dominantly moderate for recreation because of the slope and the clayey subsoil.

The capability subclass is IVe. The woodland group is 3c.

DaE—Davidson sandy clay loam, 15 to 25 percent slopes. This well drained soil is on side slopes on the uplands. Mapped areas are oval and range from 4 to 80 acres.

Typically, the surface layer is dark reddish brown sandy clay loam about 7 inches thick. The subsoil to a depth of 103 inches is dark red clay loam in the upper part and dark red clay in the lower part.

Included with this soil in mapping are a few areas of soils that have a loam surface layer, a few areas of soils that are less acid than is typical, a few areas where the lower part of the subsoil is lighter red, and a few small eroded areas where the surface layer is clay loam. Also included are a few small areas of Pacolet soil. The included areas make up 20 to 30 percent of this map unit.

The organic matter content is low in the surface layer of this Davidson soil. Permeability is moderate, the available water capacity is high, the shrink-swell potential is low, and surface runoff is rapid. The subsoil ranges from very strongly acid to medium acid. Depth to bedrock is more than 60 inches. The water table is below 6 feet.

Most of the acreage is woodland. The rest is pasture. Some small areas along the Catawba River are used for recreation.

This soil has moderate potential for pasture. Proper pasture maintenance provides adequate protective cover.

The potential is moderately high for broadleaf and needleleaf trees. The dominant trees are loblolly pine, shortleaf pine, yellow-poplar, hickory, white oak, red oak, sweetgum, and ash. The main understory species are dogwood, sourwood, redbud, black cherry, and holly. The slope is the main limitation in woodland use and management.

This soil has low potential for most urban recreational use because of the slope.

The capability subclass is VIe. The woodland group is 3r.

EnB—Enon sandy loam, 2 to 8 percent slopes. This well drained soil is on broad ridges on the uplands. Mapped areas are oval and range from 5 to 300 acres.

Typically, the surface layer is brown sandy loam about 7 inches thick. The subsoil is 29 inches thick. The upper part is yellowish brown sandy clay loam, the middle part is yellowish brown clay, and the lower part is yellowish brown clay loam. The underlying material to a depth of 60 inches is light olive brown clay loam and sandy loam.

Included with this soil in mapping are a few areas where the surface layer is fine sandy loam or loam, a few eroded areas where it is clay loam, and a few intermingled areas of Iredell, Mecklenburg, Vance, and

Wilkes soils. The included areas, each less than 5 acres, make up 20 to 40 percent of this map unit.

The organic matter content is low in the surface layer of this Enon soil. Permeability is slow, the available water capacity is medium, the shrink-swell potential is high, and surface runoff is medium. The subsoil ranges from strongly acid through mildly alkaline. Depth to bedrock is below 60 inches. The water table is below 6 feet.

Most of the acreage is woodland and pasture. The rest is cropland.

This soil has moderately high potential for most crops. Good tilth can be maintained by returning crop residue to the soil. Erosion is a hazard if cultivated crops are grown. Minimum tillage and the use of cover crops, including grasses and legumes, reduce runoff and help to control erosion.

The potential is moderate for broadleaf and needleleaf trees. The dominant trees are loblolly pine, Virginia pine, shortleaf pine, eastern redcedar, white oak, red oak, hickory, yellow-poplar, sweetgum, and sycamore. The dominant understory species are dogwood, redbud, holly, sourwood, and black cherry. The clayey subsoil is the main limitation in woodland use and management.

This soil has low potential for most urban uses because of the slow permeability, the high shrink-swell potential, and the low strength. The slow permeability significantly limits the absorption of effluent in septic tank absorption fields. This limitation can be partly overcome by modifying the field or by increasing the size of the absorption area, or both. Corrective measures for shrink swell include strengthening the footings and foundations and removing excess moisture. Increasing the size of the footings and, where appropriate, placing structures on slabs are measures commonly used to overcome low strength. The potential is moderate for camp areas and playgrounds because of the slow permeability. It is high for most other kinds of recreation.

Capability subclass is IIIe. The woodland group is 4c.

EnD—Enon sandy loam, 8 to 15 percent slopes. This well drained soil is on side slopes on the uplands. Mapped areas are oblong and range from 4 to 80 acres.

Typically, the surface layer is brown sandy loam about 7 inches thick. The subsoil is 29 inches thick. The upper part is yellowish brown sandy clay loam, the middle part is yellowish brown clay, and the lower part is yellowish brown clay loam. The underlying material to a depth of 60 inches is light olive brown clay loam and sandy loam.

Included with this soil in mapping are a few areas where the surface layer is fine sandy loam or loam and a few eroded areas where the surface layer is sandy clay loam or clay loam, and a few intermingled areas of Mecklenburg, Vance, and Wilkes soils. The included areas, each less than 5 acres, make up 20 to 40 percent of this mapping unit.

The organic matter content is low in the surface layer of this Enon soil. Permeability is slow, the available water capacity is medium, the shrink-swell potential is high, and surface runoff is rapid. The subsoil ranges from strongly acid to mildly alkaline. Depth to bedrock is below 60 inches. The water table is below 6 feet.

Most of the acreage is woodland and pasture. The rest is cropland.

This soil has moderate potential for most crops. Good tilth can be maintained by returning the crop residue to the soil. Erosion is a hazard if cultivated crops are grown. Minimum tillage and the use of cover crops, including grasses and legumes, help to control erosion in cultivated areas.

This soil has moderate potential for broadleaf and needleleaf trees. The dominant trees are loblolly pine, Virginia pine, shortleaf pine, eastern redcedar, white oak, red oak, hickory, yellow-poplar, sweetgum, and sycamore. The dominant understory species are dogwood, redbud, holly, sourwood, and black cherry. The clayey subsoil is the main limitation in woodland use and management.

This soil has low potential for most urban uses because of the slow permeability, the high shrink-swell potential, and the low strength. The slow permeability significantly limits the absorption of effluent in septic tank absorption fields. This limitation can partly be overcome by modifying the field or by increasing the size of the absorption area, or both. Corrective measures for shrink swell include strengthening the footings and foundations and removing the excess moisture. Increasing the size of the footings and, where appropriate, placing structures on slabs are measures commonly used to overcome low strength. The potential is high for paths and trails and low for playgrounds because of the slope. It is moderate for most other kinds of recreation because of the slow permeability and the slope.

The capability subclass is IVe. The woodland group is 4c.

GeB2—Georgeville silty clay loam, 2 to 8 percent slopes, eroded. This well drained soil is on broad ridges on the uplands. Mapped areas are oval and range from 6 to several hundred acres.

Typically, the surface layer is yellowish red silty clay loam about 5 inches thick. The subsoil is 44 inches thick. The upper part is red silty clay, and the lower part is red silty clay loam. The underlying material to a depth of 110 inches is brownish yellow, yellowish red, and strong brown silt loam.

Included with this soil in mapping are a few areas of rills and shallow gullies, a few uneroded areas where the surface layer is darker brown and less clayey than is typical for the Georgeville soil, and a few areas where the subsoil is browner. Also included are a few intermingled areas of Cecil, Goldston, and Lignum soils. The included areas, each less than 5 acres, make up 10 to 20 percent of this map unit.

The organic matter content is low in the surface layer of this Georgeville soil. Permeability is moderate, the available water capacity is medium, the shrink-swell potential is low, and surface runoff is medium. The subsoil is strongly acid or very strongly acid. Depth to bedrock is more than 60 inches. The water table is below 6 feet.

Most of the acreage is cropland. The rest is pasture or woodland.

This soil has high potential for corn, soybeans, pasture, hay, and horticultural crops. Because the surface layer is thin, this soil is difficult to keep in good tilth. The surface layer commonly crusts as it dries after a hard rain or becomes cloddy if worked when wet, both of which affect germination and cause poor or uneven crop growth. Minimum tillage, the return of crop residue to the soil, and the use of cover crops, including grasses and legumes, improve tilth, reduce runoff, and help to control erosion.

The potential is moderate for broadleaf or needleleaf trees. The dominant trees are loblolly pine, shortleaf pine, yellow-poplar, hickory, white oak, red oak, sweetgum, and ash. The main understory species are dogwood, sourwood, redbud, black cherry, and holly. The clayey subsoil is the main limitation in woodland use and management.

This soil has high to moderate potential for most urban uses. The moderate permeability is a limitation for septic tank absorption fields. This limitation generally can be overcome by modifying the field or by increasing the size of the absorption area, or both. The potential is only moderate for recreation because of the clayey subsoil.

The capability subclass is IIIe. The woodland group is 4c.

GeD2—Georgeville silty clay loam, 8 to 15 percent slopes, eroded. This well drained soil is on side slopes on the uplands. Mapped areas are oblong and range from 4 to 60 acres.

Typically, the surface layer is yellowish red silty clay loam about 5 inches thick. The subsoil is 44 inches thick. The upper part is red silty clay, and the lower part is red silty clay loam. The underlying material to a depth of 110 inches is brownish yellow, yellowish red, and strong brown silt loam.

Included with this soil in mapping are a few uneroded areas where the surface layer is darker brown and less clayey than is typical for the Georgeville soil, a few areas of rills and shallow gullies, and a few small areas where the subsoil is browner. Also included are a few intermingled areas of Cecil and Goldston soils. The included areas, each less than 5 acres, make up 10 to 20 percent of this map unit.

The organic matter content is low in the surface layer of this Georgeville soil. Permeability is moderate, the available water capacity is medium, the shrink-swell potential is low, and surface runoff is medium. The subsoil is strongly acid or very strongly acid. Depth to bedrock is more than 60 inches. The water table is below 6 feet.

Most of the acreage is cropland. The rest is pasture or woodland.

This soil has moderate potential for corn, soybeans, pasture, hay, and horticultural crops. Because the surface layer is thin, the soil is difficult to keep in good tilth. The surface layer commonly crusts as it dries after a hard rain or becomes cloddy if worked when wet, both of which affect germination and cause poor or uneven crop growth. Minimum tillage, the return of crop residue to the soil, and the use of cover crops, including grasses and legumes, improve tilth, reduce runoff, and help to control erosion.

This soil has moderate potential for broadleaf and needleleaf trees. The dominant trees are loblolly pine, shortleaf pine, yellow-poplar, hickory, white oak, red oak, sweetgum, and ash. The main understory species are dogwood, sourwood, redbud, black cherry, and holly. The clayey subsoil is the main limitation in woodland use and management.

The potential is moderate for most urban uses because of the slope and the moderate permeability. The slope limitation can generally be overcome by special planning, design, or maintenance. The moderate permeability is a limitation for septic tank absorption fields. The effects of permeability on septic tank absorption fields generally can be overcome by modifying the field or by increasing the size of the absorption area, or both. Erosion is a hazard if the ground cover is removed. The potential is dominantly moderate for recreation because of the slope and the clayey subsoil.

The capability subclass is VIe. The woodland group is 4c.

GoB—Goldston slaty silt loam, 2 to 8 percent slopes. This well drained soil is on ridges and side slopes of the Piedmont Uplands. Mapped areas are commonly irregular and range from 4 to 20 acres.

Typically, the surface layer is brown slaty silt loam about 2 inches thick. The subsurface layer is mottled pale brown and very pale brown slaty silt loam 6 inches thick. The subsoil is brownish yellow slaty silt loam 8 inches thick. The underlying material to a depth of 24 inches is light yellowish brown slaty silt loam. It is about 75 percent by volume rock fragments. Below this is fractured, slightly weathered, fine-grained Carolina slate rock.

Included with this soil in mapping are a few areas where there is slate bedrock at or near the surface and some small areas of Georgeville and Lignum soils. The included areas, each less than 4 acres, make up 10 to 20 percent of this map unit.

The organic matter content is low in the surface layer of this Goldston soil. Permeability is moderately rapid, the available water capacity is very low, the shrink-swell potential is low, and surface runoff is medium. The subsoil ranges from extremely acid to medium acid. Depth to fractured bedrock is 20 to 40 inches. The water table is below 6 feet.

Most of the acreage is forest. Some areas are used for hay and pasture.

This soil has low potential for corn, soybeans, and horticultural crops. It has moderate potential for small grain, hay, and pasture. Erosion is a hazard if cultivated crops are grown. Minimum tillage and the use of cover crops, including grasses and legumes, reduce runoff and help to control erosion.

The potential for broadleaf and needleleaf trees is moderate. The dominant trees are eastern redcedar, loblolly pine, Virginia pine, southern red oak, and white oak. The main understory species are dogwood, redbud, holly, sourwood, and black cherry. There are no significant limitations in woodland use and management.

This soil has low to moderate potential for urban uses because of the depth to rock. The potential is only moderate for recreation because of the content of slate fragments and the depth to rock.

The capability subclass is IIIs. The woodland group is 4o.

GoD—Goldston slaty silt loam, 8 to 15 percent slopes. This well drained soil is on ridges and narrow side slopes of the uplands. Mapped areas are commonly oblong and range from 4 to 10 acres.

Typically, the surface layer is brown slaty silt loam about 2 inches thick. The subsurface layer is mottled pale brown and very pale brown slaty silt loam 6 inches thick. The subsoil is brownish yellow slaty silt loam 8 inches thick. The underlying material to a depth of 24 inches is light yellowish brown slaty silt loam. It is about 75 percent by volume rock fragments. Below this is fractured, slightly weathered, fine-grained Carolina slate rock.

Included with this soil in mapping are a few areas where there is slate bedrock at or near the surface and some small areas of Georgeville soils. The included areas, each less than 4 acres, make up 10 to 20 percent of this map unit.

The organic matter content is low in the surface layer of this Goldston soil. Permeability is moderately rapid, the available water capacity is very low, the shrink-swell potential is low, and surface runoff is moderately rapid. The subsoil ranges from extremely acid to medium acid. Depth to fractured bedrock is 20 to 40 inches. The water table is below 6 feet.

Most of the acreage is forest. Some areas are used for hay or pasture.

This soil has low potential for crops and moderate potential for hay and pasture. The erosion and the depth to bedrock are the main hazards if cultivated crops are grown. Minimum tillage or the use of cover crops, including grasses and legumes, help to control erosion in cultivated areas.

The potential is moderate for broadleaf and needleleaf trees. The dominant trees are eastern redcedar, loblolly pine, Virginia pine, southern red oak, and white oak. The understory species are mainly dogwood, redbud, holly, sourwood, and black cherry. There are no significant limitations in use or management.

This soil has low to moderate potential for urban uses because of the depth to rock. The potential is only moderate or low for recreation because of the slope, the content of slate fragments, and the depth to rock.

The capability subclass is VIs. The woodland group is 4o.

HeB—Helena sandy loam, 2 to 8 percent slopes. This moderately well drained soil is on broad ridges and in slightly concave areas around the heads of intermittent streams. Mapped areas are 5 to 100 acres.

Typically, the surface layer is light olive brown sandy loam about 8 inches thick. The subsoil is 32 inches thick. The upper part is brownish yellow sandy clay loam, the middle part is brownish yellow and yellowish brown clay, and the lower part is mottled yellowish brown, light gray, and reddish brown clay loam. The underlying material to a depth of 50 inches is light gray sandy clay. Below this is light gray sandy clay loam.

Included with this soil in mapping are a few areas of similar soils that are less acid than the Helena soil and a few wet areas in shallow depressions and seeps. In some areas slopes are more than 8 percent. Also included are small areas of Appling, Enon, Monacan, and Vance soils. The included soils make up about 10 to 25 percent of this unit.

The organic matter content is low in the surface layer of this Helena soil. Permeability is slow, the available water capacity is low, the shrink-swell potential is high, and surface runoff is medium. The subsoil is very strongly acid or strongly acid. Depth to rippable bedrock is 40 to 60 inches. Seasonally the perched water table is only 1 to 2.5 feet below the surface.

Most of the acreage is used for hay, pasture, and woodland. Some areas are used as cropland.

This soil has moderately high potential for most crops. Good tilth can be maintained by returning crop residue to the soil. Erosion is a hazard on the steeper slopes. Minimum tillage or the use of cover crops, including grasses and legumes, help to control erosion if these soils are cultivated.

The potential for broadleaf and needleleaf trees is moderately high. The dominant trees are loblolly pine, Virginia pine, sweetgum, sycamore, white oak, and yellow-poplar. The dominant understory species are dogwood, redbud, holly, sourwood, and black cherry. Seasonal wetness is the main limitation in woodland use and management.

The potential is low for urban uses because of the slow permeability and the high shrink-swell potential. The slow permeability significantly limits the absorption of effluent in septic tank absorption fields. This limitation can be overcome by modifying the field or by increasing the size of the absorption area, or both. Strengthening the footings and foundations and removing the excess moisture are measures for shrink-swell. The potential is dominantly moderate for recreation because of the wetness and the slow permeability.

The capability subclass is IIIe. The woodland group is 3w.

HuB—Helena-Urban land complex, 2 to 8 percent slopes. This map unit consists of areas of Helena soils and areas of Urban land primarily in the suburban areas of Charlotte. These areas are too small and too intricately mixed to be mapped separately. The undisturbed Helena soil makes up 50 to 70 percent of each area, and Urban land makes up 15 to 35 percent. The rest of this unit consists of areas where most of the natural soil has been altered or covered as the result of grading and digging.

The undisturbed Helena soil is well drained. Typically, the surface layer is light olive brown sandy loam about 8 inches thick. The subsoil is 32 inches thick. The upper part is brownish yellow sandy clay loam, the middle part is brownish yellow and yellowish brown clay, and the lower part is mottled yellowish brown, light gray, and reddish brown clay loam. The underlying material to a depth of 50 inches is light gray sandy clay. Below that, it is light gray sandy clay loam.

The organic matter content is low in the surface layer of this Helena soil. Permeability is slow, the available water capacity is low, the shrink-swell potential is high, and surface runoff is medium. The subsoil is very strongly acid or strongly acid. Depth to rippable bedrock is 40 to 60 inches. The seasonal perched water table is 1 to 2.5 feet below the surface.

The Urban land part of this unit is covered mostly with closely spaced houses, paved streets, parking lots, driveways, small shopping centers, industrial buildings, schools, churches, and apartment complexes.

In some altered, or disturbed, areas the Helena soil is covered with more than 20 inches of fill material. In others, more than two-thirds of the natural soil has been removed by cutting and grading.

Included with this complex in mapping are small areas of Appling, Enon, Monacan, and Vance soils.

Surface runoff from rooftops and paved surfaces increases the hazard of flooding in low-lying areas downstream. The clayey subsoil is a limitation in landscaping. The slow permeability, the wetness, and the high shrink-swell potential are limitations for most urban uses.

Onsite investigation is generally needed before planning the use and management of this unit.

This unit is not assigned to a capability subclass or to a woodland group.

IrA—Iredell fine sandy loam, 0 to 1 percent slopes. This moderately well drained soil is on broad, flat areas on the uplands. Mapped areas range from 5 to several hundred acres.

Typically, the surface layer is olive brown fine sandy loam about 6 inches thick. The subsoil is light olive brown clay and clay loam 22 inches thick. The underlying material to a depth of 65 inches is light olive brown and olive loam.

Included with this soil in mapping are small areas where water is ponded in flats and depressions in winter and a few areas of similar soils that have slopes of more than 1 percent. Also included are small areas of Enon, Mecklenburg, and Wilkes soils. The included soils make up about 15 to 35 percent of this map unit.

The organic matter content is low in the surface layer of this Iredell soil. Permeability is slow, the available water capacity is medium, the shrink-swell potential is very high, and surface runoff is slow. The subsoil is slightly acid to mildly alkaline. Depth to bedrock is more than 60 inches. Seasonally the perched water table is only 1 to 2 feet below the surface.

Most of the acreage is used for crops, hay, or pasture. Some areas are forested.

This soil has moderately high potential for most crops. Small wet areas and slow permeability are the main limitations in the use and management of this soil. Tilth can be improved by returning crop residue to the soil and by not tilling the soil when wet. Erosion is a slight hazard. This soil has high potential for pasture forages (fig. 4).

The potential is moderate for broadleaf and needleleaf trees. The dominant trees are loblolly pine, shortleaf pine, post oak, and white oak. The dominant understory species are dogwood, redbud, holly, sourwood, and black cherry. The clayey subsoil is the main limitation in woodland use and management.

The potential is low for most urban uses because of the very high shrink-swell potential, the wetness, and the slow permeability. The slow permeability significantly limits the absorption of effluent in septic tank absorption fields. This limitation generally can be partly overcome by modifying the fields or by increasing the size of the absorption area, or both. Corrective measures for the shrink-swell limitation include strengthening the footings and foundations and removing the excess moisture. Corrective measures for wetness are surface drainage, tile drainage, and land grading. The potential is dominantly moderate or low for recreation because of wetness.

The capability subclass is IIw. The woodland group is 4c.

IrB—Iredell fine sandy loam, 1 to 8 percent slopes. This moderately well drained soil is on broad ridges and broad gentle side slopes of the uplands. Mapped areas range from 5 to several hundred acres.

Typically, the surface layer is olive brown fine sandy loam about 6 inches thick. The subsoil is light olive brown clay and clay loam 22 inches thick. The underlying material to a depth of 65 inches is light olive brown and olive loam.

Included with this soil in mapping are a few areas of a similar soil that is more acid than Iredell soil. Also included are small areas of Enon, Mecklenburg, and Wilkes soils. The included soils make up about 10 to 25 percent of this unit.

The organic matter content is low in the surface layer of this Iredell soil. Permeability is slow, the available water capacity is medium, the shrink-swell potential is very high, and surface runoff is medium. The subsoil is slightly acid to mildly alkaline. Depth to bedrock is more than 60 inches. Seasonally the perched water table is only 1 to 2 feet below the surface.

Most of the acreage is used for crops, hay, and pasture. Some areas are forested.

This soil has moderately high potential for most crops. Small included wet areas, slow permeability, and erosion are the main limitations in the use and management of this soil. Keeping tillage to a minimum, not tilling when the soil is wet, and returning crop residue to the soil improve tilth and aid in controlling runoff and erosion.

The potential is moderate for broadleaf and needleleaf trees. The dominant trees are loblolly pine, shortleaf pine, post oak, and white oak. The dominant understory species are dogwood, redbud, holly, sourwood, and black cherry. The clayey subsoil is the dominant limitation in woodland use and management.

This soil has low potential for most urban uses because of the very high shrink-swell potential, the wetness, and the slow permeability. The slow permeability significantly limits the absorption of effluent in septic tank absorption fields. This limitation generally can be partly overcome by modifying the field or by increasing the size of the absorption area, or both. Corrective measures commonly used for shrink-swell limitations are strengthening the footings and foundations and removing the excess moisture. Surface drainage, tile drainage, and land grading are commonly used to overcome wetness. The potential is moderate or low for most recreational uses because of wetness.

The capability subclass is IIe. The woodland group is 4c.

IuB—Iredell-Urban land complex, 0 to 8 percent slopes. This map unit consists of areas of Iredell soils and areas of Urban land primarily in the suburban areas of Charlotte. These areas are too small and too intricately mixed to be mapped separately. The undisturbed Iredell soil makes up 50 to 70 percent of each area, and Urban land makes up 15 to 35 percent. The rest of this unit consists of areas where most of the natural soil has been altered or covered as the result of grading and digging.

The undisturbed Iredell soil is moderately well drained. Typically, the surface layer is olive brown fine sandy loam about 6 inches thick. The subsoil is light olive brown clay and clay loam 22 inches thick. The underlying material to a depth of 65 inches is light olive brown and olive loam.

The organic matter content is low in the surface layer of this Iredell soil. Permeability is slow, the available water capacity is medium, the shrink-swell potential is very high, and surface runoff is medium. The subsoil is slightly acid to mildly alkaline. Depth to bedrock is more than 60 inches. Seasonally the perched water table is only 1 to 2 feet below the surface.

The Urban land part of this unit is covered mostly with closely-spaced houses, paved streets, parking lots, driveways, shopping centers, industrial buildings, schools, churches, and apartment complexes.

In some altered, or disturbed, areas the Iredell soil is covered with more than 20 inches of fill material. In others, more than two-thirds of the natural soil has been removed by cutting and grading.

Included in mapping are small areas of Enon, Mecklenburg, and Wilkes soils.

Erosion is a hazard because of the slope and runoff if these soils are disturbed for urban development. Runoff from rooftops and paved surfaces causes an increased hazard of flooding in low-lying areas downstream. The poor tilth and the clayey subsoil are limitations to good landscaping.

Onsite investigation is generally needed before planning use and management of this unit.

This unit is not assigned to a capability subclass or to a woodland group.

LgB—Lignum gravelly silt loam, 2 to 8 percent slopes. This moderately well drained soil is on low ridges and gentle side slopes around the heads of drainageways. Mapped areas include both convex and concave slopes that are oblong to oval and range from 4 to 20 acres.

Typically, the surface layer is yellowish brown gravelly silt loam about 5 inches thick. The subsoil is 32 inches thick. The upper part is brownish yellow silty clay loam, and the lower part is strong brown, yellowish brown, and reddish yellow clay. The underlying material to a depth of 50 inches is mottled yellow and gray silt. Hard slate rock is at a depth of 50 inches.

Included with this soil in mapping are a few areas of similar soils that are less acid than the Lignum soil and a few areas where the depth to hard bedrock is less than 40 inches. Also included are a few small areas of Enon, Goldston, and Helena soils.

The organic matter content is low in the surface layer of this Lignum soil. Permeability is slow, the available water capacity is medium, the shrink-swell potential is moderate, and surface runoff is medium. The subsoil is strongly acid or very strongly acid. Depth to bedrock ranges from 48 to 72 inches. The water table is below 5 feet, but there is a perched water table at 1 to 2.5 feet during wet seasons.

Most of the acreage is used as woodland. Some areas are used for hay, pasture, or crops.

This soil has high potential for corn, soybeans, small grain, hay, and pasture. Minimum tillage, the return of crop residue to the soil, and the use of cover crops, including grasses and legumes, reduce runoff and help to control erosion.

This soil has moderately high potential for broadleaf and needleleaf trees. The dominant trees are red oak, shortleaf pine, loblolly pine, and Virginia pine. The main understory species are dogwood, redbud, and holly. Wetness is the main limitation in woodland use and management.

The potential is low for most urban uses because of wetness, the slow permeability, and low strength. The slow permeability significantly limits the absorption of effluent in septic tank absorption fields. This limitation generally can be overcome by modifying the field or by increasing the size of the absorption area, or both. Corrective measures to overcome low strength are increasing the size of the footings and, where appropriate, placing structures on slabs. Surface drainage, tile drainage, and land grading are commonly used to reduce wetness. The potential is dominantly moderate for recreation because of the slow permeability and wetness.

The capability subclass is IIe. The woodland group is 3w.

MeB—Mecklenburg fine sandy loam, 2 to 8 percent slopes. This well drained soil is on broad ridges on the uplands. Mapped areas are commonly oblong and range from 5 to more than 500 acres.

Typically, the surface layer is dark reddish brown fine sandy loam about 7 inches thick. The subsoil is yellowish red clay 27 inches thick. The underlying material to a depth of 45 inches is mottled strong brown and yellowish red clay loam. Below this to a depth of 65 inches it is very dark grayish brown and light olive brown loam.

Included with this soil in mapping are a few small eroded areas where the surface layer is clay loam, a few areas where the subsoil is dark red, and a few areas where the subsoil is thicker than 32 inches. Also included are a few intermingled areas of Cecil, Enon, Iredell, and Wilkes soils. The included areas, each less than 5 acres, make up 10 to 20 percent of this map unit.

The organic matter content is low in the surface layer of this Mecklenburg soil. Permeability is slow, the available water capacity is medium, the shrink-swell potential is moderate, and surface runoff is medium. The subsoil is medium acid to neutral. Depth to bedrock ranges from 48 to 60 inches. The water table is below 6 feet.

Most of the acreage is used as cropland and pasture. The rest is forested.

This soil has moderately high potential for corn, soybeans, pasture, hay, small grain, and most horticultural crops. Erosion is a hazard if cultivated crops are grown. This loss of the original surface layer reduces tilth. Minimum tillage, the return of crop residue to the soil, and the use of cover crops, including grasses and legumes, reduce runoff and help to control erosion.

The potential is moderate for broadleaf and needleleaf trees. The dominant trees are loblolly pine. Virginia pine, shortleaf pine, eastern redcedar, white oak and red oak, hickory, yellow-poplar, sweetgum, and sycamore. The dominant understory species are dogwood, redbud, holly, sourwood, and black cherry. There are no significant limitations in woodland use or management.

This soil has low potential for most urban uses because of the slow permeability, the moderate shrink-swell potential, the low strength, and the depth to bedrock. The slow permeability significantly limits the absorption of effluent in septic tank absorption fields. This limitation generally can be overcome by modifying the field or by increasing the size of the absorption area, or both. Corrective measures commonly used for low strength include increasing the size of the footings and where appropriate placing structures on slabs. Strengthening the footings and foundations and removing excess moisture are corrective measures for shrink swell. The potential is only moderate for camp areas and playgrounds because of the slow permeability. It is high for most other kinds of recreation.

The capability subclass is IIe. The woodland group is 4o.

MeD—Mecklenburg fine sandy loam, 8 to 15 percent slopes. This well drained soil is on side slopes on the uplands. Mapped areas are narrow, oblong bands that range from 5 to more than 100 acres.

Typically, the surface layer is dark reddish brown fine sandy loam about 7 inches thick. The subsoil is yellowish red clay 27 inches thick. The underlying material to a depth of 45 inches is mottled strong brown and yellowish red clay loam. Below this to a depth of 65 inches it is very dark grayish brown and light olive brown loam.

Included with this soil in mapping are a few small eroded areas where the surface layer is clay loam, a few areas where the subsoil is dark red, and a few areas where the subsoil is thicker than 32 inches. Also included are a few intermingled areas of Cecil, Enon, and Wilkes soils. The included areas, each less than 5 acres, make up 10 to 20 percent of this map unit.

The organic matter content is low in the surface layer of this Mecklenburg soil. Permeability is slow, the available water capacity is medium, the shrink-swell potential is moderate, and surface runoff is rapid. Reaction in the subsoil ranges from medium acid to neutral. Depth to bedrock ranges from 48 to 60 inches. The water table is below 6 feet.

Most of the acreage is woodland and pasture. The rest is cropland.

This soil has moderate potential for corn, soybeans, pasture, hay, small grain, and most horticultural crops. Erosion is a hazard if cultivated crops are grown. The loss of topsoil reduces tilth. Minimum tillage, the return of crop residue to the soil, and the use of cover crops, including grasses and legumes, reduce runoff and help to control erosion in cultivated areas.

This soil has moderate potential for broadleaf and needleleaf trees. The dominant trees are loblolly pine, Virginia pine, shortleaf pine, eastern redcedar, white oak, red oak, hickory, yellow-poplar, sweetgum, and sycamore. The dominant understory species are dogwood, redbud, holly, sourwood, and black cherry. There are no significant limitations in woodland use and management.

The potential is low for most urban uses because of the slow permeability, the moderate shrink-swell potential, the low strength, the slope, and the depth to bedrock. The slow permeability significantly limits the absorption of effluent in septic tank absorption fields. This limitation generally can be overcome by modifying the field or by increasing the size of the absorption area, or both. Corrective measures commonly used to overcome low strength include increasing the size of the footings and, where appropriate, placing structures on slabs. Corrective measures commonly used for shrink swell are strengthening the footings and foundations and removing the excess moisture. The slope can generally be reduced or modified by special planning, design, or maintenance. The potential is high for paths and trails, low for playgrounds because of the slope, and moderate for most other kinds of recreation because of the slope and the slow permeability.

The capability subclass is IVe. The woodland group 4o.

MkB—Mecklenburg-Urban land complex, 2 to 8 percent slopes. This map unit consists of areas of Mecklenburg soils and areas of Urban land primarily in the suburban areas of Charlotte. These areas are too small and too intricately mixed to be mapped separately. The undisturbed Mecklenburg soil makes up 50 to 70 percent of each area, and Urban land makes up 15 to 35 percent. The rest of this unit consists of areas where most of the natural soil has been altered or covered as the result of grading and digging.

The undisturbed Mecklenburg soil is moderately well drained. Typically, the surface layer is dark reddish brown fine sandy loam about 7 inches thick. The subsoil is yellowish red clay 27 inches thick. The underlying material to a depth of 45 inches is mottled strong brown and yellowish red clay loam. Below this to a depth of 65 inches it is very dark grayish brown and light olive brown loam.

The organic matter content is low in the surface layer of this Mecklenburg soil. Permeability is slow, the available water capacity is medium, the shrink-swell potential is moderate, and surface runoff is medium. The subsoil is medium acid to neutral. Depth to bedrock ranges from 48 to 60 inches. The water table is below 6 feet.

The Urban land part of this unit is covered mostly with closely spaced houses, paved streets, parking lots, driveways, shopping centers, industrial buildings, schools, churches, and apartment complexes.

In some altered, or disturbed, areas the Mecklenburg soil is covered with more than 20 inches of fill material. In others, more than two-thirds of the natural soil has been removed by cutting and grading.

Included in mapping are small areas of Enon and Wilkes soils.

Erosion is a hazard because of the slope and the runoff if these soils are disturbed for urban development. Surface runoff from rooftops and paved surfaces causes an increased hazard of flooding in low-lying areas downstream. The clayey subsoil is a limitation to landscaping. The slow permeability, the moderate shrink-swell potential, the low strength, and the depth to bedrock limit most urban uses.

Onsite investigation is generally needed before planning use and management of this unit.

This unit is not assigned to a capability subclass or to a woodland group.

MO—Monacan soils. These somewhat poorly drained, nearly level soils are on flood plains along streams and drainageways. Mapped areas are long and narrow. They have a branched drainage pattern. Areas range from 5 to 500 acres. The composition of this unit is more variable than that of other units in the survey area. It has been controlled well enough, however, to be interpreted for the expected use of the soil.

The surface layer of these soils is brownish loam, fine sandy loam, or sandy loam. The subsoil is reddish loam in the upper part and brownish or grayish silty clay loam, fine sandy loam, sandy clay loam, and sandy clay in the lower part.

Included with these soils in mapping are a few areas of similar soils that are not so wet in the upper part of the subsoil. These areas are commonly adjacent to the stream channel. Also included are small areas where the soil is poorly drained and a few where it is more acid than is typical for Monacan soils. The included areas make up 10 to 20 percent of this map unit.

The organic matter content is low in the surface layer. Permeability is moderate, the available water capacity is high, the shrink-swell potential is low, and surface runoff is slow. The subsoil is strongly acid to neutral. Depth to bedrock is more than 60 inches. Depth to the seasonal high water table is only 0.5 foot to 2 feet in winter and early in spring. Flooding is for brief periods late in winter and early in spring.

Most of the acreage is used for crops or pasture. The rest is forested. These soils have moderate potential for corn, soybeans, small grain, and horticultural crops and high potential for hay and pasture. Artificial drainage and flood control are needed to achieve optimum yields.

These soils have very high potential for broadleaf and needleleaf trees. The dominant trees are yellow-poplar, white oak, American sycamore, sweetgum, water oak, white oak, and loblolly pine.

These soils have low potential for all urban uses because of the wetness and flooding. The potential is low for camp areas and golf fairways because of the flooding and wetness. It is high for paths and trails. It is moderate for most other kinds of recreation because of the wetness and flooding.

The capability subclass is IIIw. The woodland group is 1c.

MS—Monacan soils and Arents. This map unit consists of nearly level, low-lying areas along major drainageways. It is 50 to 60 percent Monacan soil and 30 to 40 percent Arents. In some places the Monacan soil is undisturbed. In others it is up to 20 inches fill material. The composition of this map unit is more variable than that of most other units in the survey area but has been controlled well enough to be interpreted for the expected use of the soils.

The Monacan soil is somewhat poorly drained and is on flood plains. This soil is subject to frequent flooding. Up to 20 inches of fill material of varying composition has been added in some places.

Arents are areas where the natural soil has been altered by the addition of fill material. The fill is 20 inches to 8 feet thick. It has been added to elevate the surface in order to reduce flooding. The fill varies in composition. It has been transported from cut or graded areas of upland soils and is loamy or clayey. In some places it contains stones, logs, stumps, and solid waste.

About 10 to 15 percent of this unit is included areas of Urban land, which is covered with mostly streets, houses, parking lots, apartment complexes, and shopping centers. The Urban land is subject to flooding.

The main hazards in using these areas for permanent structures or other development are flooding, wetness, the settling of fill areas, and the sediment damage to streams from erosion of the fill material.

Onsite investigation is generally needed before planning use and treatment of this unit.

This unit is not assigned to a capability subclass. Monacan soil is in woodland group 1c.

PaE—Pacolet sandy loam, 15 to 25 percent slopes. This well drained soil is on side slopes adjacent to drainageways. Mapped areas are commonly oblong and range from 6 to 100 acres.

Typically, the surface layer is very dark grayish brown sandy loam about 3 inches thick. The subsoil is 28 inches thick. The upper part is red clay, and the lower part is red clay loam. The underlying material to a depth of 65 inches is mottled red, yellowish red, yellow, and reddish yellow sandy loam.

Included with this soil in mapping are a few small areas of Cecil, Davidson, and Wilkes soils. These included areas make up 25 to 35 percent of this map unit.

The organic matter content is low in the surface layer of this Pacolet soil. Permeability is moderate, the available water capacity is low, the shrink-swell potential is low, and surface runoff is rapid. The subsoil is very strongly acid to medium acid. Bedrock is below 60 inches. The water table is below 6 feet.

Most of the acreage is woodland. A few areas are used for pasture. The potential for pasture is moderate.

This soil has moderately high potential for broadleaf and needleleaf trees. The dominant trees are yellow-poplar, shortleaf pine, Virginia pine, loblolly pine, red oak, and white oak. The main understory species are dogwood and redbud. The slope is the main limitation in woodland use and management.

The potential is low for most urban and recreational uses because of the slope.

The capability subclass is VIe. The woodland group is 3r.

PaF—Pacolet sandy loam, 25 to 45 percent slopes. This well drained soil is on side slopes adjacent to drainageways. Mapped areas are commonly oblong and range from 6 to 80 acres.

Typically, the surface layer is very dark grayish brown sandy loam about 3 inches thick. The subsoil is 28 inches thick. The upper part is red clay, and the lower part is red clay loam. The underlying material to a depth of 65 inches is mottled red, yellowish red, yellow, and reddish yellow sandy loam.

Included with this soil in mapping are a few small areas of Cecil, Davidson, and Wilkes soils. These included areas make up 10 to 25 percent of this map unit.

The organic matter content is low in the surface layer of this Pacolet soil. Permeability is moderate, the available water capacity is low, the shrink-swell potential is low, and surface runoff is rapid. The subsoil is very strongly acid to medium acid. Bedrock is below 60 inches. The water table is below 6 feet.

Most of the acreage is woodland. A few areas are used for pasture. The potential for pasture is moderate.

This soil has moderately high potential for broadleaf and needleleaf trees. The dominant trees are yellow-poplar, shortleaf pine, Virginia pine, loblolly pine, red oak, and white oak. The main understory species are dogwood and redbud. The slope is the main limitation in woodland use and management.

This soil has low potential for most urban and recreational uses because of the slope.

The capability subclass is VIIe. The woodland group is 3r.

PB3—Pacolet-Udorthents complex, gullied. This map unit consists of areas of eroded Pacolet soil and areas where gullies have cut through the original soil into the underlying weathered bedrock. The slope ranges from 12 to 25 percent. The composition of this map unit is more variable than that of most other units in the survey area but has been controlled well enough to be interpreted for the expected use of the soils.

The Pacolet soil, on ridges between the gullies, makes up 40 to 70 percent of each unit. It is eroded to the extent that most of the original surface layer and part of the subsoil has been washed away. The present surface layer is clay loam or clay 1 to 4 inches thick. The subsoil is red clay 10 to 25 inches thick.

Udorthents, in the U-type gullies, make up 30 to 60 percent of each unit (fig. 5). They consist of weathered rock material exposed by erosion. This material commonly is soft, is not cohesive, and has little resistance to the cutting action of water. The gullies are mostly 4 to 20 feet deep. Some are still subject to active erosion. Others are either stabilized or are partly stabilized.

Vegetation is sparse in these areas. It is mostly naturally reseeded shortleaf and Virginia pine.

Limitations are severe for all farming and urban uses because of the gullies, slow infiltration, rapid runoff, and erodibility. Extensive grading would be needed if these areas were to be reclaimed. Establishing vegetation is difficult because of the slope and the very low supply of organic matter, available plant nutrients, and moisture.

Onsite investigation is generally needed before planning the use and reclamation of this unit.

This unit is not assigned to a capability subclass. Pacolet soil is in woodland group 4c.

Pt—Pits. This map unit consists of areas where all the soil material has been removed and the underlying material has been quarried for construction aggregate. Most of the quarrying is for gravel or crushed stone for use in road construction or other paving. The size of the excavated areas range from 4 to 200 acres.

These pits are from 10 to 175 feet deep. The sides are mostly steep to vertical. Included in mapping are small areas of water.

Most areas lack vegetation. The more shallow parts in some areas could be reclaimed if there is enough soil material to support plants. Reclaiming some of the deeper areas would be difficult.

Onsite investigation is generally needed before planning the reclamation and use of this unit.

This unit is not assigned to a capability subclass or woodland group.

UL—Udorthents, loamy. This map unit consists of areas where all of the original soil has been removed for use as fill material in construction. The exposed surface now consists mainly of highly weathered bedrock or the bedrock that had underlain the natural soil before it was excavated. Areas range from 5 to 40 acres. The composition of this map unit is more variable than that of most other units in the survey area but has been controlled well enough to be interpreted for the expected use of the soils.

The cuts are 3 to 25 feet deep. They are level or gently sloping. The sides are very steep to nearly vertical.

Included in mapping are small undisturbed areas where there is a clayey subsoil and part of the loamy surface layer.

Most areas have been reclaimed and seeded to grass. A few are naturally reseeded in wild grasses, weeds, and shortleaf and Virginia pines. The potential is low for plants because of the low fertility, the low available water capacity, and the erodibility.

The potential for urban development varies. Many areas are graded along one side to the level of an adjoining roadway. The potential is high for industrial or commercial development. Some areas cut below the remaining original ground level have low potential for urban development.

Onsite investigation is generally needed before planning the reclamation and use of this unit.

This unit is not assigned to a capability subclass or woodland group.

UO—Udorthents, sanitary landfill. This map unit consists of areas where the natural soil has been altered by sanitary landfill. These are excavated areas where deeply graded trenches have been backfilled with alternated layers of solid refuse and soil material and covered with 2 to 3 feet of soil. After the final cover is added, the surface is nearly level to gently sloping. Areas range from 20 to 160 acres. The composition of this map unit is more variable than that of most other units in the survey area but has been controlled well enough to be interpreted for the expected use of the soils.

Included in areas still in use is a small acreage of undisturbed soil.

These areas have moderate potential for plant growth. Most are seeded to grass or planted to trees. Natural fertility and available water capacity are generally low. The erosion hazard is severe. A permanent plant cover is essential to protect these areas from erosion.

These areas are unsuitable for most building purposes because of subsidence and the danger of hazardous methane gas, which is produced in the landfill. The potential is moderate to high for most outdoor recreational activities.

Onsite investigation is needed before planning the use and management of this unit.

This unit is not assigned to a capability subclass or woodland group.

Ur—Urban land. This map unit consists of areas where more than 85 percent of the surface area is covered with asphalt, concrete, buildings, or other impervious cover. Most of the soil material has been cut, filled, and graded, and the natural characteristics altered or destroyed. The rest is small lawns or shrub gardens near buildings, sidewalks, and parking lots.

Most areas are in or near the business district of Charlotte. Isolated areas mapped are more than 5 acres.

The main problem created in areas of Urban land is that the very high volume of surface runoff can cause flooding in low-lying areas downstream.

Examining and identifying the soils in this unit is impractical. Careful onsite investigation is needed to determine the suitability of any particular area for any proposed use.

VaB—Vance sandy loam, 2 to 8 percent slopes. This well drained soil is on broad ridges and side slopes of the uplands. Mapped areas are commonly oblong and range from 4 to 40 acres.

Typically, the surface layer is yellowish brown sandy loam about 8 inches thick. The subsoil is strong brown clay 25 inches thick. The underlying material to a depth of 50 inches is mottled strong brown, yellow, and red clay loam and loam.

Included with this soil in mapping are a few areas of similar soils that are less acid than the Vance soil and a few eroded areas where the surface layer is sandy clay loam or clay loam. Also included are small areas of Appling, Enon, and Helena soils. The included soils make up about 10 to 25 percent of this map unit.

The organic matter content is low in the surface layer of this Vance soil. Permeability is slow, the available water capacity is medium, the shrink-swell potential is moderate, and surface runoff is medium. The subsoil is strongly acid or very strongly acid. Depth to bedrock is below 60 inches. The water table is below 6 feet.

Most of the acreage is used for crops, hay, and pasture. Some areas are woodland.

This soil has moderately high potential for most crops. Erosion is a hazard if cultivated crops are grown. As the original surface layer is lost, the underlying sticky subsoil becomes part of the plow layer. This process lowers the overall tilth. Minimum tillage, the return of crop residue to the soil, and the use of cover crops, including grasses and legumes, reduce runoff and help to control erosion.

This soil has moderately high potential for broadleaf and needleleaf trees. The dominant trees are loblolly pine, Virginia pine, sweetgum, sycamore, white oak, and yellow-poplar. The dominant understory species are dogwood, redbud, holly, sourwood, and black cherry. There are no significant limitations in woodland use or management.

This soil has low potential for most urban uses because of the slow permeability and the low strength. The slow permeability significantly limits the absorption of effluent in septic tank absorption fields. This limitation generally can be overcome by modifying the field or by increasing the size of the absorption area, or both. Corrective measures commonly used for low strength are increasing the size of the footings and, where appropriate, placing structures on slabs. The potential is only moderate for camp areas and playgrounds because of the slow permeability. It is high for most other kinds of recreation.

The capability subclass is IIIe. The woodland group is 3o.

VaD—Vance sandy loam, 8 to 15 percent slopes. This well drained soil is on side slopes on the uplands. Mapped areas are oblong and range from 4 to 25 acres.

Typically, the surface layer is yellowish brown sandy loam about 8 inches thick. The subsoil is strong brown clay 25 inches thick. The underlying material to a depth of 50 inches is mottled strong brown, yellow, and red clay loam and loam.

Included with this soil in mapping are a few areas of similar soils that are less acid than the Vance soil and a few eroded areas where the surface layer is sandy clay loam or clay loam. Also included are small areas of Appling, Enon, and Helena soils. The included soils make up about 10 to 25 percent of this map unit.

The organic matter content is low in the surface layer of this Vance soil. Permeability is slow, the available water capacity is medium, the shrink-swell potential is moderate, and surface runoff is rapid. The subsoil is strongly acid or very strongly acid. Depth to bedrock is below 60 inches. The water table is below 6 feet.

Most of the acreage is woodland. Some areas are used for crops, hay, and pasture.

This soil has moderately high potential for most crops. Good tilth can be maintained by returning crop residue to the soil. Surface runoff and erosion are hazards if cultivated crops are grown. Minimum tillage or the use of cover crops, including grasses and legumes, helps to control erosion in cultivated areas.

This soil has moderately high potential for broadleaf and needleleaf trees. The dominant trees are loblolly pine, Virginia pine, sweetgum, sycamore, white oak, and yellow-poplar. The dominant understory species are dogwood, redbud, holly, sourwood, and black cherry. There are no significant limitations in woodland use or management.

The potential for most urban uses is low because of the slow permeability, the slope, and the low strength. The slow permeability significantly limits the absorption of effluent in septic tank absorption fields. This limitation generally can be overcome by modifying the field or by increasing the size of the absorption area, or both. The slope limitation can be reduced or modified by special planning, design, and maintenance. Corrective measures commonly used for low strength are increasing the size of the footings and, where appropriate, placing structures on slabs. The potential is high for paths and trails. It is low for playgrounds because of the slope and slow permeability. It is moderate for most other kinds of recreation because of the slope and slow permeability.

The capability subclass is IIIe. The woodland group is 3o.

WkB—Wilkes loam, 4 to 8 percent slopes. This well drained soil is on upland ridges. Mapped areas are on narrow ridges and range from 4 to 25 acres.

Typically, the surface layer is dark grayish brown loam about 4 inches thick. The subsurface layer is brown loam 3 inches thick. The subsoil is 8 inches thick. The upper part is strong brown clay, and the lower part is strong brown clay loam. The underlying material to a depth of 48 inches (fig. 6) is olive brown, green, and black sandy loam. Below this is dark colored hard rock.

Included with this soil in mapping are a few areas where the slope is less than 4 percent, a few areas where there is no clay subsoil, a few eroded areas where the surface layer is sandy clay loam, and a few small areas where the bedrock is less than 40 inches below the surface. Also included are some small areas of Enon and Iredell soils. The included soils, each less than 5 acres, make up about 10 to 20 percent of this map unit.

The organic matter content is low in the surface layer of this Wilkes soil. Permeability is moderately slow, the available water capacity is very low, the shrink-swell potential is moderate, and surface runoff is medium. The subsoil is slightly acid to mildly alkaline. Depth to hard bedrock range from 40 to 80 inches. The water table is below 6 feet.

Most of the acreage is used for crops, hay, and pasture. Some areas are used for woodland or residential development.

This soil has moderate potential for row crops, such as corn and soybeans, and moderate potential for hay, pasture, and small grain. The shape makes the hazard of erosion severe if these soils are used for row crops. Minimum tillage, the return of crop residue to the soil, and the use of cover crops, including grasses and legumes, reduce runoff and help to control erosion.

This soil has moderate potential for needleleaf trees. The dominant trees are loblolly pine, shortleaf pine, Virginia pine, and redcedar. The main understory species are dogwood, redbud, holly, sourwood, and black cherry. There are no significant limitations in woodland use or management.

The potential is moderate to low for most urban uses because of the depth to rock. The potential is low for playgrounds because of the slope, moderate for golf fairways because of the depth to bedrock, and high for most other uses.

The capability subclass is IVe. The woodland group is 4o.

WkD—Wilkes loam, 8 to 15 percent slopes. This well drained soil is on narrow ridges and side slopes of the uplands. Mapped areas are oval and range from 4 to 100 acres.

Typically, the surface layer is dark grayish brown loam about 4 inches thick. The subsurface layer is brown loam 3 inches thick. The subsoil is 8 inches thick. The upper part is strong brown clay, and the lower part is strong brown clay loam. The underlying material to a depth of 48 inches is olive brown, green, and black sandy loam. Below this is dark colored hard rock.

Included with this soil in mapping are a few areas where the slope is less than 8 percent, a few areas where there is no clay subsoil, a few eroded areas where the surface layer is sandy clay loam, and a few small areas where bedrock is less than 40 inches below the surface. Also included are some small areas of Enon and Mecklenburg soils. The included soils, each less than 5 acres, make up about 10 to 20 percent of this map unit.

The organic matter content is low in the surface layer of this Wilkes soil. Permeability is moderately slow, the available water capcaity is very low, the shrink-swell potential is moderate, and surface runoff is rapid. The subsoil is slightly acid to mildly alkaline. Depth to hard bedrock ranges from 40 to 80 inches. The water table is below 6 feet.

Most of the acreage is used for hay and pasture. Some areas are woodland.

This soil has low potential for row crops, such as corn and soybeans, and moderate potential for hay, pasture, and small grain. Erosion is a hazard if cultivated crops are grown. Minimum tillage, the return of crop residue to the soil, and the use of cover crops, including grasses and legumes, help to control erosion in cultivated areas.

The potential is moderate for needleleaf trees. The dominant trees are loblolly pine, shortleaf pine, Virginia pine, and redcedar. The main understory species are dogwood, redbud, holly, sourwood, and black cherry. There are no significant limitations in woodland use and management.

This soil has moderate to low potential for most urban uses because of the slope and the depth to bedrock. The potential is high for paths and trails. It is low for playgrounds because of the slope. It is moderate for most other kinds of recreation because of the slope.

The capability subclass is VIe. The woodland group is 4o.

WkE—Wilkes loam, 15 to 25 percent slopes. This well drained soil is on side slopes adjacent to drainageways. Mapped areas are oblong and range from 6 to 200 acres.

Typically, the surface layer is dark grayish brown loam about 4 inches thick. The subsurface layer is brown loam 3 inches thick. The subsoil is 8 inches thick. The upper part is strong brown clay, and the lower part is strong brown clay loam. The underlying material to a depth of 48 inches is olive brown, green, and black sandy loam. Below this is dark colored hard rock.

Included with this soil in mapping are a few areas where there is no clay subsoil, a few small eroded areas where the surface layer is sandy clay loam, and a few small areas where bedrock is less than 40 inches below the surface. Also included are some small areas of the Pacolet soil. The included soils, each less than 5 acres, make up about 10 to 15 percent of this map unit.

The organic matter content is low in the surface layer of this Wilkes soil. Permeability is moderately slow, the available water capacity is very low, the shrink-swell potential is moderate, and surface runoff is rapid. The subsoil is slightly acid to mildly alkaline. Depth to hard bedrock ranges from 40 to 80 inches. The water table is below 6 feet.

Most of the acreage is woodland. Some areas are used for pasture.

This soil has low potential for crops and moderate potential for pasture. Good pasture management helps to insure adequate protective cover by reducing runoff and controlling erosion. Pastures should be properly maintained to prevent the hazard of erosion.

The potential is moderate for needleleaf trees. The dominant trees are loblolly pine, shortleaf pine, Virginia pine, and redcedar. The main understory species are dogwood, redbud, holly, sourwood, and black cherry. The slope is the main limitation in woodland use and management.

This soil has low potential for most urban uses because of the slope and the depth to bedrock. The potential is low for most recreational uses because of the slope.

The capability subclass is VIIe. The woodland group is 4r.

WkF—Wilkes loam, 25 to 45 percent slopes. This well drained soil is on side slopes adjacent to major drainageways. Mapped areas are commonly oblong and range from 4 to 100 acres.

Typically, the surface layer is dark grayish brown loam about 4 inches thick. The subsurface layer is brown loam 3 inches thick. The subsoil is 8 inches thick. The upper part is strong brown clay, and the lower part is strong brown clay loam. The underlying material to a depth of 48 inches is olive brown, green, and black sandy loam. Below this is dark colored hard rock.

Included with this soil in mapping are a few areas where the slope is less than 25 percent, a few areas where there is no clay subsoil, a few eroded areas where the surface layer is clay loam, and a few small areas where bedrock is less than 40 inches below the surface. Also included are some small areas of the Pacolet soil. The included soils, each less than 5 acres, make up about 10 percent of this map unit.

The organic matter content is low in the surface layer of this Wilkes soil. Permeability is moderately slow, the available water capacity is very low, the shrink-swell potential is moderate, and surface runoff is rapid. The subsoil is slightly acid to mildly alkaline. Depth to hard bedrock ranges from 40 to 80 inches. The water table is below 6 feet.

Most of the acreage is woodland. Some areas are used for pasture.

This soil is not suited to crops because of the slope. It has moderate potential for pasture. Good pasture management helps to insure adequate protective cover by reducing runoff and controlling erosion. Pastures should be properly maintained to prevent the hazard of erosion.

This soil has moderate potential for needleleaf trees. The dominant trees are loblolly pine, shortleaf pine, Virginia pine, and redcedar. The main understory species are dogwood, redbud, holly, sourwood, and black cherry. The slope is the main limitation in woodland use and management.

This soil has low potential for most urban and recreational uses because of the slope and the depth to rock.

The capability subclass is VIIe. The woodland group is 4r.

WuD—Wilkes-Urban land complex, 8 to 15 percent slopes. This map unit consists of areas of Wilkes soils and areas of Urban land primarily in the suburban areas of Charlotte. These areas are too small and too intricately mixed to be mapped separately. The undisturbed Wilkes soil makes up 50 to 70 percent of each area, and Urban land makes up 15 to 35 percent. The rest of this unit consists of areas where most of the natural soil has been altered or covered as the result of grading and digging.

The undisturbed Wilkes soil is well drained. Typically, the surface layer is dark grayish brown loam about 4 inches thick. The subsurface layer is brown loam 3 inches thick. The subsoil is 8 inches thick. The upper part is strong brown clay, and the lower part is strong brown clay loam. The underlying material to a depth of 48 inches is olive brown, green, and black sandy loam. Below this is dark colored hard rock.

The organic matter content is low in the surface layer. Permeability is moderately slow, the available water capacity is very low, the shrink-swell potential is moderate, and surface runoff is rapid. The subsoil is slightly acid to mildly alkaline. Depth to hard bedrock ranges from 40 to 80 inches. The water table is below 6 feet.

The Urban land part of this unit is covered mostly with paved streets, closely spaced houses, driveways, apartment complexes, schools, and churches.

In some altered, or disturbed, areas the Wilkes soil is covered with more than 20 inches of fill material. In others, more than two-thirds of the natural soil has been removed by cutting and grading.

Included with this unit in mapping are small areas of Enon and Mecklenburg soils.

Because of the slope and runoff, erosion is a hazard if these soils are disturbed for urban development. Also because of the slope, grading is needed for urbanization. The degree of grading limits urban development because of the depth to bedrock. Surface runoff from rooftops and paved surfaces causes an increased hazard of flooding in low-lying areas downstream.

Onsite investigation is generally needed before planning the use and management of this unit.

This unit is not assigned to a capability subclass or to a woodland group.

Use and management of the soils

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

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

Information in this section is useful in planning use and management of soils for crops and pasture, and woodland; as sites for buildings, highways and other transportation systems, sanitary facilities, and parks and other recreation facilities; and for wildlife habitat. From the data presented, the potential of each soil for specified land uses can be determined, soil limitations to these land uses can be identified, and costly failures in houses and other structures, caused by unfavorable soil properties, can be avoided. A site where soil properties are favorable can be selected, or practices that will overcome the soil limitations can be planned.

Planners and others using the soil survey can evaluate the impact of specific land uses on the overall productivity of the survey area or other broad planning area and on the environment. Productivity and the environment are closely related to the nature of the soil. Plans should maintain or create a land-use pattern in harmony with the natural soil.

Contractors can find information that is useful in locating sources of sand and gravel, roadfill, and topsoil. Other information indicates the presence of bedrock, wetness, or very firm soil horizons that cause difficulty in excavation.

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

Crops and pasture

Albert B. Coffey, district conservationist, and personnel from the State Resource Conservationist's office, Soil Conservation Service, helped prepare this section.

According to the 1975 Land Utilization Summary compiled by the North Carolina Department of Agriculture, 164,314 acres in Mecklenburg County is farmland. Of this total, 110,631 acres is forest or idle cropland, 33,578 acres is open pasture, and 20,105 acres is cropland. Of the 20,105 acres of cropland, about 30 percent is used for hay, 21 percent for soybeans, 16 percent for corn or grain, 8 percent for corn or sorghum for silage, 13 percent for small grain, such as oats, wheat, and barley, and 12 percent for other crops.

More than 50 percent of the county is now in nonfarm use. The acreage in crops and pasture is gradually decreasing as farmland is abandoned or converted to urban development.

The major management concerns in the use of the soils for crops and pasture are described in this section. In addition, the crops or pasture plants best suited to the soil, including system of land capability classification used by the Soil Conservation Service is explained; and the predicted yields of the main crops and hay and pasture plants are presented for each soil.

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

Soil erosion is the major concern on most of the soils in Mecklenburg County. If slope is more than 2 percent, erosion is a hazard.

Loss of the surface layer through erosion is damaging for two reasons. First, productivity is reduced as the surface layer is lost and part of the subsoil is incorporated into the plow layer. Loss of the surface layer is especially damaging on soils that have a clayey subsoil, such as the upland soils and on soils that are shallow to bedrock such as Goldston and Wilkes. Second, soil erosion on farmland results in sedimentation of streams.

Control of erosion minimizes the pollution of streams by sediment and improves the quality of water for municipal use, for recreation, and for fish and wildlife.

In many sloping fields, tilling or preparing a good seedbed is difficult on clayey spots because the original friable surface soil has been eroded away.

Erosion control practices provide protective surface cover, reduce runoff, and increase infiltration. A cropping system that keeps vegetative cover on the soil for extended periods can hold soil erosion losses to amounts that will not reduce the productive capacity of the soils. On livestock farms, the legume and grass forage crops in the cropping system reduce erosion on sloping land, also provide nitrogen, and improve tilth for the following crop.

Contour tillage and terracing are practical in most areas of gently sloping soils. Cropping systems that provide substantial vegetative cover are required to control erosion unless minimum tillage is practiced. Minimizing tillage and leaving crop residue on the surface help increase infiltration and reduce the hazards of runoff and erosion. These practices can be adapted to most soils in the survey area, but they are more difficult to use successfully on the eroded soils and on the soils that have a clayey surface layer. No-till farming of corn is effective in reducing erosion on sloping land and can be adapted to most soils in the survey area. It is more difficult to practice successfully, however, on the soils that have a clayey surface layer.

Terraces and diversions reduce the length of slope and reduce runoff and erosion with slopes of 8 percent or less. They are not practical on steeper slopes or on shallow soils such as Wilkes or Goldston.

Contouring and contour stripcropping are widespread erosion control practices in the survey area. They are best adapted to soils that have smooth, uniform slopes.

Information for the design of erosion control practices for each kind of soil is contained in the Technical Guide, available in local offices of the Soil Conservation Service.

Soil drainage is a management need on some of the acreage used for crops and pasture in the survey area. Some soils are so wet that the production of crops common to the area is generally not feasible unless artificial drainage is installed. These are the somewhat poorly drained Monacan soils on the flood plains and the moderately well drained Helena, Iredell, and Lignum soils in upland positions and around the heads of drainageways.

The design of both surface and subsurface drainage systems varies with the kind of soil. A combination of surface drainage and tile drainage is needed in most areas of the somewhat poorly drained Monacan soils when used for intensive row cropping. Drains have to be more closely spaced in slowly permeable soils than in more permeable soils. Tile drainage is not feasible on the Helena, Lignum, or Iredell soils.

Soil fertility is naturally low in most soils on uplands in the survey area. Fertilizer and lime additions to all soils are necessary for economical crop production.

On all soils additions of lime and fertilizer should be based on the results of soil tests, on the need of the crop, and on the expected level of yields. The Cooperative Extension Service can help in determining the kinds and amounts of fertilizer and lime to apply.

Soil tilth is an important factor in the germination of seeds and in the infiltration of water into the soil. Soils with good tilth are granular and porous.

Many of the soils used for crops in the survey area have a high clay content in the surface layer and most are low in content of organic matter. Generally the structure of such soils is weak, and intense rainfall causes the formation of a crust on the surface. The crust is hard when dry and nearly impervious to water. Once the crust forms, it reduces infiltration and increases runoff. Regular additions of crop residue, manure, and other organic material can help improve soil structure and reduce crust formation.

Field crops suited to the soils and climate of the survey area include some that are not now commonly grown such as cotton which at one time was the chief cash crop in the county. Corn and soybeans are now the principal row crops. Corn and grain sorghum for silage are the principal row crops for cattle feed.

Wheat, oats, and barley are the common close-growing crops grown for grain harvest while hay is the dominant crop grown overall.

Special crops grown commercially in the survey area are vegetables, small fruits, tree fruits, and nursery plants. A small acreage throughout the survey area is used for melons, strawberries, grapes, sweet corn, tomatoes, peppers, and other vegetables and small fruits.

Latest information and suggestions for growing special crops can be obtained from local offices of the Cooperative Extension Service and the Soil Conservation Service.

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

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

The yields were estimated assuming that the latest soil and crop management practices were used. Hay and pasture yields were estimated for the most productive varieties of grasses and legumes suited to the climate and the soil. A few farmers may be obtaining average yields higher than those shown in table 5.

The management needed to achieve the indicated yields of the various crops depends on the kind of soil and the crop. Such management provides drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate tillage practices, including time of tillage and seedbed preparation and tilling when soil moisture is favorable; 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 residues, barnyard manure, and green-manure crops; harvesting crops with the smallest possible loss; and timeliness of all fieldwork.

The estimated yields reflect the productive capacity of the soils 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 included because the acreage of these crops is small. The local offices of the Soil Conservation Service and the Cooperative Extension Service can provide information about the management concerns and productivity of the soils for these crops.

Capability classes and subclasses

Capability classes and subclasses show, in a general way, the suitability of soils for most kinds of field crops. The soils are classed according to their limitations when they are used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to rice, cranberries, horticultural crops, or other crops that require special management. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for forest trees, or for engineering purposes.

In the capability system, all kinds of soil are grouped at three levels: capability class, subclass, and unit. These levels are defined in the following paragraphs. A survey area may not have soils of all classes.

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

Class I soils have few limitations that restrict their use. (None in Mecklenburg County)

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

Class III soils have severe limitations that reduce the choice of plants, 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. (None in Mecklenburg County)

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 landforms have limitations that nearly preclude their use for commercial crop production. (None in Mecklenburg County)

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

Woodland management and productivity

Albert B. Coffey, district conservationist, and Edwin J. Young, woodland conservationist, Soil Conservation Service, helped prepare this section.

All the area that is now Mecklenburg County was originally forest. The forest was dominantly hardwoods and scattered small areas of shortleaf, loblolly, and Virginia pine and eastern redcedar.

Ever since early settlers moved into the area in the 1740's, this original forest has been cleared for wood products and crop production. As natural fertility declined, fields were abandoned and were naturally reseeded with pine and eastern redcedar. Most of the second growth stands, having reached merchantable size, have also been cut to meet later demands for wood products and cropland. As a result of these disturbances, most of the present forest is stands of pine or mixed pine and second growth hardwoods.

According to the 1971 North Carolina Conservation Needs Inventory, forest now occupies about 170,000 acres, or about 51 percent of the total land area in Mecklenburg County. The value of the forest resource can be greatly increased by planned reforestation and by better management of the existing stands.

Table 6 contains information useful to woodland owners or forest managers planning use of soils for wood crops. Map unit symbols for soils suitable for wood crops are listed, and the ordination (woodland suitability) symbol for each soil is given. All soils bearing the same ordination symbol require the same general kinds of woodland management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; *t*, toxic substances in the soil; *d*, restricted root depth; *c*, clay in the upper part of the soil; *s*, sandy texture; *f*, high content of coarse fragments in the soil profile; and *r*, steep slopes. The letter *o* indicates insignificant limitations or restrictions. If a soil has more than one limitation, priority in placing the soil into a limitation class is in the following order: x, w, t, d, c, s, f, and r.

In table 6 the soils are also rated for a number of factors to be considered in management. *Slight, moderate,* and *severe* are used to indicate the degree of major soil limitations.

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

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or equipment; *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree that the soil affects expected mortality of planted tree seedlings. Plant competition is not considered in the ratings. Seedlings from good planting stock that are properly planted during a period of sufficient rainfall are rated. A rating of *slight* indicates that the expected mortality of the planted seedlings is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Ratings of *plant competition* indicate the degree to which undesirable plants are expected to invade or grow if openings are made in the tree canopy. The invading plants compete with native plants or planted seedlings by impeding or preventing their growth. A rating of *slight* indicates little or no competition from other plants; *moderate* indicates that plant competition is expected to hinder the development of a fully stocked stand of desirable trees; *severe* means that plant competition is expected to prevent the establishment of a desirable stand unless the site is intensively prepared, weeded, or otherwise managed for the control of undesirable plants.

The *potential productivity* of merchantable or *important trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. Site index was calculated at age 50 for all species. The site index applies to fully stocked, even-aged, unmanaged stands. Important trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

Trees to plant are those that are suitable for commercial wood production and that are suited to the soils.

Landscaping

Ted Caudle, ornamental horticulturist, and Donald McSween, urban forester, Mecklenburg County Agricultural Extension Service, helped prepare table 7.

Table 7 lists landscaping plants that either grow naturally in Mecklenburg County or can be readily adapted. Considered in the table are characteristics of plants, such as tolerance for wetness, required depth of root zone, susceptibility to root rot disease in poorly aerated clays, and any restrictive range in soil reaction (pH). Not considered is the plant tolerance to shade or sunlight.

Soil properties that influence the growth of plants are the rooting depth, drainage, texture, content of organic matter, available water capacity, and soil reaction. Many of these properties can be modified to encourage plant growth.

Shallowness of the soil over bedrock, a seasonal high water table, or impervious soil layers restrict plant roots. Goldston and Wilkes soils, for example, have bedrock or soil layers that have a high content of rock fragments within about 20 inches of the surface. Because the storage of available water is very low, these soils are droughty when rainfall is limited. Adding topsoil, mulching to conserve moisture, adding water, and maintaining a good fertilization program are appropriate landscaping techniques.

Wet soils occur in small scattered areas throughout the county, in areas that receive runoff from the adjacent soils. They occur in small depressions, in concave areas around the heads of intermittent drainageways and along drainageways, in seeps, and at the base of slopes. Surface ditches or tile drains or both can be used to remove the excess water, particularly in areas of Helena, Lignum, and Monacan soils. Monacan soils are also subject to flooding. Another consideration is selecting plants that tolerate wet soil conditions.

Almost all upland soils in the county have a predominantly clayey subsoil. They are low or medium in natural fertility. The dense clayey subsoil restricts the internal movement of air and water and limits root development. Organic and inorganic amendments improve the soils for most lawn and landscaping plants. Compost (aerobically composted leaves, pine needles, grass, and wood chippings or any combination of these), peat moss, leaf mold, rotted sawdust, stable manure, and coarse construction sand are suitable amendments. Each soil amendment is used chiefly to improve the pore space within the soil, which directly affects air and water movement and plant root development. The amendments also improve soil tilth, increase fertility, and help in reducing soil compaction.

Most plants thrive in soils that are only slightly acid. A few plants, for example, azalea and rhododenron, require very acid soils. Because the soils in the county range from very strongly acid to neutral, it is often necessary to plant only adapted plants or to amend the soil reaction. Adding organic matter, such as pine needles or acid leaf mold, can increase the acidity for plants that require acid soils. Generally, however, a chemical method is needed to bring about the desired increase in acidity. Certain sulfur compounds are often prescribed for this purpose. A soil test can determine the amount and kind of the compounds needed.

For help in making soil tests, applying site drainage, or deciding what soil amendments, if any, are needed, contact the local office of the Soil Conservation Service or the Agricultural Extension Service.

Engineering

Albert B. Coffey, district conservationist, and John F. Rice, assistant State conservation engineer, Soil Conservation Service, helped prepare this section.

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

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

Among the soil properties and site conditions identified by a soil survey and used in determining the ratings in this section were grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock that is within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure or aggregation, in-place soil density, and geologic origin of the soil material. Where pertinent, data about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of absorbed cations were also considered.

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

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

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

The information is presented mainly in tables. Table 8 shows, for each kind of soil, the degree and kind of limitations for building site development; table 9, for sanitary facilities; and table 11, for water management. Table 10 shows the suitability of each kind of soil as a source of construction materials.

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

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

Building site development

The degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, and local roads and streets are indicated in table 8. A *slight* limitation indicates that soil properties generally are favorable for the specified use; any limitation is minor and easily overcome. A *moderate* limitation indicates that soil properties and site features are unfavorable for the specified use, but the limitations can be overcome or minimized by special planning and design. A *severe* limitation indicates that one or more soil properties or site features are so unfavorable or difficult to overcome that a major increase in construction effort, special design, or intensive maintenance is required. For some soils rated severe, such costly measures may not be feasible.

Shallow excavations are made for pipelines, sewerlines, communications and power transmission lines, basements, and open ditches. Such digging or trenching is influenced by soil wetness caused by a seasonal high water table; the texture and consistence of soils; the tendency of soils to cave in or slough; and the presence of very firm, dense soil layers, bedrock, or large stones. In addition, excavations are affected by slope of the soil and the probability of flooding. Ratings do not apply to soil horizons below a depth of 6 feet unless otherwise noted.

In the soil series descriptions, the consistence of each soil horizon is given, and the presence of very firm or extremely firm horizons, usually difficult to excavate, is indicated.

Dwellings and *small commercial buildings* referred to in table 8 are built on undisturbed soil and have foundation loads of a dwelling no more than three stories high. Separate ratings are made for small commercial buildings without basements and for dwellings with and without basements. For such structures, soils should be sufficiently stable that cracking or subsidence of the structure from settling or shear failure of the foundation does not occur. These ratings were determined from estimates of the shear strength, compressibility, and shrink-swell potential of the soil. Soil texture, plasticity and in-place density, potential frost action, soil wetness, and depth to a seasonal high water table were also considered. Soil wetness and depth to a seasonal high water table indicate potential difficulty in providing adequate drainage for basements, lawns, and gardens. Depth to bedrock, slope, and large stones in or on the soil are also important considerations in the choice of sites for these structures and were considered in determining the ratings. Susceptibility to flooding is a serious hazard.

Local roads and streets referred to in table 8 have an all-weather surface that can carry light to medium traffic all year. They consist of a subgrade of the underlying soil material; a base of gravel, crushed rock fragments, or soil material stabilized with lime or cement; and a flexible or rigid surface, commonly asphalt or concrete. The roads are graded with soil material at hand, and most cuts and fills are less than 6 feet deep.

The load supporting capacity and the stability of the soil as well as the quantity and workability of fill material available are important in design and construction of roads and streets. The classifications of the soil and the soil texture, density, shrink-swell potential, and potential frost action are indicators of the traffic supporting capacity used in making the ratings. Soil wetness, flooding, slope, depth to hard rock or very compact layers, and content of large stones affect stability and ease of excavation.

Lawns and landscaping require soils that are suitable for the establishment and maintenance of turf for lawns and ornamental trees and shrubs for landscaping. The best soils are firm after rains, are not dusty when dry, and absorb water readily and hold sufficient moisture for plant growth. The surface layer should be free of stones. If shaping is required, the soils should be thick enough over bedrock or hardpan to allow for necessary grading. In rating the soils, the availability of water for sprinkling is assumed.

Sanitary facilities

Favorable soil properties and site features are needed for proper functioning of septic tank absorption fields, sewage lagoons, and sanitary landfills. The nature of the soil is important in selecting sites for these facilities and in identifying limiting soil properties and site features to be considered in design and installation. Also, those soil properties that affect ease of excavation or installation of these facilities will be of interest to contractors and local officials. Table 9 shows the degree and kind of limitations of each soil for such uses and for use of the soil as daily cover for landfills. It is important to observe local ordinances and regulations.

If the degree of soil limitation is expressed as *slight*, soils are generally favorable for the specified use and limitations are minor and easily overcome; if *moderate*, soil properties or site features are unfavorable for the specified use, but limitations can be overcome by special planning and design; and if *severe*, soil properties or site features are so unfavorable or difficult to overcome that major soil reclamation, special designs, or intensive maintenance is required. Soil suitability is rated by the terms *good*, *fair*, or *poor*, which, respectively, mean about the same as the terms *slight*, *moderate*, and *severe*.

Septic tank absorption fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into the natural soil. Only the soil horizons between depths of 18 and 72 inches are evaluated for this use. The soil properties and site features considered are those that affect the absorption of the effluent and those that affect the construction of the system.

Properties and features that affect absorption of the effluent are permeability, depth to seasonal high water table, depth to bedrock, and susceptibility to flooding. Stones, boulders, and shallowness to bedrock interfere with installation. Excessive slope can cause lateral seepage and surfacing of the effluent. Also, soil erosion and soil slippage are hazards if absorption fields are installed on sloping soils.

In some soils, loose sand and gravel or fractured bedrock is less than 4 feet below the tile lines. In these soils the absorption field does not adequately filter the effluent, and ground water in the area may be contaminated.

On many of the soils that have moderate or severe limitations for use as septic tank absorption fields, a system to lower the seasonal water table can be installed or the size of the absorption field can be increased so that performance is satisfactory.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons have a nearly level floor and cut slopes or embankments of compacted soil material. Aerobic lagoons generally are designed to hold sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water. Soils that are very high in content of organic matter and those that have cobbles, stones, or boulders are not suitable. Unless the soil has very slow permeability, contamination of ground water is a hazard where the seasonal high water table is above the level of the lagoon floor. In soils where the water table is seasonally high, seepage of ground water into the lagoon can seriously reduce the lagoon's capacity for liquid waste. Slope, depth to bedrock, and susceptibility to flooding also affect the suitability of sites for sewage lagoons or the cost of construction. Shear strength and permeability of compacted soil material affect the performance of embankments.

Sanitary landfill is a method of disposing of solid waste by placing refuse in successive layers either in excavated trenches or on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil material. Landfill areas are subject to heavy vehicular traffic. Risk of polluting ground water and trafficability affect the suitability of a soil for this use. The best soils have a loamy or silty texture, have moderate to slow permeability, are deep to a seasonal water table, and are not subject to flooding. Clayey soils are likely to be sticky and difficult to spread. Sandy or gravelly soils generally have rapid permeability, which might allow noxious liquids to contaminate ground water. Soil wetness can be a limitation, because operating heavy equipment on a wet soil is difficult. Seepage into the refuse increases the risk of pollution of ground water.

Ease of excavation affects the suitability of a soil for the trench type of landfill. A suitable soil is deep to bedrock and free of large stones and boulders. If the seasonal water table is high, water will seep into trenches.

Unless otherwise stated, the limitations in table 9 apply only to the soil material within a depth of about 6 feet. If the trench is deeper, a limitation of slight or moderate may not be valid. Site investigation is needed before a site is selected.

Daily cover for landfill should be soil that is easy to excavate and spread over the compacted fill in wet and dry periods. Soils that are loamy or silty and free of stones or boulders are better than other soils. Clayey soils may be sticky and difficult to spread; sandy soils may be subject to soil blowing.

The soils selected for final cover of landfills should be suitable for growing plants. Of all the horizons, the A horizon in most soils has the best workability, more organic matter, and the best potential for growing plants. Thus, for either the area- or trench-type landfill, stockpiling material from the A horizon for use as the surface layer of the final cover is desirable.

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

Construction materials

The suitability of each soil as a source of roadfill, sand, gravel, and topsoil is indicated in table 10 by ratings of good, fair, or poor. The texture, thickness, and organic-matter content of each soil horizon are important factors in rating soils for use as construction materials. Each soil is evaluated to the depth observed, generally about 6 feet.

Roadfill is soil material used in embankments for roads. Soils are evaluated as a source of roadfill for low embankments, which generally are less than 6 feet high and less exacting in design than high embankments. The ratings reflect the ease of excavating and working the material and the expected performance of the material where it has been compacted and adequately drained. The performance of soil after it is stabilized with lime or cement is not considered in the ratings, but information about some of the soil properties that influence such performance is given in the descriptions of the soil series.

The ratings apply to the soil material between the A horizon and a depth of 5 to 6 feet. It is assumed that soil horizons will be mixed during excavation and spreading. Many soils have horizons of contrasting suitability within their profile. The estimated engineering properties in table 14 provide specific information about the nature of each horizon. This information can help determine the suitability of each horizon for roadfill.

Soils rated *good* are coarse grained. They have low shrink-swell potential, low potential frost action, and few cobbles and stones. They are at least moderately well drained and have slopes of 15 percent or less. Soils rated *fair* have a plasticity index of less than 15 and have other limiting features, such as moderate shrink-swell potential, moderately steep slopes, wetness, or many stones. If the thickness of suitable material is less than 3 feet, the entire soil is rated *poor*.

Sand and *gravel* are used in great quantities in many kinds of construction. The ratings in table 10 provide guidance as to where to look for probable sources and are based on the probability that soils in a given area contain sizable quantities of sand or gravel. A soil rated *good* or *fair* has a layer of suitable material at least 3 feet thick, the top of which is within a depth of 6 feet. Coarse fragments of soft bedrock material, such as shale and siltstone, are not considered to be sand and gravel. Fine-grained soils are not suitable sources of sand and gravel.

The ratings do not take into account depth to the water table or other factors that affect excavation of the material. Descriptions of grain size, kinds of minerals, reaction, and stratification are given in the soil series descriptions and in table 14.

Topsoil is used in areas where vegetation is to be established and maintained. Suitability is affected mainly by the ease of working and spreading the soil material in preparing a seedbed and by the ability of the soil material to support plantlife. Also considered is the damage that can result at the area from which the topsoil is taken.

The ease of excavation is influenced by the thickness of suitable material, wetness, slope, and amount of stones. The ability of the soil to support plantlife is determined by texture, structure, and the amount of soluble salts or toxic substances. Organic matter in the A1 or Ap horizon greatly increases the absorption and retention of moisture and nutrients. Therefore, the soil material from these horizons should be carefully preserved for later use.

Soils rated *good* have at least 16 inches of friable loamy material at their surface. They are free of stones and cobbles, are low in content of gravel, and have gentle slopes. They are low in soluble salts that can limit or prevent plant growth. They are naturally fertile or respond well to fertilizer. They are not so wet that excavation is difficult during most of the year.

Soils rated *fair* are loose sandy soils or firm loamy or clayey soils in which the suitable material is only 8 to 16 inches thick or soils that have appreciable amounts of gravel, stones, or soluble salt.

Soils rated *poor* are very sandy soils and very firm clayey soils; soils with suitable layers less than 8 inches thick; soils having large amounts of gravel, stones, or soluble salt; steep soils; and poorly drained soils.

Although a rating of *good* is not based entirely on high content of organic matter, a surface horizon is generally preferred for topsoil because of its organic-matter content. This horizon is designated as A1 or Ap in the soil series descriptions. The absorption and retention of moisture and nutrients for plant growth are greatly increased by organic matter.

Water management

Many soil properties and site features that affect water management practices have been identified in this soil survey. In table 11 the degree of soil limitation and soil and site features that affect use are indicated for each kind of soil. This information is significant in planning, installing, and maintaining water control structures.

Soil and site limitations are expressed as slight, moderate, and severe. *Slight* means that the soil properties and site features are generally favorable for the specified use and that any limitation is minor and easily overcome. *Moderate* means that some soil properties or site features are unfavorable for the specified use but can be overcome or modified by special planning and design. *Severe* means that the soil properties and site features are so unfavorable and so difficult to correct or overcome that major soil reclamation, special design, or intensive maintenance is required.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have a low seepage potential, which is determined by permeability and the depth to fractured or permeable bedrock or other permeable material.

Embankments, dikes, and levees require soil material that is resistant to seepage, erosion, and piping and has favorable stability, shrink-swell potential, shear strength, and compaction characteristics. Large stones and organic matter in a soil downgrade the suitability of a soil for use in embankments, dikes, and levees.

Drainage of soil is affected by such soil properties as permeability; texture; depth to bedrock, hardpan, or other layers that affect the rate of water movement; depth to the water table; slope; stability of ditchbanks; susceptibility to flooding; and availability of outlets for drainage.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to intercept runoff. They allow water to soak into the soil or flow slowly to an outlet. Features that affect suitability of a soil for terraces are uniformity and steepness of slope; depth to bedrock, hardpan, or other unfavorable material; large stones; permeability; ease of establishing vegetation; and resistance to water erosion, soil blowing, soil slipping, and piping.

Grassed waterways are constructed to channel runoff to outlets at a nonerosive velocity. Features that affect the use of soils for waterways are slope, permeability, erodibility, wetness, and suitability for permanent vegetation.

Recreation

Albert B. Coffey, district conservationist, and Edwin J. Young, woodland conservationist, Soil Conservation Service, helped prepare this section.

Mecklenburg County offers a variety of recreational activities. Charlotte has 75 parks and playgrounds, 3 public swimming pools, 11 public golf courses, 10 community centers with varied recreational programs, and a number of ice and roller skating rinks, bowling alleys, and tennis courts.

The 43 private lakes in the county, larger than 5 acres, offer fishing, swimming, and boating. In addition, county residents have access to 50,000 acres of impounded water, Lake Norman (fig. 8), Lake Wylie, and Mountain Island Lake, along the Catawba River. These three lakes, providing boating, swimming, and fishing, are served by numerous public and private marinas, boat launching sites, and camp sites.

Carowinds, a 73 acre family-theme park just south of Charlotte, provides rides, attractions, and exhibits that recreate the culture and heritage of the Carolinas.

Rapid population growth in the county is increasing the demands on existing recreational facilities. New public and private recreational facilities are continually being developed. A knowledge of soils and soil properties is needed in planning and developing new recreational facilities and in maintaining the existing facilities.

The soils of the survey area are rated in table 12 according to limitations that affect their suitability for recreation uses. The ratings are based on such restrictive soil features as flooding, wetness, slope, and texture of the surface layer. Not considered in these ratings, but important in evaluating a site, are location and accessibility of the area, size and shape of the area and its scenic quality, the ability of the soil to support vegetation, access to water, potential water impoundment sites available, and either access to public sewerlines or capacity of the soil to absorb septic tank effluent. Soils subject to flooding are limited, in varying degree, for recreation use by the duration and intensity of flooding and the season when flooding occurs. Onsite assessment of height, duration, intensity, and frequency of flooding is essential in planning recreation facilities.

The degree of the limitation of the soils is expressed as slight, moderate, or severe. *Slight* means that the soil properties are generally favorable and that the limitations are minor and easily overcome. *Moderate* means that the 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 12 can be supplemented by information in other parts of this survey. Especially helpful are interpretations for septic tank absorption fields, given in table 9, and interpretations for dwellings without basements and for local roads and streets, given in table 8.

Camp areas require such site preparation as shaping and leveling for 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 for this use have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing camping sites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for use as 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 will 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 or boulders, is firm after rains, and is not dusty when dry. If shaping is required to obtain a uniform grade, the depth of the soil over bedrock or hardpan should be enough to allow necessary grading.

Paths and trails for walking, horseback riding, bicycling, and other uses should require little or no cutting and filling. The best soils for this use are those that are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once during the annual period of use. They should have moderate slopes and have 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 should have a surface that is free of stones and boulders and have moderate slopes. Suitability of the soil for traps, tees, or greens was not considered in rating the soils. Irrigation is an assumed management practice.

Wildlife habitat

Albert B. Coffey, district conservationist, and John P. Edwards, wildlife biologist, Soil Conservation Service, helped prepare this section.

Soils directly affect the kind and amount of vegetation that is available to wildlife as food and cover, and they affect the construction of water impoundments. The kind and abundance of wildlife that populate an area depend largely on the amount and distribution of food, cover, and water. If any one of these elements is missing, is inadequate, or is inaccessible, wildlife either are scarce or do not inhabit the area.

Mecklenburg County has habitat suitable for many kinds of small game. Gray squirrel, cottontail, fox, raccoon, muskrat, opossum, bobwhite quail, mourning dove, numerous nongame birds, and fish are the most important kinds of wildlife in the county. There is a small deer population.

Improving habitat can increase the abundance of wildlife in the county. Field borders and hedgerows, for example, which are not suitable for cultivation, can provide food and cover for wildlife. The need for habitat should be considered in planning land use patterns in any particular area.

In table 13, the soils in the survey area are rated according to their potential to support the main kinds of wildlife habitat in the area. This information can be used in planning for parks, wildlife refuges, nature study areas, and other developments for wildlife; selecting areas that are suitable for wildlife; selecting soils that are suitable for creating, improving, or maintaining specific elements of wildlife habitat; and 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* means that the element of wildlife habitat or the kind of habitat is easily created, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected if the soil is used for the designated purpose. A rating of *fair* means that the element of wildlife habitat or kind of habitat can be created, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* means that limitations are severe for the designated element or kind of wildlife habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* means that restrictions for the element of wildlife habitat or kind of wildlife are very severe, and that unsatisfactory results can be expected. Wildlife habitat is impractical or even impossible to create, improve, or maintain on soils having such a rating.

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

Grain and seed crops are seed-producing annuals used by wildlife. The major soil properties 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.

Grasses and legumes are domestic perennial grasses and herbaceous legumes that are planted for wildlife food and cover. Major soil properties 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.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds, that provide food and cover for wildlife. Major soil properties that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, and flood hazard. Soil temperature and soil moisture are also considerations.

Hardwood trees and the associated woody understory provide cover for wildlife and produce nuts or other fruit, buds, catkins, twigs, bark, or foliage that wildlife eat. Major soil properties that affect growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness.

Coniferous plants are cone-bearing trees, shrubs, or ground cover plants that furnish habitat or supply food in the form of browse, seeds, or fruitlike cones. Soil properties that have a major effect on the growth of coniferous plants are depth of the root zone, available water capacity, and wetness.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites, exclusive of submerged or floating aquatics. They produce food or cover for wildlife that use wetland as habitat. Major soil properties affecting wetland plants are texture of the surface layer, wetness, reaction.

Shallow water areas are bodies of water that have an average depth of less than 5 feet and that are useful to wildlife. They can be naturally wet areas, or they can be created by dams or levees or by water-control structures in marshes or streams. Major soil properties affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. The availability of a dependable water supply is important if water areas are to be developed.

The kinds of wildlife habitat are briefly described in the following paragraphs.

Openland habitat 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.

Woodland habitat consists of areas of hardwoods or conifers, or a mixture of both, and associated grasses, legumes, and wild herbaceous plants.

Wetland habitat consists of open, marshy or swampy, shallow water areas where water-tolerant plants grow.

Soil properties

Extensive data about soil properties are summarized on the following pages. The two main sources of these data are the many thousands of soil borings made during the course of the survey and the laboratory analyses of selected soil samples from typical profiles.

In making soil borings during field mapping, soil scientists can identify several important soil properties. They note the seasonal soil moisture condition or the presence of free water and its depth. For each horizon in the profile, they note the thickness and color of the soil material; the texture, or amount of clay, silt, sand, and gravel or other coarse fragments; the structure, or the natural pattern of cracks and pores in the undisturbed soil; and the consistence of the soil material in place under the existing soil moisture conditions. They record the depth of plant roots, and determine the pH or reaction of the soil.

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

The available field and laboratory data are summarized in tables. The tables give the estimated range of engineering properties, the engineering classifications, and the physical and chemical properties of each major horizon of each soil in the survey area. They also present data about pertinent soil and water features, engineering test data, and data obtained from physical and chemical laboratory analyses of soils.

Engineering properties

Table 14 gives estimates of engineering properties and classifications for the major horizons of each soil in the survey area.

Most soils have, within the upper 5 or 6 feet, horizons of contrasting properties. Table 14 gives information for each of these contrasting horizons in a typical profile. *Depth* to the upper and lower boundaries of each horizon is indicated. More information about the range in depth and about other properties in each horizon is given for each soil series in the section "Soil series and morphology."

Texture is described in table 14 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 soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains gravel or other particles coarser than sand, an appropriate modifier is added, for example, "gravelly silt loam." Other texture terms are defined in the Glossary.

The two systems commonly used in classifying soils for engineering use are the Unified Soil Classification System (Unified) (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO) (*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, plasticity index, liquid limit, and organic-matter content. Soils are grouped into 15 classes—eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes have a dual classification symbol, for example, CL-ML.

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

When laboratory data are available, the A-1, A-2, and A-7 groups are further classified as follows: A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, and A-7-6. As an additional refinement, the desirability of soils as subgrade material can be indicated by a group index number. These numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The AASHTO classification for soils tested in the survey area, with group index numbers in parentheses, is given in table 17. The estimated classification, without group index numbers, is given in table 14. Also in table 14 the percentage, by weight, of rock fragments more than 3 inches in diameter is estimated for each major horizon. These estimates are determined mainly by observing volume percentage in the field and then converting that, by formula, to weight percentage.

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

Liquid limit and *plasticity index* indicate the effect of water on the strength and consistence of soil. These indexes are used in both the Unified and AASHTO soil classification systems. They are also used as indicators in making general predictions of soil behavior. Range in liquid limit and plasticity index is estimated on the basis of test data from the survey area or from nearby areas and on observations of the many soil borings made during the survey.

In some surveys, the estimates are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterburg limits extend a marginal amount across classification boundaries (1 or 2 percent), the classification in the marginal zone is omitted.

Physical and chemical properties

Table 15 shows estimated values for several soil characteristics and features that affect behavior of soils in engineering uses. These estimates are given for each major horizon, at the depths indicated, in the typical pedon of each soil. The estimates are based on field observations and on test data for these and similar soils.

Permeability is estimated on the basis of known relationships among the soil characteristics observed in the field—particularly soil structure, porosity, and gradation or texture—that influence the downward movement of water in the soil. The estimates are for vertical water movement when the soil is saturated. Not considered in the estimates is lateral seepage or such transient soil features as plowpans and surface crusts. Permeability of the soil is an important factor to be considered in planning and designing drainage systems, in evaluating the potential of soils for septic tank systems and other waste disposal systems, and in many other aspects of land use and management.

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

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

Shrink-swell potential depends mainly on the amount and kind of clay in the soil. Laboratory measurements of the swelling of undisturbed clods were made for many soils. For others the swelling was estimated on the basis of the kind and amount of clay in the soil and on measurements of similar soils. The size of the load and the magnitude of the change in soil moisture content also influence the swelling of soils. Shrinking and swelling of some soils can cause damage to building foundations, basement walls, roads, and other structures unless special designs are used. A high shrink-swell potential indicates that special design and added expense may be required if the planned use of the soil will not tolerate large volume changes.

Erosion factors are used to predict the erodibility of a soil and its tolerance to erosion in relation to specific kinds of land use and treatment. The soil erodibility factor (K) is a measure of the susceptibility of the soil to erosion by water. Soils having the highest K values are the most erodible. K values range from 0.10 to 0.64. To estimate annual soil loss per acre, the K value of a soil is modified by factors representing plant cover, grade and length of slope, management practices, and climate. The soil-loss tolerance factor (T) is the maximum rate of soil erosion, whether from rainfall or soil blowing, that can occur without reducing crop production or environmental quality. The rate is expressed in tons of soil loss per acre per year.

Soil and water features

Table 16 contains information helpful in planning land uses and engineering projects that are likely to be affected by soil and water features.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are placed in one of four groups on the basis of the intake of water after the soils have been wetted and have received 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 chiefly of deep, well drained to excessively drained sands or gravels. 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 that have a layer that impedes the downward movement of water or soils that have moderately fine texture or fine texture. These soils have a slow rate of water transmission.

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

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

The generalized description of flood hazards is of value in land-use planning and provides a valid basis for land-use restrictions. The soil data are less specific, however, than those provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table is the highest level of a saturated zone more than 6 inches thick for a continuous period of more than 2 weeks during most years. The depth to a seasonal high water table applies to undrained soils. Estimates are based mainly on the relationship between grayish colors or mottles in the soil and the depth to free water observed in many borings made during the course of the soil survey. Indicated in table 16 are the depth to the seasonal high water table; the kind of water table, that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. Only saturated zones above a depth of 5 or 6 feet are indicated.

Information about the seasonal high water table helps in assessing the need for specially designed foundations, the need for specific kinds of drainage systems, and the need for footing drains to insure dry basements. Such information is also needed to decide whether or not construction of basements is feasible and to determine how septic tank absorption fields and other underground installations will function. Also, a seasonal high water table affects ease of excavation.

Depth to bedrock is shown for all soils that are underlain by bedrock at a depth of 5 to 6 feet or less. For many soils, the limited depth to bedrock is a part of the definition of the soil series. The depths shown are based on measurements made in many soil borings and on other observations during the mapping of the soils. The kind of bedrock and its hardness as related to ease of excavation is also shown. Rippable bedrock can be excavated with a single-tooth ripping attachment on a 200-horsepower tractor, but hard bedrock generally requires blasting.

Risk of corrosion pertains to potential soil-induced chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to soil moisture, particle-size distribution, total acidity, and electrical conductivity of the soil material. The rate of corrosion of concrete is based mainly on the sulfate content, texture, and acidity of the soil. Protective measures for steel or more resistant concrete help to avoid or minimize damage resulting from the corrosion. Uncoated steel intersecting soil boundaries or soil horizons is more susceptible to corrosion than an installation that is entirely within one kind of soil or within one soil horizon.

Engineering test data

The results of analyses of engineering properties of several typical soils of the survey area are given in table 17.

The data presented are for soil samples that were collected from carefully selected sites. The soil profiles sampled are typical of the series discussed in the section "Soil series and morphology." The soil samples were analyzed by the North Carolina Department of Transportation, Materials and Tests Unit.

The methods used in obtaining the data are listed by code in the next paragraph. Most of the codes, in parentheses, refer to the methods assigned by the American Association of State Highway and Transportation Officials. The codes for shrinkage, Unified classification, and California bearing ratio are those assigned by the American Society for Testing and Materials.

The methods and codes are AASHTO classification (M-145-66); Unified classification (D-2487-66T); mechanical analysis (T88-57); liquid limit (T89-60); plasticity index (T90-56); moisture-density, method A (T99-57); shrinkage (D-427).

Classification of the soils

The system of soil classification currently used was adopted by the National Cooperative Soil Survey in 1965. Readers interested in further details about the system should refer to "Soil taxonomy" (*4*).

The system of classification has six categories. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. In this system the classification is based on the different soil properties that can be observed in the field or those that can be inferred either from other properties that are observable in the field or from the combined data of soil science and other disciplines. The properties selected for the higher categories are the result of soil genesis or of factors that affect soil genesis. In table 18, the soils of the survey area are classified according to the system.

Categories of the system are discussed in the following paragraphs.

ORDER. Ten soil orders are recognized as classes in the system. The properties used to differentiate among orders are those that reflect the kind and degree of dominant soil-forming processes that have taken place. Each order is identified by a word ending in *sol.* An example is Ultisols.

SUBORDER. Each order is divided into suborders based primarily on properties that influence soil genesis and are important to plant growth or that are selected to reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Udults. (*Ud*, from Udic meaning not wet but in a humid climate).

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

SUBGROUP. Each great group may be divided into three subgroups: the central (typic) concept of the great groups, which is not necessarily the most extensive subgroup; the intergrades, or transitional forms to other orders, suborders, or great groups; and the extragrades, which have some properties that are representative of the great groups 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 is thought to typify the great group. An example is Typic Hapludults.

FAMILY. Families are established within a subgroup on the basis of similar physical and chemical properties that affect management. Among the properties considered in horizons of major biological activity below plow depth are particle-size distribution, mineral content, temperature regime, thickness of the soil penetrable by roots, consistence, moisture equivalent, soil slope, and permanent cracks. A family name consists of the name of a subgroup and a series of adjectives. The adjectives are the class names for the soil properties used as family differentiae. An example is clayey, kaolinitic, thermic Typic Hapludults.

SERIES. The series consists of soils that formed in a particular kind of material and have horizons that, except for texture of the surface soil or of the underlying substratum, are similar in differentiating characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineral and chemical composition. An example is the Cecil series in the clayey, kaolinitic, thermic family of Typic Hapludults.

Soil series and morphology

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

Characteristics of the soil and the material in which it formed are discussed for each series. The soil is then compared to similar soils and to nearby soils of other series. Then a pedon, a small three-dimensional area of soil that is typical of the soil series in the survey area, is described. The detailed descriptions of each soil horizon follow standards in the Soil Survey Manual (*3*). Unless otherwise noted, colors described are for moist soil.

Following the pedon description is the range of important characteristics of the soil series in this survey area. Phases, or mapping units, of each soil series are described in the section "Soil maps for detailed planning."

Appling series

The Appling series consists of well drained, moderately permeable soils that formed in residuum from acid igneous and metamorphic rock. These soils are on broad ridges and side slopes. Slope ranges from 2 to 15 percent.

Typical pedon of Appling sandy loam, 2 to 8 percent slopes, 0.5 mile north of South Carolina State Line on U.S. 521, 0.75 mile east of State Road 3632, 0.25 mile north on State Road 3635, 70 feet east in field:

Ap—0 to 8 inches; yellowish brown (10YR 5/4) sandy loam; moderate fine granular structure; very friable; many fine and medium roots; medium acid; gradual wavy boundary.

B1—8 to 11 inches; brownish yellow (10YR 6/6) sandy loam; weak medium subangular blocky structure; friable; many fine roots; many fine and medium pores; strongly acid; abrupt smooth boundary.

B21—11 to 16 inches; yellowish brown (10YR 5/8) clay; moderate medium subangular blocky structure; firm; few fine and medium roots; common medium pores; common prominent continuous clay films on faces of peds; strongly acid; gradual wavy boundary.

B22t—16 to 29 inches; brownish yellow (10YR 6/8) clay; common medium prominent red (2.5YR 4/8) mottles; moderate medium subangular blocky structure; firm; few fine and medium roots; common medium pores; common thin patchy clay films on faces of peds; strongly acid; gradual wavy boundary.

B23t—29 to 43 inches; brownish yellow (10YR 6/6) clay; common medium prominent red (2.5YR 4/8) and few fine faint very pale brown mottles; weak medium subangular blocky structure; firm; few fine roots; few fine pores; few thin patchy clay films on faces of peds; strongly acid; gradual wavy boundary.

C—43 to 66 inches; red (2.5YR 4/8), brownish yellow (10YR 6/8) and white (10YR 8/2) saprolite that crushes to sandy clay loam; massive; firm; strongly acid.

The thickness of the clayey B horizon ranges from 24 to 46 inches. Depth to bedrock is more than 60 inches. The B horizon is strongly acid or very strongly acid.

The Ap horizon is yellowish brown, brown, or pale brown. The A2 horizon, where present, is light yellowish brown or brownish yellow.

The B1 horizon, where present, is brownish yellow or very pale brown sandy loam or sandy clay loam. The B2t horizon is yellowish brown, brownish yellow, strong brown, or yellowish red clay or sandy clay. The B3 horizon, where present, is mottled brownish yellow, strong brown, reddish yellow, and red clay loam or sandy clay loam.

The C horizon is commonly variegated yellowish red, reddish yellow, red, brownish yellow, yellowish brown, brown, white, and light gray saprolite that crushes to sandy loam or sandy clay loam.

Cecil series

The Cecil series consists of well drained, moderately permeable soils that formed in residuum from acid igneous and metamorphic rock. These soils are on broad ridges and side slopes. Slope ranges from 2 to 15 percent.

Typical pedon of Cecil sandy clay loam, 2 to 8 percent slopes, eroded, 2.6 miles north of I-85 on U.S. 21, 0.4 mile west of junction of N.C. 115 on Sunset Road (State Road 2108), 25 feet southeast at intersection of State Road 2100:

Ap—0 to 6 inches; yellowish red (5YR 4/6) sandy clay loam; weak fine granular structure; friable; few to common fine roots; common fine pores; medium acid; clear smooth boundary.

B21t—6 to 18 inches; red (2.5YR 4/6) clay; moderate fine subangular blocky structure; firm; few to common fine roots; common fine pores; thin continuous clay films on faces of peds; strongly acid; clear smooth boundary.

B22t—18 to 35 inches; red (2.5YR 4/6) clay; common fine distinct brownish yellow mottles; moderate fine subangular blocky structure; firm; few fine pores; thin distinct continuous clay films on faces of peds; few fine flakes of mica; strongly acid; clear smooth boundary.

B23t—35 to 46 inches; red (2.5YR 4/6) clay; common fine distinct brownish yellow mottles; weak fine subangular blocky structure; firm; faint discontinuous clay films on faces of peds; few fine flakes of mica; few fine pockets of saprolite; strongly acid; clear wavy boundary.

B3—46 to 53 inches; red (2.5YR 4/6) clay loam; common fine distinct brownish yellow mottles; weak fine subangular blocky structure; firm; few flakes of mica; common pockets of saprolite; strongly acid; gradual wavy boundary.

C—53 to 65 inches; red and yellow saprolite that crushes to loam; massive; friable; strongly acid.

Thickness of the clayey B horizon ranges from 24 to 44 inches. Depth to bedrock is more than 60 inches. The B horizon is strongly acid or very strongly acid.

The Ap horizon is yellowish brown, brown, yellowish red, red, or reddish brown.

The B1 horizon, if present, is sandy clay loam or clay loam. The B2t horizon is red clay, and in some places it has brownish yellow, yellowish brown, reddish yellow, or strong brown mottles in the lower part. The B3 horizon is sandy clay loam or clay loam.

The C horizon is strong brown, red, or yellow saprolite that crushes to loam or clay loam.

Davidson series

The Davidson series consists of well drained, moderately permeable soils that formed in materials weathered from dark colored rocks high in ferromagnesian minerals. These soils occur on broad ridges and narrow side slopes. Slope ranges from 2 to 25 percent.

Typical pedon of Davidson sandy clay loam, 2 to 8 percent slopes, 1 mile south of Shopton on N.C. 160, 3 miles southwest of State Road 1116, 1.3 miles west on State Road 1115, 50 feet southwest of junction of State Road 1378:

Ap—0 to 7 inches; dark reddish brown (2.5YR 3/4) sandy clay loam, moderate fine granular structure; friable; medium acid; gradual smooth boundary.

B1—7 to 16 inches; dark red (2.5YR 3/6) clay loam; weak fine subangular blocky structure; friable; medium acid; gradual wavy boundary.

B21t—16 to 43 inches; dark red (2.5YR 3/6) clay; weak fine subangular blocky structure; firm, sticky, slightly plastic; common fine quartz grains; strongly acid; gradual wavy boundary.

B22t—43 to 103 inches; dark red (2.5YR 3/6) clay; small pockets of clay loam and loam throughout the horizon; weak fine subangular blocky structure; friable, slightly plastic; few to common fine quartz grains; strongly acid.

The clayey textured horizons commonly extend 60 to 100 inches or more. Depth to bedrock is more than 60 inches. The B horizon ranges from very strongly acid to medium acid.

The Ap horizon is dusky red, very dusky red, dark reddish brown, or dark red.

The B1 horizon, where present, is dark red or dark reddish brown. The B2t horizon is dark red, dark reddish brown, or dusky red. In some places the B23t horizon and the lower B2t horizons are red. Structure ranges from weak to moderate subangular blocky.

Enon series

The Enon series consists of well drained, slowly permeable soils that formed in residuum from mixed acidic and basic crystalline rock. These soils are on broad and narrow ridges and side slopes. Slope ranges from 2 to 15 percent.

Typical pedon of Enon sandy loam, 2 to 8 percent slopes, 1.75 miles east of N.C. 115 in Huntersville on State Road 2448, 100 yards north on private drive, 100 feet west in cultivated field:

Ap—0 to 7 inches; brown (10YR 4/3) sandy loam; weak medium granular structure; friable; common fine manganese concretions; medium acid; abrupt smooth boundary.

B1—7 to 11 inches; yellowish brown (10YR 5/6) sandy clay loam; weak medium subangular blocky structure; friable; few fine roots; common fine and medium pores; few patchy clay films on faces of peds; few fine manganese concretions; slightly acid; clear wavy boundary.

B21t—11 to 15 inches; yellowish brown (10YR 5/6) clay; common medium distinct yellowish red (5YR 5/8) mottles; moderate medium subangular blocky structure; firm, sticky; few fine roots; common fine and medium pores; common distinct clay films on faces of peds; few fine manganese concretions; slightly acid; gradual wavy boundary.

B22t—15 to 24 inches; yellowish brown (10YR 5/6) clay; moderate medium subangular blocky structure; very firm; sticky; few fine roots; common fine and medium pores; common distinct clay films on faces of peds; few fine manganese concretions; common fine grains of black minerals; slightly acid; gradual wavy boundary.

B3—24 to 36 inches; yellowish brown (10YR 5/4) clay loam; weak coarse subangular blocky structure; firm; few fine roots; common fine and medium pores; few fine manganese concretions; many fine grains of black and light colored minerals; 40 percent saprolite; neutral; gradual wavy boundary.

C1—36 to 46 inches; light olive brown (2.5Y 5/4) saprolite that crushes to clay loam; friable; massive; many fine grains of dark and light colored minerals; neutral; gradual wavy boundary.

C2—46 to 60 inches; light olive brown (2.5Y 5/4) saprolite that crushes to sandy loam; massive; friable; many fine grains of dark and light colored minerals; neutral.

Thickness of the clayey B horizon ranges from 10 to 27 inches. Depth to bedrock is more than 60 inches. Reaction in the B horizon ranges from strongly acid to mildly alkaline.

The Ap horizon is brown, yellowish brown, dark yellowish brown, dark brown, or dark grayish brown.

The B1 horizon, where present, is strong brown or yellowish brown sandy clay loam or clay loam. The B2t horizon is strong brown, yellowish brown, or light olive brown clay or clay loam. In some places mottles of dark yellowish brown, light yellowish brown, yellowish red, or red are in the lower B horizons. The B3 horizon, if present, has colors similar to those of the B2 horizon and is clay loam or sandy clay loam.

The C horizon is commonly variegated gray, brown, yellow, olive, or black saprolite that crushes to loam, sandy loam, or clay loam.

Georgeville series

The Georgeville series consists of well drained, moderately permeable soils that formed in residuum from fine-textured rocks, generally classed as phyllites or Carolina slates. These soils are on broad ridges and narrow side slopes. Slope ranges from 2 to 15 percent.

Typical pedon of Georgeville silty clay loam, 2 to 8 percent slopes, eroded, 0.3 mile west of Cabarrus County line on N.C. 27, 200 feet north on private road, 40 feet west of road in a small, cleared field:

Ap—0 to 5 inches; yellowish red (5YR 5/6) silty clay loam; moderate fine granular structure; friable; common fine roots; common fine root channels and krotovinas; common fine and medium pores; few quartz pebbles; medium acid; clear smooth boundary.

B21t—5 to 19 inches; red (2.5YR 4/6) silty clay; strong medium subangular blocky structure; firm; common fine roots; common to many fine root channels and pores; continuous silt and clay films on faces of peds; few small quartz pebbles; strongly acid; gradual wavy boundary.

B22t—19 to 35 inches; red (2.5YR 4/8) silty clay; moderate medium subangular blocky structure; firm; few fine roots; few fine pores; common patchy silt and clay films on faces of peds; very strongly acid; gradual wavy boundary.

B3—35 to 49 inches; red (2.5YR 4/8) silty clay loam; common fine distinct brownish yellow and common fine distinct red mottles; weak medium subangular blocky structure; firm; few light gray bodies of saprolite; thin patchy clay films on faces of peds; strongly acid; gradual wavy boundary.

C1—49 to 95 inches; brownish yellow and yellowish red highly weathered slate that crushes to silt loam; massive; friable; strongly acid; diffuse wavy boundary.

C2—95 to 110 inches; strong brown highly weathered slate that crushes to silt loam; massive; friable; many small pockets of gray clay; strongly acid.

The thickness of the clayey B horizon ranges from 20 to 40 inches. Depth to bedrock is more than 60 inches. The B horizon is very strongly acid or strongly acid.

The Ap horizon is yellowish red or brown.

The B2t horizon is silty clay or clay. The B3 horizon is red or yellowish red silty clay loam or clay that has red and yellow mottles in places.

The C horizon is commonly variegated in colors of gray, brown, yellow, and red highly weathered slate or sericite schist that crushes to silt loam or silty clay loam.

Goldston series

The Goldston series consists of well drained, moderately rapidly permeable soils that formed in residuum from fine-grained felsic slates. These soils are on narrow ridges and sides of ridges between intermittent and permanent streams. Slope ranges from 2 to 15 percent.

Typical pedon of Goldston slaty silt loam, 2 to 8 percent slopes, approximately 4 miles east of Mint Hill on Brief Road (State Road 3106), 3/8 mile east of junction of State Road 3181, 30 feet south of road in woods:

O1—1 inch to 0; undecomposed and partly decomposed forest litter.

A1—0 to 2 inches; brown (10YR 5/3) slaty silt loam; weak medium granular structure; very friable; many fine and medium roots; few medium pores; 40 percent by volume slate fragments; strongly acid; abrupt smooth boundary.

A2—2 to 8 inches; mottled pale brown (10YR 6/3) and very pale brown (10YR 7/4, 8/3) slaty silt loam; weak medium granular structure; very friable; common fine roots; common fine and medium pores; 40 percent by volume slate fragments; very strongly acid; clear wavy boundary.

B—8 to 16 inches; brownish yellow (10YR 6/6) slaty silt loam; common fine faint brownish yellow mottles; weak medium angular blocky structure; friable; slightly sticky; common fine roots; common fine and medium pores; 40 percent by volume slate fragments; very strongly acid; clear smooth boundary.

Cr1—16 to 24 inches; light yellowish brown (10YR 6/4) slaty silt loam; platy rock structure; few fine roots in rock fractures; 75 percent by volume slate rock fragments; very strongly acid; gradual wavy boundary.

Cr2—24 to 62 inches; fractured, slightly weathered, fine-grained Carolina slate rock.

Depth to fractured bedrock ranges from 20 to 40 inches. Reaction of the B horizon ranges from extremely acid to medium acid.

The A1 horizon is brown or pale brown. It is 30 to 50 percent by volume slate fragments. Color values in the A2 horizon are commonly 1 or 2 color chips lighter than those in the A1.

The B horizon is pale yellow or brownish yellow slaty silt loam or slaty very fine sandy loam that is 35 to 60 percent by volume slate fragments. These are cyclic soils. There is a strong brown to brownish yellow silt loam or silty clay loam Bt horizon in 20 to 50 percent of the areas.

The C horizon is light yellowish brown, dark yellowish brown, or pale brown slaty silt loam. Slate fragments make up more than 50 percent by volume.

Helena series

The Helena series consists of moderately well drained, slowly permeable soils that formed in residuum from acidic crystalline rock. These soils are on broad ridges and foot slopes on the uplands. Slope ranges from 2 to 8 percent.

Typical pedon of Helena sandy loam, 2 to 8 percent slopes, 2.5 miles south of Huntersville on U.S. 21, 0.4 mile west of U.S. 21 on Alexanderana Road, 50 feet south of road in idle field:

Ap—0 to 8 inches; light olive brown (2.5Y 5/4) sandy loam; moderate fine granular structure; very friable; many fine roots; few fine pores; strongly acid; clear smooth boundary.

B1—8 to 11 inches; brownish yellow (10YR 6/6) sandy clay loam; few fine faint reddish yellow mottles; moderate medium and coarse subangular blocky structure; friable; slightly sticky, slightly plastic; common fine roots; few fine pores; common prominent silt and clay films on faces of coarse peds; strongly acid; clear smooth boundary.

B21t—11 to 15 inches; brownish yellow (10YR 6/6) clay; common fine distinct red mottles; moderate medium subangular blocky structure; firm, sticky, plastic; common fine roots; few fine pores; common thin distinct continuous clay films on faces of peds; strongly acid; gradual wavy boundary.

B22t—15 to 23 inches; brownish yellow (10YR 6/6) clay; common medium distinct light gray (2.5Y 7/2) and common fine prominent reddish brown mottles; moderate fine and medium subangular blocky structure; very firm, sticky, very plastic; few fine roots; few fine pores; common thin distinct clay films on faces of peds; strongly acid; gradual wavy boundary.

B23t—23 to 31 inches; yellowish brown (10YR 5/8) clay; common medium and coarse distinct light gray (2.5Y 7/2) and common medium prominent reddish brown (2.5YR 4/4) mottles; weak medium subangular blocky structure; very firm, sticky, very plastic; few fine roots; few fine pores; few patchy clay films on faces of peds; strongly acid; gradual wavy boundary.

B3—31 to 40 inches; mottled yellowish brown (10YR 5/6), light gray (2.5Y 7/2), and reddish brown (2.5YR 4/4) clay loam; weak fine angular blocky structure; very firm, sticky, plastic; few fine roots; common pockets of saprolite; strongly acid; gradual wavy boundary.

C1—40 to 50 inches; light gray (5Y 7/1) saprolite that crushes to sandy clay; common medium distinct yellowish brown (10YR 5/6) and common fine distinct yellowish red mottles; massive; firm, slightly sticky, slightly plastic; common fine flakes of mica; strongly acid; gradual wavy boundary.

C2—50 to 64 inches; light gray (5Y 7/1) saprolite that crushes to sandy clay loam; common fine strong brown mottles; massive; friable; very strongly acid.

Thickness of the clayey B horizon ranges from 12 to 25 inches. Depth to rippable bedrock is 40 to 60 inches. The B horizon is very strongly acid or strongly acid.

The A1 or Ap horizon is light olive brown, dark grayish brown, or grayish brown. The A2 horizon, if present, is light olive brown or grayish brown.

The B1 horizon is brownish yellow or yellowish brown sandy clay loam or clay loam. The B2t horizon is yellowish brown, brownish yellow, or strong brown sandy clay or clay. Mottles of 2 chroma or less are in the upper 24 inches of the Bt horizon. The B3 horizon, if present, has colors similar to those of the B2t horizon and is clay loam or sandy clay loam.

The C horizon is commonly light gray or variegated yellowish brown, yellowish red, strong brown, or gray saprolite that crushes to loamy sand, sandy loam, sandy clay loam, or sandy clay.

Iredell series

The Iredell series consists of moderately well drained, slowly permeable soils that formed in residuum from basic crystalline rock. These soils are on broad flat ridges and broad, gently sloping areas on the uplands. Slope ranges from 0 to 8 percent.

Typical pedon of Iredell fine sandy loam, 1 to 8 percent slopes, 1 mile east of Pineville on N.C. 51, 1.5 miles north of State Road 3687, 400 yards east of road:

Ap—0 to 6 inches; olive brown (2.5Y 4/4) fine sandy loam; moderate medium granular structure; friable many fine roots; common fine manganese concretions; slightly acid; abrupt smooth boundary.

B21t—6 to 19 inches; light olive brown (2.5Y 5/4) clay; moderate medium columnar structure parting to moderate medium angular blocky; very firm, very sticky, very plastic; few fine roots; few fine manganese concretions; common distinct clay films on primary and secondary faces of peds; common slickensides and pressure faces; neutral; gradual smooth boundary.

B22t—19 to 24 inches; light olive brown (2.5Y 5/4) clay; moderate medium columnar structure parting to weak medium angular blocky; very firm, very sticky, very plastic; common distinct clay films on primary and secondary faces of peds; common slickensides and pressure faces; common fine crystals of feldspar; common black minerals; mildly alkaline; gradual wavy boundary.

B3—24 to 28 inches; light olive brown (2.5Y 5/4) clay loam; weak medium subangular blocky structure; firm, sticky, plastic; common fine crystals of feldspar; common green minerals; common pockets of saprolite; mildly alkaline; gradual wavy boundary.

C1—28 to 40 inches; light olive brown (2.5Y 5/4) saprolite that crushes to loam; massive; friable; few pockets of clay loam; common fine black minerals; mildly alkaline; gradual wavy boundary.

C2—40 to 65 inches; olive (5Y 4/4) saprolite that crushes to loam; massive; friable; few pockets of clay loam; few fine flakes of mica; many fine black and green minerals; mildly alkaline.

Thickness of the clayey B horizon ranges from 11 to 24 inches. Depth to bedrock is more than 60 inches. The B horizon ranges from slightly acid to mildly alkaline.

The Ap horizon is dark grayish brown, very dark grayish brown, dark brown, or olive brown.

The B1 horizon, where present, is yellowish brown, dark yellowish brown, light olive brown, or light yellowish brown clay loam, sandy clay, or sandy clay loam. The B2t horizon is yellowish brown or light olive brown. The B3 horizon is olive brown, light olive brown, yellowish brown, or olive clay loam or sandy clay loam.

The C horizon is variegated in colors of light olive brown, brown, yellowish brown, light gray, yellow, or olive saprolite that crushes to sandy loam, sandy clay loam, loam, or loamy sand.

Lignum series

The Lignum series consists of moderately well drained, slowly permeable soils that formed in residuum from fine grained schist or slate rock. These soils are on gentle slopes of interstream divides and around the heads of drainageways. Slope ranges from 2 to 8 percent.

Typical pedon of Lignum gravelly silt loam, 2 to 8 percent slopes, 4 miles east of Mint Hill on Brief Road, 0.3 mile south on State Road 3107; 500 feet west of road, through woods, in a cleared field:

Ap—0 to 5 inches; yellowish brown (10YR 5/4) gravelly silt loam; weak medium granular structure; friable; many fine roots; very strongly acid; abrupt smooth boundary.

B1—5 to 11 inches; brownish yellow (10YR 6/6) silty clay loam; weak fine subangular blocky structure; friable; common fine roots; few fine pores; strongly acid; clear smooth boundary.

B21t—11 to 15 inches; strong brown (7.5YR 5/8) clay; common medium distinct yellow (10YR 7/6) mottles; moderate fine subangular blocky structure; firm, plastic, slightly sticky; few fine roots; few fine pores; thin discontinuous clay films on faces of peds; few fine pebbles; strongly acid; gradual wavy boundary.

B22t—15 to 28 inches; yellowish brown (10YR 5/6) clay; common fine and medium distinct light gray (10YR

7/1) and common medium distinct olive yellow (2.5YR 6/6) mottles; moderate fine angular blocky structure; very firm, plastic, slightly sticky; few fine pores; thin continuous clay films on faces of peds; few fine pebbles; strongly acid; gradual wavy boundary.

B23t—28 to 37 inches; reddish yellow (7.5YR 6/8) clay; many medium distinct light gray (5Y 7/2) mottles; weak fine angular blocky structure; very firm, plastic, slightly sticky; very strongly acid; abrupt smooth boundary.

Cr—37 to 50 inches; mottled yellow and gray saprolite that crushes to silt; 75 percent by volume brittle slate fragments; very strongly acid; abrupt boundary.

R—50 to 52 inches; hard slate rock.

Thickness of the clayey B horizon is less than 30 inches. Depth to bedrock ranges from 48 to 72 inches. Reaction in the B horizon is strongly acid or very strongly acid.

The Ap horizon is yellowish brown, pale brown, or grayish brown.

The B1 horizon is strong brown, brownish yellow, or light yellowish brown silt loam or silty clay loam. The B2t horizon is strong brown, reddish yellow, or yellowish brown clay or silty clay. Mottles of chroma 2 or less range from few to common in the lower B2t horizon. The B3 horizon, if present, is clay loam or silty clay loam.

The C horizon is mottled yellow and gray silt loam or silt. It is 15 to 80 percent weathered slate fragments in the lower part.

Mecklenburg series

The Mecklenburg series consists of well drained, slowly permeable soils that formed in residuum from basic igneous and metamorphic rocks. These soils are on broad ridges and side slopes. Slope ranges from 2 to 15 percent.

Typical pedon of Mecklenburg fine sandy loam, 2 to 8 percent slopes, approximately 9 miles southwest of Charlotte on N.C. 49, 0.8 mile south on State Road 1122, 40 feet west of road:

Ap—0 to 7 inches; dark reddish brown (5YR 3/4) fine sandy loam; moderate fine granular structure; friable; few fine roots; few fine pores; common fine manganese concretions; neutral; clear smooth boundary.

B21t—7 to 15 inches; yellowish red (5YR 4/6) clay; moderate fine subangular blocky structure; very firm, sticky, plastic; common fine roots; few fine pores; common fine manganese concretions; common thin distinct continuous clay films on faces of peds; neutral; gradual wavy boundary.

B22t—15 to 22 inches; yellowish red (5YR 4/6) clay; common medium distinct strong brown (7.5YR 5/8) mottles; moderate fine subangular blocky structure; very firm, plastic; few fine roots; common light and dark colored minerals; thin continuous clay films on faces of peds; common fine manganese concretions; slightly acid; gradual wavy boundary.

B3—22 to 34 inches; yellowish red (5YR 4/6) clay; many coarse distinct strong brown (7.5YR 5/8) mottles; weak fine subangular blocky structure; firm; few fine manganese concretions; common pockets of saprolite; few fine flakes of mica; slightly acid; gradual wavy boundary.

C1—34 to 45 inches; mottled strong brown (7.5YR 5/8) and yellowish red (5YR 4/6) saprolite that crushes to clay loam; massive; friable, slightly sticky, slightly plastic; common fine flakes of mica; slightly acid; diffuse boundary.

C2—45 to 65 inches; very dark grayish brown (2.5Y 3/2) and light olive brown (2.5Y 5/4) saprolite that crushes to loam; massive; friable; few pockets of strong brown clay in upper 10 inches; common fine flakes of mica; neutral.

Thickness of the clayey B horizon is less than 32 inches. Depth to bedrock ranges from 48 to 60 inches. Reaction in the B horizon ranges from medium acid to neutral.

The Ap horizon is reddish brown, dark reddish brown, brown, or yellowish red.

The B2t horizon is red or yellowish red and has few to common brown to red mottles in the lower part. The B3 horizon, if present, is strong brown or yellowish red.

The C horizon is commonly variegated red, yellow, brown, gray, and black saprolite that crushes to loam, sandy loam, sandy clay loam, or clay loam.

Monacan series

The Monacan series consists of somewhat poorly drained, moderately permeable soils that formed in recent alluvium. These soils are on flood plains adjacent to streams. The width of the flood plain varies. Map units are commonly long and narrow. Slope ranges from 0 to 2 percent.

Typical pedon of Monacan loam in Long Creek Community, 700 feet south Beatties Ford Road bridge, 250 feet east of the channel of Long Creek in pasture:

Ap—0 to 7 inches; brown (7.5YR 4/4) loam; moderate medium granular structure; friable; many fine roots; neutral; clear smooth boundary.

B1—7 to 14 inches; yellowish red (5YR 4/6) loam; common fine distinct light olive brown and brownish yellow mottles; weak fine subangular blocky structure; friable; common fine roots; common medium pores; neutral; clear smooth boundary.

B21—14 to 21 inches; brown (7.5YR 4/4) silty clay loam; common medium distinct olive gray (5Y 5/2) mottles; weak fine subangular blocky structure; friable; common fine roots; common medium pores; few black organic specks; neutral; clear smooth boundary.

B22—21 to 25 inches; dark brown (10YR 4/3) fine sandy loam; many medium distinct gray (5Y 5/1) mottles; weak medium subangular blocky structure; friable; few fine roots; common medium pores; neutral; abrupt smooth boundary.

B23g—25 to 33 inches; dark gray (N 4/0) sandy clay loam; many coarse distinct yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure; firm; common medium pores; neutral; clear smooth boundary.

B24g—33 to 43 inches; gray (5Y 5/1) sandy clay loam; common fine distinct dark yellowish brown mottles; weak medium subangular blocky structure; friable; few fine pores; neutral; gradaul wavy boundary.

B25g—43 to 65 inches; light gray (5Y 6/1) sandy clay; common fine distinct dark yellowish brown and common medium distinct gray (N 5/0) mottles; massive that parts to weak medium subangular blocky structure; very firm; some large pockets of gray sandy loam; many brown and black specks; neutral.

Loamy layers extend to a depth of more than 60 inches. Depth to bedrock is more than 60 inches. The B horizon ranges from strongly acid to neutral.

The Ap horizon is brown, dark brown, or dark grayish brown.

The B1 horizon is yellowish red or brown loam or clay loam. The B2 horizon is strong brown, brown, dark brown, or yellowish brown in the upper part and brown, light gray, gray, or dark gray in the lower part. Texture is fine sandy loam, sandy clay loam, silty clay loam, clay loam, or sandy clay. Clayey textures are below 40 inches.

The C horizon, if present, is stratified with textures ranging from loamy sand to clay.

Pacolet series

The Pacolet series consits of well drained, moderately permeable soils that formed in residuum from acid igneous and metamorphic rock. Slope ranges from 15 to 45 percent.

Typical pedon of Pacolet sandy loam, 25 to 45 percent slopes, near Lake Wylie, 3/8 mile south of N.C. 49 on State Road 1109, 3.25 miles southwest on State Road 1102, 50 feet east of road in woods, about 350 feet past junction of State Road 1101:

O1—1 inch to 0; undecomposed and partly decomposed hardwood litter.

A1—0 to 3 inches; very dark grayish brown (10YR 3/2) sandy loam; moderate fine granular structure; friable; many medium roots; medium acid; clear smooth boundary.

B2t—3 to 17 inches; red (2.5YR 4/6) clay; moderate medium subangular blocky structure; firm; few fine roots; common fine flakes of mica; common fine crystals of feldspar; strongly acid; gradual wavy boundary.

B3—17 to 31 inches; red (2.5YR 4/8) clay loam; weak fine subangular blocky structure; friable; common fine flakes of mica; common pockets of saprolite in lower part; strongly acid; gradual wavy boundary.

C1—31 to 41 inches; mottled red (2.5YR 4/8) and yellowish red (5YR 5/8) saprolite that crushes to sandy loam; massive; friable; many fine flakes of mica; very strongly acid; gradual wavy boundary.

C2—41 to 65 inches; mottled red (2.5YR 4/8), yellow (10YR 7/6), yellowish red (5YR 5/8), and reddish yellow (7.5YR 7/6) saprolite that crushes to sandy loam; many fine flakes of mica; very strongly acid.

The thickness of the clayey B horizon is less than 24 inches. Depth to bedrock is more than 60 inches. Reaction ranges from medium acid to very strongly acid in the B horizon. There are few to many flakes of mica throughout most subsurface horizons.

The A1 horizon is very dark grayish brown, dark grayish brown, or very dark gray. There are A2 horizons in some pedons.

The B1 horizon, if present, is yellowish red or red sandy clay loam or clay loam. The B2t horizon is red clay or clay loam. The lower B2t horizon has yellow mottles in some pedons. The B3 horizon is red or yellowish red clay loam or sandy clay loam.

The C horizon is variegated red, yellow, brown, and pink saprolite that crushes to loam, clay loam, or sandy loam.

Vance series

The Vance series consists of well drained, slowly permeable soils that formed in residuum from acid igneous and metamorphic rock. These soils are on broad ridges and side slopes. Slope ranges from 2 to 15 percent.

Typical pedon of Vance sandy loam, 2 to 8 percent slopes, 0.4 mile east of N.C. 115 on State Road 2457 (Alexanderana Road), 100 feet south in field (0.6 mile southeast of North Mecklenburg High School):

Ap—0 to 8 inches; yellowish brown (10YR 5/4) sandy loam; moderate medium granular structure; friable; many fine and medium roots; many medium pores; few earthworm casts; slightly acid; abrupt smooth boundary.

B21t—8 to 17 inches; strong brown (7.5YR 5/6) clay; moderate coarse prismatic structure parting to strong medium and coarse subangular blocky; very firm, sticky, plastic; common fine roots; common fine pores; thin continuous clay films on faces of peds; few earthworm casts; strongly acid; clear smooth boundary.

B22t—17 to 26 inches; strong brown (7.5YR 5/6) clay; common medium prominent red (2.5YR 4/8) and common fine distinct yellow mottles; moderate coarse subangular blocky structure; very firm, sticky, plastic, common fine and medium roots; common fine pores; prominent patchy clay films on faces of peds; very strongly acid; gradual wavy boundary.

B3—26 to 33 inches; strong brown (7.5YR 5/6) clay; common medium prominent red (2.5YR 4/6) and common fine distinct yellow mottles; weak medium subangular blocky structure; firm, slightly sticky, plastic; common fine and medium roots; common fine pores; prominent patchy clay films on faces of peds; few pockets of C material; very strongly acid; gradual wavy boundary.

C1—33 to 38 inches; mottled yellow, strong brown, and red saprolite that crushes to clay loam; rock structure; firm; few medium roots; few root casts, coated with clay; very strongly acid; gradual wavy boundary.

C2—38 to 50 inches; weathered saprolite that crushes to loam; friable; very strongly acid.

The thickness of the clayey B horizon is less than 36 inches. Depth to bedrock is more than 60 inches. The B horizon is strongly acid or very strongly acid.

The Ap horizon is brown or yellowish brown. The A2 horizon is light yellowish brown or brownish yellow sandy loam or fine sandy loam.

The B1 horizon, where present, is yellowish brown or yellowish red. The B2t horizon is yellowish brown, strong brown, or yellowish red sandy clay, clay loam, or clay. The B3 horizon, where present, is yellowish brown, brownish yellow, or strong brown clay or clay loam.

The C horizon is commonly variegated in colors of yellow, strong brown, and red saprolite that crushes to clay loam or loam.

Wilkes series

The Wilkes series consists of well drained, moderately slowly permeable soils. These soils formed in residuum from diorite, hornblende schist, and related rocks that are moderately high in ferromagnesian minerals or from a mixture of acidic and basic rocks. They are on ridges and narrow side slopes. Slope ranges from 4 to 45 percent.

Typical pedon of Wilkes loam, 4 to 8 percent, approximately 1 mile north of N.C. 49 at University of North Carolina at Charlotte on State Road 2833, 60 feet north of road in woods:

O1—1 inch to 0; undecomposed mixed hardwood and pine litter.

A1—0 to 4 inches; dark grayish brown (10YR 4/2) loam; moderate fine granular structure; friable; many fine and medium roots; few fine flakes of mica; slightly acid; clear smooth boundary.

A2—4 to 7 inches; brown (10YR 5/3) loam; moderate fine granular structure; friable; many fine roots; few fine flakes of mica; slightly acid; clear smooth boundary.

B2t—7 to 13 inches; strong brown (7.5YR 5/6) clay; weak prismatic structure parting to moderate medium angular blocky; very firm, sticky plastic; few fine roots; few fine flakes of mica; few green and black minerals; slightly acid; gradual wavy boundary.

B3—13 to 15 inches; strong brown (7.5YR 5/6) clay loam; massive; firm; common fine flakes of mica; many green, black, and light colored minerals; 25 to 35 percent saprolite; slightly acid; clear wavy boundary.

Cr—15 to 45 inches; olive brown, green, and black saprolite that crushes to sandy loam; massive; friable; common fine flakes of mica; slightly acid; clear wavy boundary.

R—45 to 48 inches; hard, slightly weathered dark rock; very difficult to rip with auger; slightly acid.

The thickness of the clayey B horizon is less than 10 inches. Depth to bedrock ranges from 40 to 80 inches. The B horizon ranges from slightly acid to mildly alkaline.

The A1 or Ap horizon is dark grayish brown, brown, dark yellowish brown, or light olive brown. The A2 horizon is brown or light yellowish brown.

The B2t horizon is yellowish brown, dark yellowish brown, brownish yellow, or strong brown clay or clay loam. The B3 horizon, if present, is strong brown or yellowish brown.

The C horizon is commonly variegated yellowish brown, strong brown, olive brown, green, black, and gray saprolite that crushes to loam or sandy loam.

Formation of the soils

The following paragraphs describe the factors of soil formation and relate them to the soils of Mecklenburg County.

Factors of soil formation

Factors that contribute to differences among soils are the climate, the plant and animal life, the parent material, the relief, and time. Climate and plant and animal life, particularly plants, are the active forces in soil formation. Their effect on parent material is modified by the topography and by the length of time the parent material has been in place. The relative importance of each factor differs from place to place. In some places one factor dominates in the formation of a soil and determines most of its properties. In most places, however, the interaction of all factors determines the kind of soil that develops in any given place.

Climate

Climate affects the physical, chemical, and biological relationships in the soil, chiefly through precipitation and temperature. Temperature and rainfall influence the rate at which rock is weathered and organic matter decomposes. The amount of leaching in a soil also is related to the amount of precipitation that falls and its movement through the soil. The effects of climate also control the kinds of plants and animals that can thrive in a region. Temperature influences the kind and growth of organisms and the speed of chemical and physical reactions in the soil.

Mecklenburg County has a warm, humid climate. It occupies a moderate plateau ranging in elevation from 520 to more than 830 feet. Mountains to the west of the county have a modifying effect on both temperature changes and precipitation. Therefore, changes are gradual. The climate favors rapid chemical processes, resulting in decomposition of organic matter and rock weathering. The temperature and rainfall especially favor intense leaching and oxidation.

The effects of climate are reflected in the soils of Mecklenburg County. Mild temperatures throughout the year and abundant rainfall have resulted in depletion of organic matter and considerable leaching of soluble bases from most soils, so that most are acid. Because variations are small, climate has probably not caused major local differences among soils. The most important effect that climate has had on the formation of Mecklenburg County soils is in the alteration of parent materials, through changes in temperature and changes in the amount of precipitation, and through influences on the plant and animal life.

Plant and animal life

Plant and animal life influences the formation and differentiation of horizons. The type and number of organisms in and on the soil are determined in part by climate and in part by the nature of the soil material, the relief, and the age of the soil. Bacteria, fungi, and other micro-organisms aid in the weathering of rocks and in the decomposition of organic matter. The plants and animals that live on a soil are the primary source of organic material. Plants largely determine the kinds and amounts of organic matter that go into a soil under normal conditions, as well as the way in which the organic matter is added. Plants also have an important part in the changes of base status and in the leaching process of a soil through the nutrient cycle. Animals convert complex compounds into simpler forms and add their own bodies to the organic matter. In addition to adding organic matter, organisms modify certain chemical and physical properties. In Mecklenburg County most of the organic material accumulates on the surface where it is acted upon by micro-organisms, fungi, earthworms, and other forms of life, and by direct chemical reaction. The material is then mixed with the uppermost mineral part of the soil by the activities of earthworms and other small invertebrates. Rodents have had little effect on the formation of soils in the county.

Under the native forest of this county, not enough bases are brought to the surface by plants to counteract the effects of leaching. In general, the soils of Mecklenburg County developed under a hardwood forest. These trees took up elements from the subsoil and added organic matter by depositing leaves, roots, twigs, and eventually the whole plant to the surface. Here the material was acted upon by organisms and underwent chemical reaction.

Organic materials decompose rapidly in Mecklenburg County because of the moderate temperature, the abundant moisture supply and the character of the organic material. Organic matter decays so rapidly that little accumulates in the soil.

Parent material

Parent material is the unconsolidated mass from which a soil forms. The character of this mass affects the kind of profile that develops and the degree of this development. In Mecklenburg County the parent material is a major factor in determining what kind of soil forms. It is largely responsible for the chemical and mineralogical composition of soils and for the major differences among soils of the county. Major differences in parent material, such as texture, can be observed in the field. Less distinct differences, such as mineralogical composition, can be determined only by careful laboratory analysis.

The type of bedrock from which the unconsolidated mass has formed is mostly granite, diorite, and gabbro, or a mixture of these. In a small area in the extreme eastern tip of the county, the bedrock is slate.

The two broad classes of parent material in Mecklenburg County are residuum and alluvium. The residual material is residue from the underlying rock. The transported material is related directly to the soils or rocks from which it was removed.

In Mecklenburg County the parent material of the residual soils was derived chiefly from acid and basic igneous rock. The acid, or felsic, rock is mostly granite. Cecil and Appling soils formed in material derived from acid igneous and metamorphic rock, a fact reflected in the low pH of these soils. In addition, the characteristics of the parent material influenced the texture of these clayey soils as well as the texture of other more friable, coarser textured soils. The basic, or mafic, rocks are mostly gabbro and diorite. Iredell and Mecklenburg soils formed in material derived from those rocks. Thus, they are less acid and have a more pronounced sticky, clayey texture than other soils in the county. Large areas of the county are underlain by a mixure of acid and basic igneous rocks. Helena, Enon, and Wilkes soils are dominant in these areas; the Enon soil is the most common.

The transported parent material is mostly recently deposited alluvium. It consists of material that has been changed very little by the soil-forming processes. The Monacan soil, the only alluvial soil mapped in the county, is on flood plains along the large and small streams.

Relief

Relief causes differences in free drainage, surface runoff, soil temperature, and the extent of geologic erosion. In Mecklenburg County, the relief is largely determined by the kind of underlying bedrock, the geology of the area, and the amount of landscape dissected by streams.

Percolation of water through the profile is affected by relief. Water movement through the profile is important in soil development because it aids chemical reactions and is necessary for leaching.

Slopes in the county range from 0 to 45 percent. On the uplands where slopes are less than 10 percent, the soils generally have deeper, better defined profiles than the steeper soils. Examples are the well developed Cecil, Appling, and Davidson soils. Relief is also important in soil formation because it can affect the depth of soils. From some soils having slopes of 15 percent, geologic erosion removes soil material almost as fast as it forms. As a result, most of the strongly sloping to steep soils have a thinner solum. Examples are Wilkes and Pacolet soils, which are not as deep nor so well developed as the less sloping soils.

Drainage also can be affected by relief. A high water table, for example, is usually related to nearly level relief. The Iredell soil on uplands is imperfectly drained because it is nearly level and the internal movement of water is slow.

Soils at the lower elevations are less sloping and receive runoff from adjacent higher lying areas. This water tends to accumulate in the nearly level to depressional areas. An example is the somewhat poorly drained Monacan soil on flood plains.

Time

The length of time that soil material has been exposed to the soil-forming processes accounts for some differences in soils. The length of time required for a well-defined soil profile depends on the other factors of soil formation. Less time is required for development of a soil profile in coarse textured material than in similar, but finer textured material, even though the environment is the same for both. Less time is required for profile development in a warm, humid area where the plant cover is dense than in a cold, dry area where the plant cover is sparse.

The age of soils varies considerably, and the length of time that a soil has been developing is generally reflected in the profile. Old soils generally have better defined horizons than young soils. In Mecklenburg County, the effects of time as a soil forming factor is more apparent in the older soils, such as Cecil and Appling, which occupy the broader parts of the uplands. These soils have more distinct horizons than Monacan soils, for example, which formed in alluvium and are still acquiring new deposits from the uplands.

Monacan soils and other soils on first bottoms have not been in place long enough to have developed distinct horizons. They are considered young soils. Other soils in the county are considered young because of their topographic position. Wilkes soils, for example, are not so well developed because they are steep and geologic erosion keeps pace with soil development. This fact also partly accounts for the shallowness over bedrock.

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Glossary

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

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	More than 9

Base saturation. The degree to which material having base exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to frequent flooding.

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 coat, clay skin.

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

Complex, soil. A mapping unit of two or more kinds of soil occurring in such an intricate pattern that they cannot be shown separately on a soil map at the selected scale of mapping and publication.

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 (or contour farming). 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.

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.

Depth to rock. Bedrock at a depth that adversely affects 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 for long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. 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, as for example in "hillpeats" and "climatic moors."

Drainage, surface. Runoff, or surface flow of water, from an area.

Erosion. The wearing away of the land surface by running 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 a bare surface.

Excess fines. Excess silt and clay. The soil does not provide a source of gravel or sand for construction purposes.

Favorable. Favorable soil features for the specified use.

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.

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

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

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

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

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.

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.

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

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

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

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

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

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

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

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.

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.

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

Low strength. Inadequate strength for supporting loads.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is greater than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

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).

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

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.

Permeability. The quality that enables the soil to transmit water or air, measured as the number of inches per hour that water moves through the 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 to 2.0 inches), *moderately rapid* (2.0 to 6.0 inches), *rapid* (6.0 to 20 inches), and *very rapid* (more than 20 inches).

Phase, soil. A subdivision of a soil series or other unit in the soil classification system based on differences in the soil that affect its management. A soil series, for example, may be divided into phases on the bases of differences in slope, stoniness, thickness, or some other characteristic that affects management. These differences are too small to justify separate series.

pH value. (See Reaction, soil). A numerical designation of acidity and alkalinity in 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 a semisolid to a plastic state.

Productivity (soil). The capability of a soil for producing a specified plant or sequence of plants under a specified system of management. Productivity is measured in terms of output, or harvest, in relation to input.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. The degree 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

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

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulates over disintegrating rock.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged in stream channels from a drainage area. The water that flows off the land surface without sinking in is called surface runoff; that which enters the ground 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.

Saprolite (geology). Soft, earthy, clay-rich, thoroughly decomposed rock formed in place by chemical weathering of igneous and metamorphic rock. In soil survey, the term saprolite is applied to any unconsolidated residual material underlying the soil and grading to hard bedrock below.

Series, soil. A group of soils, formed from a particular type of parent material, having horizons that, except for the texture of the A or surface horizon, are similar in all profile characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineralogical and chemical composition.

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.

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.

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.

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.

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

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in mature soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristics of the soil are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

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 that are separated from adjoining 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).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that it can soak into the soil or flow slowly to a prepared outlet without harm. 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.

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

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

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

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

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

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

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

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

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

Wetness. General term used for soils that have a seasonal high water table.

ILLUSTRATIONS

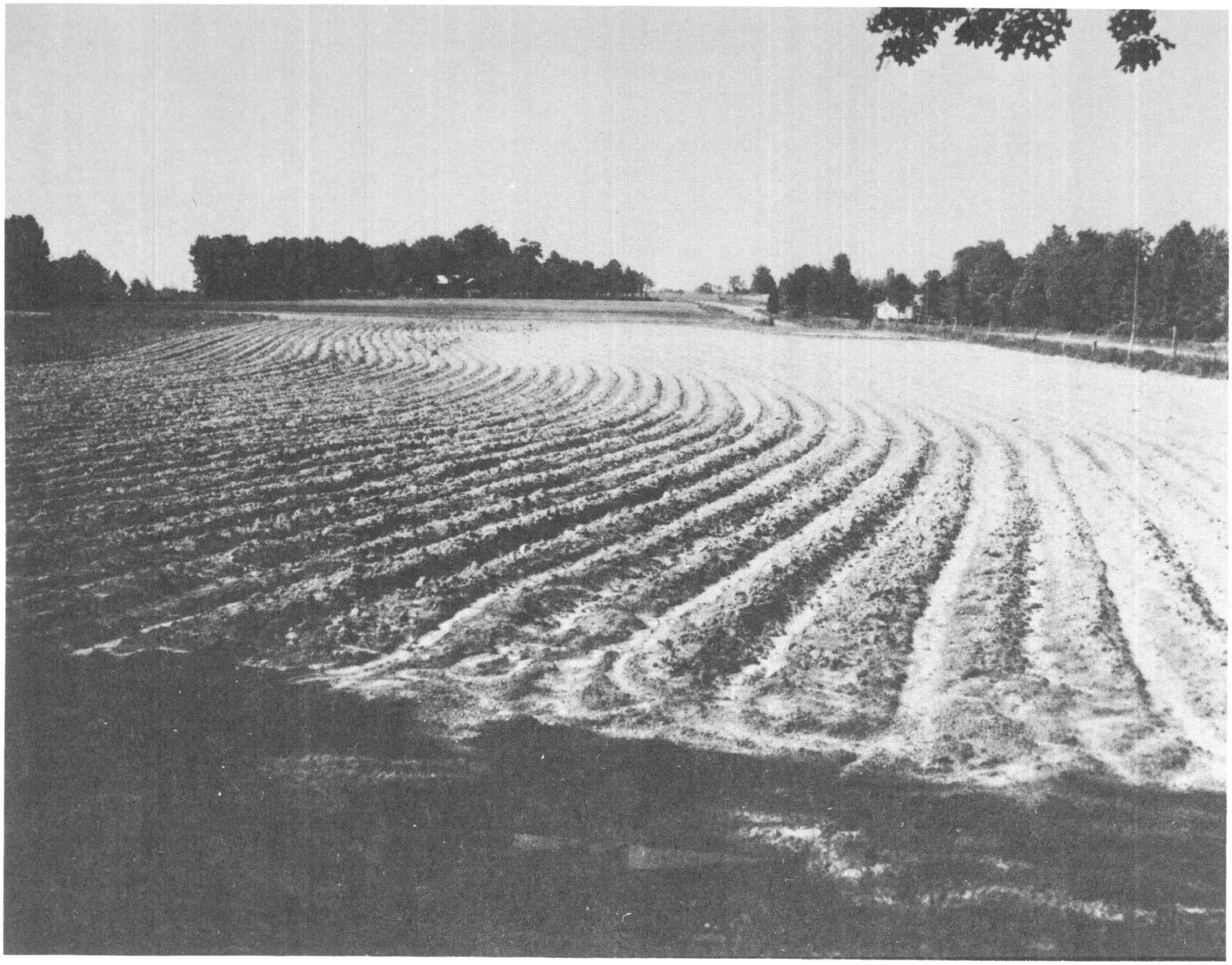

Figure 1.—Appling sandy loam, one of the best agricultural soils in the county. Contouring minimizes the risk of erosion and increases the infiltration of water.

Figure 2.—Hay on Cecil sandy clay loam, 2 to 8 percent slopes, eroded. Hay is about one-third of all the harvested cropland acreage in the county.

Figure 3.—Cecil-Urban land complex. Cecil soils are the open areas between the houses.

Figure 4.—Pasture of fescue-ladino clover on Iredell fine sandy loam. The slow internal water movement and plastic clay in the subsoil are limitations to intensive cultivation.

Figure 5.—Cleared or graded areas of this sloping clayey soil are extremely erodible. Maintaining a good plant cover is essential in preventing soil loss.

Figure 6.—Depth to bedrock is commonly 10 to 20 inches in Wilkes soils. The upper 2 to 5 feet of this bedrock zone is highly weathered and readily fractured. Plant roots penetrate this zone.

Figure 7.—Desilting basin on erodible Cecil soils. This basin trapped most of the sediment washed from the recently completed industrial site.

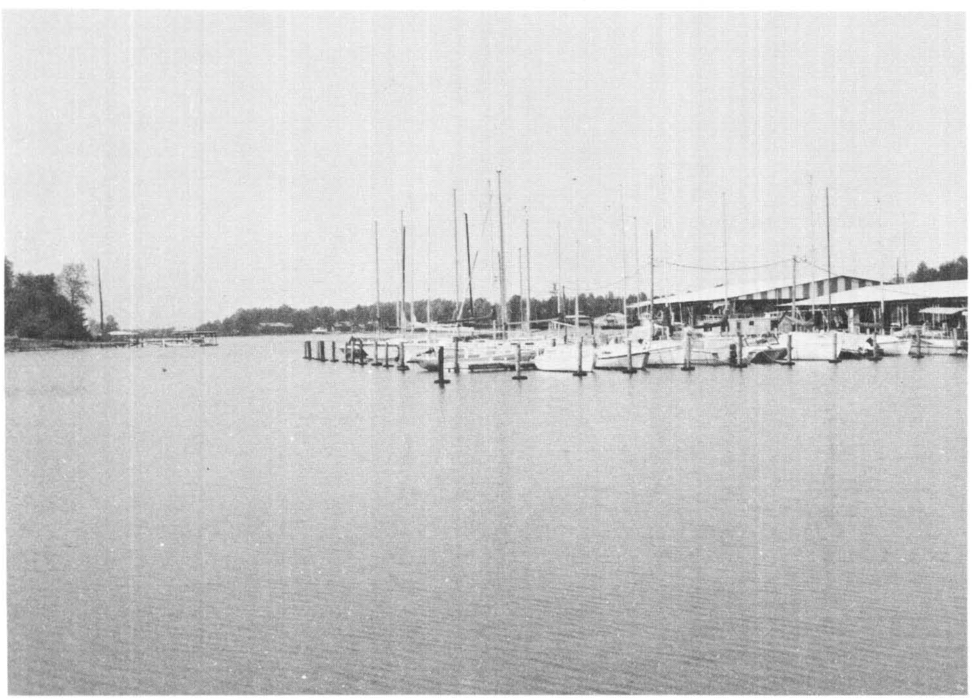

Figure 8.—Lake Norman provides numerous private and public marinas for boat docking and launching.

TABLES

TABLE 1.--TEMPERATURE AND PRECIPITATION DATA

Month	Temperature[1]						Precipitation[1]				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[2]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	51.3	31.3	41.4	74	9	27	3.70	2.27	4.98	7	2.5
February---	54.1	32.5	43.3	74	12	29	4.08	2.67	5.35	8	1.6
March------	61.6	38.7	50.2	84	20	117	4.58	3.11	5.92	8	1.4
April------	72.3	48.4	60.4	90	31	316	3.37	2.26	4.37	6	.0
May--------	79.8	57.3	68.6	94	39	577	3.55	1.76	5.01	7	.0
June-------	85.9	64.7	75.4	98	52	762	3.56	1.91	4.89	6	.0
July-------	88.6	68.5	78.6	98	57	887	4.12	2.30	5.60	8	.0
August-----	87.8	68.0	77.9	98	57	865	3.91	2.01	5.45	7	.0
September--	82.3	61.8	72.1	95	46	663	3.19	.89	5.03	5	.0
October----	72.5	49.9	61.3	89	30	354	2.51	.64	4.01	4	.0
November---	62.1	39.4	50.8	81	21	90	2.68	1.23	3.85	5	.1
December---	52.9	32.9	42.9	74	11	40	3.56	1.94	4.88	6	.8
Year-----	70.9	49.5	60.2	100	7	4,727	42.81	37.55	47.87	77	6.4

[1]Recorded in the period 1951-75 at Charlotte, N.C.

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

TABLE 2.--FREEZE DATES IN SPRING AND FALL

Probability	Temperature[1]		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	March 29	April 5	April 19
2 years in 10 later than--	March 20	March 31	April 13
5 years in 10 later than--	March 3	March 22	April 3
First freezing temperature in fall:			
1 year in 10 earlier than--	November 9	October 31	October 19
2 years in 10 earlier than--	November 15	November 4	October 24
5 years in 10 earlier than--	November 27	November 11	November 2

[1]Recorded in the period 1951-75 at Charlotte, N.C.

TABLE 3.--GROWING SEASON LENGTH

Probability	Daily minimum temperature during growing season[1]		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	237	218	192
8 years in 10	248	223	199
5 years in 10	269	233	212
2 years in 10	290	243	225
1 year in 10	301	248	232

[1]Recorded in the period 1951-75 at Charlotte, N.C.

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

Map symbol	Soil name	Acres	Percent
ApB	Appling sandy loam, 2 to 8 percent slopes	2,786	0.8
ApD	Appling sandy loam, 8 to 15 percent slopes	1,405	0.4
CeB2	Cecil sandy clay loam, 2 to 8 percent slopes, eroded	91,811	27.3
CeD2	Cecil sandy clay loam, 8 to 15 percent slopes, eroded	26,354	7.9
CuB	Cecil-Urban land complex, 2 to 8 percent slopes	30,052	9.0
CuD	Cecil-Urban land complex, 8 to 15 percent slopes	2,818	0.8
DaB	Davidson sandy clay loam, 2 to 8 percent slopes	2,829	0.8
DaD	Davidson sandy clay loam, 8 to 15 percent slopes	951	0.3
DaE	Davidson sandy clay loam, 15 to 25 percent slopes	780	0.2
EnB	Enon sandy loam, 2 to 8 percent slopes	16,950	5.1
EnD	Enon sandy loam, 8 to 15 percent slopes	9,532	2.8
GeB2	Georgeville silty clay loam, 2 to 8 percent slopes, eroded	2,324	0.7
GeD2	Georgeville silty clay loam, 8 to 15 percent slopes, eroded	1,051	0.3
GoB	Goldston slaty silt loam, 2 to 8 percent slopes	394	0.1
GoD	Goldston slaty silt loam, 8 to 15 percent slopes	345	0.1
HeB	Helena sandy loam, 2 to 8 percent slopes	10,451	3.1
HuB	Helena-Urban land complex, 2 to 8 percent slopes	1,761	0.5
IrA	Iredell fine sandy loam, 0 to 1 percent slopes	3,283	1.0
IrB	Iredell fine sandy loam, 1 to 8 percent slopes	13,656	4.1
IuB	Iredell-Urban land complex, 0 to 8 percent slopes	2,304	0.7
LgB	Lignum gravelly silt loam, 2 to 8 percent slopes	603	0.2
MeB	Mecklenburg fine sandy loam, 2 to 8 percent slopes	15,714	4.7
MeD	Mecklenburg fine sandy loam, 8 to 15 percent slopes	4,885	1.5
MkB	Mecklenburg-Urban land complex, 2 to 8 percent slopes	4,482	1.3
MO	Monacan soils	21,003	6.2
MS	Monacan soils and Arents	1,483	0.4
PaE	Pacolet sandy loam, 15 to 25 percent slopes	10,812	3.2
PaF	Pacolet sandy loam, 25 to 45 percent slopes	3,238	1.0
PB3	Pacolet-Udorthents complex, gullied	325	0.1
Pt	Pits	751	0.2
UL	Udorthents, loamy	479	0.1
UO	Udorthents, sanitary landfill	270	0.1
Ur	Urban land	12,767	3.8
VaB	Vance sandy loam, 2 to 8 percent slopes	3,909	1.2
VaD	Vance sandy loam, 8 to 15 percent slopes	820	0.2
WkB	Wilkes loam, 4 to 8 percent slopes	6,881	2.0
WkD	Wilkes loam, 8 to 15 percent slopes	10,370	3.1
WkE	Wilkes loam, 15 to 25 percent slopes	10,538	3.1
WkF	Wilkes loam, 25 to 45 percent slopes	1,317	0.4
WuD	Wilkes-Urban land complex, 8 to 15 percent slopes	1,161	0.3
	Water	2,885	0.9
	Total	336,530	100.0

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE

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

Soil name and map symbol	Corn	Corn silage	Soybeans	Wheat	Oats	Grass-legume hay	Pasture
	Bu	Ton	Bu	Bu	Bu	Ton	AUM*
ApB----- Appling	95	17	35	45	85	4.8	8.0
ApD----- Appling	70	15	25	35	75	4.2	7.0
CeB2----- Cecil	75	17	35	40	70	4.2	5.5
CeD2----- Cecil	65	13	25	35	65	4.0	4.5
CuB----- Cecil	---	---	---	---	---	---	---
CuD----- Cecil	---	---	---	---	---	---	---
DaB----- Davidson	100	19	40	50	85	5.0	8.0
DaD----- Davidson	75	15	35	40	75	4.0	7.5
DaE----- Davidson	---	---	---	---	---	---	6.0
EnB----- Enon	75	17	30	40	75	5.0	8.0
EnD----- Enon	65	13	25	40	65	4.8	7.5
GeB2----- Georgeville	75	17	35	40	65	5.0	6.0
GeD2----- Georgeville	65	13	30	35	60	4.0	5.0
GoB----- Goldston	55	---	20	25	---	3.0	4.5
GoD----- Goldston	---	---	---	---	---	2.1	3.5
HeB----- Helena	75	15	30	40	65	3.5	5.8
HuB----- Helena	---	---	---	---	---	---	---
IrA----- Iredell	70	15	30	45	55	5.0	8.0
IrB----- Iredell	65	15	---	---	65	5.0	8.0
IuB----- Iredell	---	---	---	---	---	---	---
LgB----- Lignum	90	20	35	45	55	3.0	7.0

See footnote at end of table.

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

Soil name and map symbol	Corn	Corn silage	Soybeans	Wheat	Oats	Grass-legume hay	Pasture
	Bu	Ton	Bu	Bu	Bu	Ton	AUM*
MeB: Mecklenburg	90	19	35	40	70	4.5	6.0
MeD: Mecklenburg	70	14	30	30	60	3.5	5.0
MkB: Mecklenburg	---	---	---	---	---	---	---
MO: Monacan	100	---	35	50	50	3.5	7.5
MS: Monacan	---	---	---	---	---	---	---
PaE: Pacolet	---	---	---	---	---	---	---
PaF: Pacolet	---	---	---	---	---	---	---
PB3: Pacolet	---	---	---	---	---	---	---
Pt**. Pits							
UL**, UO**. Udorthents							
Ur**. Urban land							
VaB: Vance	80	17	35	45	60	4.5	7.5
VaD: Vance	70	14	30	40	55	4.2	7.0
WkB: Wilkes	65	13	25	35	45	4.0	7.5
WkD: Wilkes	50	12	20	30	40	3.7	7.0
WkE, WkF: Wilkes	---	---	---	---	---	3.5	6.5
WuD: Wilkes	---	---	---	---	---	---	---

* 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 a period of 30 days.

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

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed in this table. Absence of an entry indicates that it is not applicable to rate the soils for the features shown on this table]

Soil name and map symbol	Ordi-nation symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equip-ment limita-tion	Seedling mortal-ity	Plant competi-tion	Common trees	Site index	
ApB, ApD----------- Appling	3o	Slight	Slight	Slight	--------	Loblolly pine-------	81	Eastern redcedar, eastern white pine, loblolly pine, yellow-poplar.
						Shortleaf pine------	65	
						Scarlet oak---------	68	
						Southern red oak----	76	
						Virginia pine-------	74	
						White oak-----------	71	
						Yellow-poplar-------	90	
CeB2, CeD2--------- Cecil	4c	Moderate	Moderate	Moderate	--------	Loblolly pine-------	72	Loblolly pine, Virginia pine.
						Shortleaf pine------	66	
						Virginia pine-------	65	
DaB, DaD----------- Davidson	3c	Moderate	Slight	Slight	--------	Loblolly pine-------	81	Loblolly pine, yellow-poplar.
						Shortleaf pine------	68	
						Northern red oak----	86	
						Southern red oak----	72	
						Sweetgum------------	80	
						White oak-----------	71	
						Yellow-poplar-------	80	
DaE---------------- Davidson	3r	Moderate	Moderate	Slight	--------	Loblolly pine-------	81	Loblolly pine, yellow-poplar.
						Shortleaf pine------	68	
						Northern red oak----	86	
						Southern red oak----	72	
						Sweetgum------------	80	
						White oak-----------	71	
						Yellow-poplar-------	80	
EnB, EnD----------- Enon	4c	Moderate	Moderate	Moderate	--------	Loblolly pine-------	71	Eastern redcedar, loblolly pine, Virginia pine.
						Shortleaf pine------	60	
						Virginia pine-------	65	
GeB2, GeD2--------- Georgeville	4c	Moderate	Moderate	Moderate	--------	Loblolly pine-------	70	Loblolly pine, Virginia pine.
						Longleaf pine-------	60	
GoB, GoD----------- Goldston	4o	Slight	Slight	Slight	--------	Loblolly pine-------	73	Eastern redcedar, loblolly pine, Virginia pine.
						Longleaf pine-------	68	
						Shortleaf pine------	63	
						Southern red oak----	66	
						White oak-----------	69	
HeB---------------- Helena	3w	Slight	Moderate	Slight	--------	Loblolly pine-------	80	Loblolly pine, Virginia pine, yellow-poplar.
						Shortleaf pine------	63	
						White oak-----------	64	
						Yellow-poplar-------	87	
IrA, IrB----------- Iredell	4c	Slight	Moderate	Moderate	--------	Loblolly pine-------	67	Loblolly pine, eastern redcedar.
						Shortleaf pine------	58	
						Post oak------------	44	
						White oak-----------	47	

See footnote at end of table.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	
LgB Lignum	3w	Slight	Moderate	Moderate	--------	Virginia pine Shortleaf pine Northern red oak	74 66 68	Loblolly pine, Virginia pine.
MeB, MeD Mecklenburg	4o	Slight	Slight	Slight	--------	Loblolly pine Shortleaf pine Southern red oak Sweetgum White oak Yellow-poplar Eastern redcedar	75 67 75 82 71 89 ---	Loblolly pine, Virginia pine, yellow-poplar, eastern redcedar.
MO, MS* Monacan	1c	Slight	Moderate	Slight	--------	Yellow-poplar Loblolly pine White oak	100 95 90	Loblolly pine, yellow-poplar.
PaE, PaF Pacolet	3r	Moderate	Moderate	Slight	--------	Loblolly pine Shortleaf pine Yellow-poplar	78 70 90	Loblolly pine, shortleaf pine, yellow-poplar.
PB3*: Pacolet	4c	Severe	Severe	Severe	--------	Loblolly pine Shortleaf pine	70 60	Loblolly pine, shortleaf pine,
VaB, VaD Vance	3o	Slight	Slight	Slight	--------	Loblolly pine Northern red oak Shortleaf pine White oak	76 --- --- ---	Loblolly pine, Virginia pine, yellow-poplar.
WkB, WkD Wilkes	4o	Slight	Slight	Slight	--------	Loblolly pine Post oak Shortleaf pine Southern red oak Sweetgum	75 79 63 76 82	Eastern redcedar, loblolly pine, Virginia pine.
WkE, WkF Wilkes	4r	Moderate	Moderate	Slight	--------	Loblolly pine Post oak Shortleaf pine Southern red oak Sweetgum	75 79 63 76 82	Loblolly pine, Virginia pine, eastern redcedar.

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

TABLE 7.--SUITABLE LANDSCAPE PLANTS AND TREES

Soil name and map symbol	Shrubs		Ground covers	Grasses	Trees	
	Evergreen	Deciduous			Deciduous	Evergreen
ApB, ApD------ Appling	Aucuba, azalea, boxwood, camellia, cleyera, gardenia, Japanese hollies, juniper, ligusstrum (privet), nandina, photinia, pyracantha, rhododendron, yucca.	Althea (hibiscus), blueberry (rabbiteye), clematis, hydrangea (blue), hydrangea (pink), lilac, roses, spirea.	Ajuga, day lily, ivy, creeping juniper, liriope, pachysandra, periwinkle.	Annual ryegrass, bermudagrass, fescue (Ky.31), zoysia.	Green ash, American beech, river birch, blackgum, black cherry, Japanese cherry, yoshino cherry, crab apple, dogwood, gingko, hawthorn, hickory, honeylocust (thornless), saucer magnolia, red maple, sugar maple, crape myrtle, oak, Bradford pear, pecan, persimmon, Lombardy poplar, yellow-poplar, golden raintree, redbud, sourwood, sweetgum, sycamore, black walnut, weeping willow.	Deodara cedar, eastern redcedar, Carolina hemlock, American holly, Carolina cherry, laurel, southern magnolia, loblolly pine, shortleaf pine, Virginia pine, white pine.
CeB2, CeD2, CuB2, CuD2--- Cecil	Aucuba, azalea, boxwood, camellia, cleyera, gardenia, Japanese hollies, juniper, ligusstrum (privet), nandina, photinia, pyracantha, rhododendron, yucca.	Althea (hibiscus), blueberry (rabbiteye), clematis, hydrangea (blue), hydrangea (pink), lilac, roses, spirea.	Ajuga, day lily, ivy, creeping juniper, liriope, pachysandra, periwinkle.	Annual ryegrass, bermudagrass, fescue (Ky.31), zoysia.	Green ash, American beech, river birch, blackgum, black cherry, Japanese cherry, yoshino cherry, crab apple, dogwood, gingko, hawthorn, hickory, honeylocust (thornless), saucer magnolia, red maple, sugar maple, crape myrtle, oak, Bradford pear, pecan, persimmon, Lombardy poplar, yellow-poplar, golden raintree, redbud, sourwood, sweetgum, sycamore, black walnut, weeping willow.	Deodara cedar, eastern redcedar, Carolina hemlock, American holly, Carolina cherry, laurel, southern magnolia, loblolly pine, shortleaf pine, Virginia pine, white pine.

See footnotes at end of table.

TABLE 7.--SUITABLE LANDSCAPE PLANTS AND TREES--Continued

Soil name and map symbol	Shrubs		Ground covers	Grasses	Trees	
	Evergreen	Deciduous			Deciduous	Evergreen
DaB, DaD, DaE----------- Davidson	Aucuba, azalea, boxwood, camellia, cleyera, gardenia, Japanese hollies, juniper, ligusstrum (privet), nandina, photinia, pyracantha, rhododendron, yucca.	Althea (hibiscus), blueberry (rabbiteye), clematis, hydrangea (blue), hydrangea (pink), lilac, roses, spirea.	Ajuga, day lily, ivy, creeping juniper, liriope, pachysandra, periwinkle.	Annual ryegrass, bermudagrass, fescue (Ky.31), zoysia.	Green ash, American beech, river birch, blackgum, black cherry, Japanese cherry, yoshino cherry, crab apple, dogwood, gingko, hawthorn, hickory, honeylocust (thornless), saucer magnolia, red maple, sugar maple, crape myrtle, oak, Bradford pear, pecan, persimmon, Lombardy poplar, yellow-poplar, golden raintree, redbud, sour-wood, sweetgum, sycamore, black walnut, weeping willow.	Deodara cedar, eastern redcedar, Carolina hemlock, American holly, Carolina cherry, laurel, southern magnolia, loblolly pine, shortleaf pine, Virginia pine, white pine.
EnB, EnD------ Enon	Aucuba, boxwood, cleyera, gardenia, Japanese hollies, juniper, ligusstrum, nandina, photinia, pyracantha, yucca.	Althea (hibiscus), clematis, hydrangea (pink), lilac, spirea.	Ajuga, day lily, ivy, creeping juniper, liriope, pachysandra, periwinkle.	Annual ryegrass, bermudagrass, fescue (Ky.31), zoysia.	Green ash, American beech, river birch, blackgum, black cherry, gingko, hawthorn, hickory, red maple, sugar maple, oak, pecan, persimmon, Lombardy poplar, yellow-poplar, sourwood, sweetgum, sycamore, black walnut, weeping willow.	Eastern redcedar, loblolly pine, shortleaf pine, Virginia pine.

See footnotes at end of table.

TABLE 7.--SUITABLE LANDSCAPE PLANTS AND TREES--Continued

Soil name and map symbol	Shrubs		Ground covers	Grasses	Trees	
	Evergreen	Deciduous			Deciduous	Evergreen
GeB2, GeD2----Georgeville	Aucuba, azalea, boxwood, camellia, cleyera, gardenia, Japanese hollies, juniper, ligusstrum (privet), nandina, photinia, pyracantha, rhododendron, yucca.	Althea (hibiscus), blueberry (rabbiteye), clematis, hydrangea (blue), hydrangea (pink), lilac, roses, spirea.	Ajuga, day lily, ivy, creeping juniper, liriope, pachysandra, periwinkle.	Annual ryegrass, bermudagrass, fescue (Ky.31), zoysia.	Green ash, American beech, river birch, blackgum, black cherry, Japanese cherry, yoshino cherry, crab apple, dogwood, gingko, hawthorn, hickory, honeylocust (thornless), saucer magnolia, red maple, sugar maple, crape myrtle, oak, Bradford pear, pecan, persimmon, Lombardy poplar, yellow-poplar, golden raintree, redbud, sourwood, sweetgum, sycamore, black walnut, weeping willow.	Deodara cedar, eastern redcedar, Carolina hemlock, American holly, Carolina cherry, laurel, southern magnolia, loblolly pine, shortleaf pine, Virginia pine, white pine.
GoB, GoD------Goldston	Aucuba, azalea, boxwood, camellia, cleyera, gardenia, Japanese hollies, Chinese hollies, juniper, ligusstrum, nandina, photinia. pyracantha, rhododendron, yucca.	Althea (hibiscus), blueberry (rabbiteye), clematis, hydrangea (blue), hydrangea (pink), lilac, spirea.	Ajuga, day lily, ivy, creeping juniper, liriope periwinkle.	Annual ryegrass, bermudagrass, fescue (Ky.31), zoysia.	Green ash, American beech, river birch, Japanese cherry, dogwood, gingko, hawthorn, hickory, honeylocust (thornless), saucer magnolia, red maple, sugar maple, crape myrtle, oak, Bradford pear, Lombardy poplar, yellow-poplar, golden raintree, eastern redbud, sourwood, sweetgum, yoshino cherry.	Deodara cedar, eastern redcedar, Carolina hemlock, American holly, cherry, laurel, southern magnolia, loblolly pine, shortleaf pine, Virginia pine.

See footnotes at end of table.

TABLE 7.--SUITABLE LANDSCAPE PLANTS AND TREES--Continued

Soil name and map symbol	Shrubs		Ground covers	Grasses	Trees	
	Evergreen	Deciduous			Deciduous	Evergreen
HeB, HuB[2]: Helena	Aucuba, cleyera, gardenia, Chinese hollies, juniper, ligusstrum, nandina, photinia, pyracantha, yucca.	Althea (hibiscus), hydrangea (blue), spirea.	Ajuga, day lily, creeping, juniper, ivy, liriope, pachysandra, periwinkle.	Annual ryegrass, bermudagrass, fescue (Ky.31), zoysia.	Green ash, American beach, river birch, red maple, sugar maple, yellow-poplar, sweetgum, sycamore, weeping willow.	Loblolly pine, shortleaf pine, Virginia pine.
IrA, IrB, IuB[2]: Iredell	Aucuba, gardenia, Chinese hollies, juniper, ligusstrum, nandina, photinia, pyracantha, yucca.	Althea (hibiscus), hydrangea (pink), lilac, spirea.	Ajuga, day lily, ivy, creeping juniper, liriope, pachysandra, periwinkle.	Annual ryegrass, bermudagrass, fescue (Ky.31), zoysia.	Green ash, American beech, river birch, black cherry, gingko, hawthorn, red maple, oak, yellow-poplar, sycamore, weeping willow.	Eastern redcedar, loblolly pine, shortleaf pine, Virginia pine.
LgB: Lignum	Aucuba, cleyera, gardenia, Chinese hollies, juniper, ligusstrum, nandina, photinia, pyracantha, yucca.	Althea (hibiscus), hydrangea (blue), spirea.	Ajuga, day lily, ivy, creeping juniper, liriope, pachysandra, periwinkle.	Annual ryegrass, bermudagrass, fescue (Ky.31), zoysia.	Green ash, American beech, river birch, red maple, sugar maple, yellow-poplar, sweetgum, sycamore, weeping willow.	Loblolly pine, shortleaf pine, Virginia pine.
MeB, MeD, MkB[2]: Mecklenburg	Aucuba, boxwood, cleyera, gardenia, Japanese, hollies, juniper, ligusstrum, nandina, photinia, pyracantha, yucca.	Althea (hibiscus), clematis, hydrangea (pink), lilac, spirea.	Ajuga, day lily, ivy, creeping juniper, liriope, pachysandra, periwinkle.	Annual ryegrass, bermudagrass, fescue (Ky.31), zoysia.	Green ash, American beech, river birch, blackgum, black cherry, gingko, hawthorn, hickory, red maple, sugar maple, oak, pecan, persimmon, Lombardy poplar, yellow-poplar, sourwood, sweetgum, sycamore, black walnut, weeping willow.	Eastern redcedar, loblolly pine, shortleaf pine, Virginia pine.

See footnotes at end of table.

TABLE 7.--SUITABLE LANDSCAPE PLANTS AND TREES--Continued

Soil name and map symbol	Shrubs		Ground covers	Grasses	Trees	
	Evergreen	Deciduous			Deciduous	Evergreen
MO, MS[2]: Monacan	Aucuba, cleyera, gardenia, Chinese hollies, juniper, ligusstrum, nandina, photinia, pyracantha, yucca.	Althea (hibiscus), clematis, hydrangea (pink), lilac, roses, spirea.	Ajuga, day lily, ivy, creeping juniper, liriope, pachysandra, periwinkle.	Annual ryegrass, bermudagrass, fescue (Ky.31), zonsia.	Green ash, American beech, river birch, red maple, yellow-poplar, eastern redbud, sourwood, sweetgum, sycamore, black walnut, weeping willow, gingko, blackgum hawthorn, saucer magnolia, sugar maple, crape myrtle.	Loblolly pine, shortleaf pine.
PaE, PaF, PB3[2]: Pacolet	Aucuba, azalea, boxwood, camellia, cleyera, gardenia, Japanese hollies, juniper, ligusstrum (privet), nandina, photinia, pyracantha, rhododendron, yucca.	Althea (hibiscus), blueberry (rabbiteye), clematis, hydrangea (blue), hydrangea (pink), lilac, roses, spirea.	Ajuga, day lily, ivy, creeping juniper, liriope, pachysandra, periwinkle.	Annual ryegrass, bermudagrass, fescue (Ky.31), zoysia.	Green ash, American beech, river birch, blackgum, black cherry, Japanese cherry, yoshino cherry, crab apple, dogwood, gingko, hawthorn, hickory, honeylocust (thornless), saucer magnolia, red maple, sugar maple, crape myrtle, oak, Bradford pear, pecan, persimmon, Lombardy poplar, yellow-poplar, golden raintree, redbud, sourwood, sweetgum, sycamore, black walnut, weeping willow.	Deodara cedar, eastern redcedar, Carolina hemlock, American holly, Carolina cherry, laurel, southern magnolia, loblolly pine, shortleaf pine, Virginia pine, white pine.
Pt[1]. Pits.						
UL, UO[2]. Udorthents.						
Ur[1]. Urban land.						

See footnotes at end of table.

TABLE 7.--SUITABLE LANDSCAPE PLANTS AND TREES--Continued

Soil name and map symbol	Shrubs		Ground covers	Grasses	Trees	
	Evergreen	Deciduous			Deciduous	Evergreen
VaB, VaD------ Vance	Aucuba, azalea, boxwood, camellias, cleyera, gardenia, Japanese hollies, juniper, ligusstrum (privet), nandina, photinia, rhododendron, yucca, Chinese hollies.	Althea (hibiscus), blueberry (rabbiteye), clematis, hydrangea (blue), hydrangea (pink), lilac, roses, spirea.	Ajuga, day lily, ivy, creeping juniper, liriope, pachysandra, periwinkle.	Annual ryegrass, bermudagrass, fescue (Ky.31), zoysia.	Green ash, American beech, river birch, blackgum, black cherry, gingko, hawthorn, hickory, red maple, sugar maple, oak, Lombardy poplar, sweetgum, sycamore, black walnut, weeping willow.	Eastern redcedar, loblolly pine, shortleaf pine, Virginia pine.
WkB, WkD, WkE, WkF, WuD[2]---- Wilkes	Aucuba, boxwood, cleyera, gardenia, Japanese hollies, juniper, ligusstrum, nandina, photinia, pyracantha, yucca.	Althea (hibiscus), clematis, hydrangea (pink), lilac, spirea.	Ajuga, day lily, ivy, creeping juniper, liriope, pachysandra, periwinkle.	Annual ryegrass, bermudagrass, fescue (Ky.31), zoysia.	Green ash, American beech, river birch, blackgum, black cherry, gingko, hawthorn, hickory, red maple, sugar maple, oak, pecan, persimmon, Lombardy poplar, yellow-poplar, sourwood, sweetgum, sycamore, black walnut, weeping willow.	Eastern redcedar, loblolly pine, shortleaf pine, Virginia pine.

[1]Urban land part and pits not rated.

[2]These highly disturbed soils generally consist of compacted, dense fill material or steep gullies that have cut completely through the original soil. Low available moisture capacity severely restricts the kinds of plants that can be grown. The gullies are subject to excessive runoff.

TABLE 8.--BUILDING SITE DEVELOPMENT

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

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
ApB----------------- Appling	Moderate: too clayey.	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
ApD----------------- Appling	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.
CeB2---------------- Cecil	Moderate: too clayey.	Slight----------	Slight----------	Moderate: slope.	Moderate: low strength.	Moderate: too clayey.
CeD2---------------- Cecil	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength.	Moderate: slope.
CuB*:						
Cecil---------------	Moderate: too clayey.	Slight----------	Slight----------	Moderate: slope.	Moderate: low strength.	Moderate: too clayey.
Urban land.						
CuD*:						
Cecil---------------	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength.	Moderate: slope.
Urban land.						
DaB----------------- Davidson	Moderate: too clayey.	Slight----------	Slight----------	Moderate: slope.	Moderate: low strength.	Slight.
DaD----------------- Davidson	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength.	Moderate: slope.
DaE----------------- Davidson	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
EnB----------------- Enon	Severe: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Slight.
EnD----------------- Enon	Severe: too clayey.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength, slope.	Severe: shrink-swell, low strength.	Moderate: slope.
GeB2---------------- Georgeville	Moderate: too clayey.	Slight----------	Slight----------	Moderate: slope.	Moderate: low strength.	Moderate: too clayey.
GeD2---------------- Georgeville	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope.	Moderate: slope.
GoB----------------- Goldston	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: depth to rock, slope.	Moderate: depth to rock.	Moderate: depth to rock.
GoD----------------- Goldston	Severe: depth to rock.	Moderate: depth to rock, slope.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock.	Severe: depth to rock, slope.
HeB----------------- Helena	Severe: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Moderate: wetness.

See footnote at end of table.

TABLE 8.--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
HuB*:						
Helena	Severe: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Moderate: wetness.
Urban land.						
IrA, IrB Iredell	Severe: too clayey, wetness.	Severe: shrink-swell, wetness.	Severe: shrink-swell, wetness.	Severe: shrink-swell, wetness.	Severe: low strength, shrink-swell.	Severe: wetness, ponding.
IuB*:						
Iredell	Severe: too clayey, wetness.	Severe: shrink-swell, wetness.	Severe: shrink-swell, wetness.	Severe: shrink-swell, wetness.	Severe: low strength, shrink-swell.	Moderate: wetness.
Urban land.						
LgB Lignum	Severe: too clayey, wetness.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: low strength.	Moderate: wetness.
MeB Mecklenburg	Severe: too clayey.	Severe: low strength.	Moderate: depth to rock, shrink-swell.	Severe: low strength.	Severe: low strength.	Slight.
MeD Mecklenburg	Severe: too clayey.	Severe: low strength.	Moderate: depth to rock, slope, shrink-swell.	Severe: slope, low strength.	Severe: low strength.	Moderate: slope.
MkB*:						
Mecklenburg	Severe: too clayey.	Severe: low strength.	Moderate: depth to rock, shrink-swell.	Severe: low strength.	Severe: low strength.	Slight.
Urban land.						
MO Monacan	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: floods.	Severe: floods.
MS*:						
Monacan	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: floods.	Severe: floods.
Arents.						
PaE, PaF Pacolet	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
PB3*:						
Pacolet	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, too clayey.
Udorthents.						
Pt*. Pits						
UL*, UO*. Udorthents						
Ur*. Urban land						
VaB Vance	Severe: too clayey.	Severe: low strength.	Severe: low strength.	Severe: low strength.	Severe: low strength.	Slight.

See footnote at end of table.

TABLE 8.--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
VaD: Vance	Severe: too clayey.	Severe: low strength.	Severe: low strength.	Severe: slope, low strength.	Severe: low strength.	Moderate: slope.
WkB: Wilkes	Moderate: depth to rock.	Slight	Moderate: depth to rock.	Moderate: slope.	Slight	Moderate: depth to rock.
WkD: Wilkes	Moderate: slope, depth to rock.	Moderate: slope.	Moderate: slope, depth to rock.	Severe: slope.	Moderate: slope.	Severe: depth to rock, slope.
WkE, WkF: Wilkes	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.
WuD*:						
Wilkes	Moderate: slope, depth to rock.	Moderate: slope.	Moderate: slope, depth to rock.	Severe: slope.	Moderate: slope.	Severe: depth to rock, slope.
Urban land.						

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

TABLE 9.--SANITARY FACILITIES

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

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
ApB----------------- Appling	Moderate: percs slowly.	Moderate: slope, seepage.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
ApD----------------- Appling	Moderate: slope, percs slowly.	Severe: slope, seepage.	Moderate: too clayey.	Moderate: slope.	Fair: too clayey, slope.
CeB2---------------- Cecil	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey, seepage.	Slight-----------	Fair: too clayey.
CeD2---------------- Cecil	Moderate: percs slowly, slope.	Severe: slope.	Moderate: too clayey, seepage.	Moderate: slope.	Fair: too clayey, slope.
CuB*: Cecil--------------	Moderate: percs slowly.				
Urban land.					
CuD*: Cecil--------------	Moderate: percs slowly, slope.				
Urban land.					
DaB----------------- Davidson	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
DaD----------------- Davidson	Moderate: slope, percs slowly.	Severe: slope.	Moderate: too clayey.	Moderate: slope.	Fair: too clayey, slope.
DaE----------------- Davidson	Severe: slope.	Severe: slope.	Severe: too clayey, slope.	Severe: slope.	Poor: too clayey, slope.
EnB----------------- Enon	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----------	Poor: too clayey.
EnD----------------- Enon	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey.
GeB2---------------- Georgeville	Moderate: percs slowly.	Moderate: slope, seepage.	Moderate: too clayey.	Slight-----------	Poor: too clayey.
GeD2---------------- Georgeville	Moderate: percs slowly, slope.	Severe: slope.	Moderate: too clayey.	Moderate: slope.	Poor: too clayey.
GoB, GoD------------ Goldston	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: seepage.	Poor: small stones, thin layer.
HeB----------------- Helena	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----------	Poor: too clayey.

See footnote at end of table.

TABLE 9.--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
HuB*:					
Helena	Severe: percs slowly.				
Urban land.					
IrA, IrB Iredell	Severe: percs slowly, wetness.	Severe: wetness.	Severe: too clayey, wetness.	Severe: wetness.	Poor: thin layer.
IuB*:					
Iredell	Severe: percs slowly, wetness.				
Urban land.					
LgB Lignum	Severe: percs slowly, wetness.	Severe: wetness, depth to rock.	Severe: depth to rock, wetness.	Severe: wetness.	Poor: too clayey.
MeB Mecklenburg	Severe: percs slowly.	Moderate: slope, depth to rock.	Severe: too clayey, depth to rock.	Slight	Poor: thin layer.
MeD Mecklenburg	Severe: percs slowly.	Severe: slope.	Severe: too clayey, depth to rock.	Moderate: slope.	Poor: thin layer.
MkB*:					
Mecklenburg	Severe: percs slowly.				
Urban land.					
MO Monacan	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Good.
MS*:					
Monacan	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Good.
Arents.					
PaE Pacolet	Severe: slope.	Severe: slope.	Moderate: too clayey, slope.	Severe: slope.	Poor: slope.
PaF Pacolet	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
PB3*:					
Pacolet	Severe: slope.	Severe: slope.	Moderate: too clayey, slope.	Severe: slope.	Poor: slope.
Udorthents.					
Pt*. Pits					
UL*, UO*. Udorthents					

See footnote at end of table.

TABLE 9.--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
Ur*. Urban land					
VaB----------------- Vance	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----------	Poor: too clayey.
VaD----------------- Vance	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey.
WkB----------------- Wilkes	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Slight-----------	Poor: thin layer.
WkD----------------- Wilkes	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Moderate: slope.	Poor: thin layer.
WkE, WkF------------ Wilkes	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Poor: thin layer.
WuD*: Wilkes--------------	Severe: depth to rock.				
Urban land.					

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

TABLE 10.--CONSTRUCTION MATERIALS

[Some of the terms used in this table to describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," and "unsuited." Absence of an entry means that it is not applicable to rate the soils for the features shown on this table]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
ApB, ApD Appling	Fair: low strength, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer, area reclaim.
CeB2, CeD2 Cecil	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
CuB*, CuD*. Cecil				
Urban land.				
DaB Davidson	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
DaD Davidson	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey, slope.
DaE Davidson	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
EnB, EnD Enon	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer.
GeB2, GeD2 Georgeville	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer.
GoB, GoD Goldston	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: small stones, area reclaim.
HeB Helena	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
HuB*. Helena				
Urban land.				
IrA, IrB Iredell	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer.
IuB*. Iredell				
Urban land.				
LgB Lignum	Poor: low strength.	Unsuited	Unsuited	Poor: too clayey.
MeB, MeD Mecklenburg	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer.

See footnote at end of table.

TABLE 10.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
MkB*. Mecklenburg				
Urban land.				
MO------------------- Monacan	Fair: wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
MS*: Monacan-------------	Fair: wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Arents.				
PaE------------------ Pacolet	Fair: low strength, slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, slope.
PaF------------------ Pacolet	Poor: slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, slope.
PB3*: Pacolet-------------	Fair: low strength, slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, slope.
Udorthents.				
Pt*. Pits				
UL*, UO*. Udorthents				
Ur*. Urban land				
VaB, VaD------------- Vance	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, too clayey.
WkB, WkD------------- Wilkes	Fair: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer.
WkE------------------ Wilkes	Fair: slope, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer.
WkF------------------ Wilkes	Poor: slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer.
WuD*. Wilkes				
Urban land.				

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

TABLE 11.--WATER MANAGEMENT

[Some of the terms used in this table to describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry means that it is not applicable to rate the soils for the features shown on this table]

Soil name and map symbol	Limitations for--		Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Terraces and diversions	Grassed waterways
ApB------------- Appling	Moderate: seepage.	Moderate: low strength.	Not needed-------	Favorable--------	Favorable.
ApD------------- Appling	Moderate: seepage.	Moderate: low strength.	Not needed-------	Slope------------	Favorable.
CeB2, CeD2-------- Cecil	Moderate: seepage.	Moderate: hard to pack.	Not needed-------	Slope------------	Slope.
CuB*, CuD*. Cecil					
Urban land.					
DaB------------- Davidson	Moderate: seepage.	Moderate: hard to pack.	Not needed-------	Favorable--------	Favorable.
DaD, DaE---------- Davidson	Moderate: seepage.	Moderate: hard to pack.	Not needed-------	Slope------------	Slope.
EnB, EnD---------- Enon	Moderate: depth to rock.	Severe: shrink-swell, hard to pack.	Not needed-------	Erodes easily, slope, percs slowly.	Percs slowly, erodes easily.
GeB2------------- Georgeville	Moderate: slope, seepage.	Moderate: compressible, low strength, erodes easily.	Not needed-------	Favorable--------	Favorable.
GeD2------------- Georgeville	Moderate: slope, seepage.	Moderate: compressible, low strength, erodes easily.	Not needed-------	Complex slope, erodes easily.	Slope, erodes easily.
GoB------------- Goldston	Severe: seepage.	Severe: thin layer.	Not needed-------	Depth to rock, complex slope.	Favorable.
GoD------------- Goldston	Severe: seepage.	Severe: thin layer.	Not needed-------	Depth to rock, complex slope.	Slope.
HeB------------- Helena	Moderate: depth to rock.	Moderate: shrink-swell, erodes easily.	Not needed-------	Favorable--------	Favorable.
HuB*. Helena					
Urban land.					
IrA, IrB---------- Iredell	Slight------------	Moderate: hard to pack.	Percs slowly, slope.	Percs slowly, wetness.	Percs slowly, slope.
IuB*:					
Iredell----------	Slight------------	Moderate: hard to pack.	Percs slowly, slope.	Percs slowly, wetness.	Percs slowly, slope.
Urban land.					
LgB------------- Lignum	Moderate: depth to rock.	Moderate: compressible, low strength.	Percs slowly, wetness.	Percs slowly, wetness.	Percs slowly, wetness.

See footnote at end of table.

TABLE 11.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
MeB: Mecklenburg	Slight	Severe: hard to pack.	Not needed	Favorable	Percs slowly.
MeD: Mecklenburg	Slight	Severe: hard to pack.	Not needed	Slope	Slope.
MkB*. Mecklenburg					
Urban land.					
MO: Monacan	Moderate: seepage.	Moderate: low strength.	Floods, wetness.	Not needed	Wetness.
MS*. Monacan	Moderate: seepage.	Moderate: low strength.	Floods, wetness.	Not needed	Wetness.
Arents.					
PaE, PaF: Pacolet	Moderate: seepage.	Moderate: hard to pack.	Not needed	Slope	Slope.
PB3*: Pacolet	Moderate: seepage.	Moderate: hard to pack.	Not needed	Slope	Slope.
Udorthents.					
Pt*. Pits					
UL*, UO*. Udorthents					
Ur*. Urban land					
VaB: Vance	Slight	Moderate: hard to pack.	Not needed	Percs slowly, erodes easily.	Percs slowly.
VaD: Vance	Slight	Moderate: hard to pack.	Not needed	Slope, percs slowly.	Slope, percs slowly.
WkB: Wilkes	Severe: depth to rock.	Severe: thin layer.	Not needed	Depth to rock, complex slope.	Favorable.
WkD, WkE, WkF: Wilkes	Severe: depth to rock.	Severe: thin layer.	Not needed	Depth to rock, complex slope.	Slope.
WuD*. Wilkes					
Urban land.					

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

TABLE 12.--RECREATIONAL DEVELOPMENT

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

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
ApB: Appling	Slight	Slight	Moderate: slope.	Slight	Slight.
ApD: Appling	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
CeB2: Cecil	Moderate: too clayey.	Moderate: too clayey.	Moderate: slope, too clayey.	Moderate: too clayey.	Moderate: too clayey.
CeD2: Cecil	Moderate: slope, too clayey.	Moderate: slope, too clayey.	Severe: slope.	Moderate: too clayey.	Moderate: slope.
CuB*:					
Cecil	Moderate: too clayey.	Moderate: too clayey.	Moderate: slope, too clayey.	Moderate: too clayey.	Moderate: too clayey.
Urban land.					
CuD*:					
Cecil	Moderate: slope, too clayey.	Moderate: slope, too clayey.	Severe: slope.	Moderate: too clayey.	Moderate: slope.
Urban land.					
DaB: Davidson	Moderate: too clayey.	Moderate: too clayey.	Moderate: slope, too clayey.	Moderate: too clayey.	Slight.
DaD: Davidson	Moderate: slope, too clayey.	Moderate: slope, too clayey.	Severe: slope.	Moderate: too clayey.	Moderate: slope.
DaE: Davidson	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too clayey, slope.	Severe: slope.
EnB: Enon	Moderate: percs slowly.	Slight	Moderate: percs slowly, slope.	Slight	Slight.
EnD: Enon	Moderate: percs slowly.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
GeB2: Georgeville	Moderate: too clayey.	Moderate: too clayey.	Moderate: slope, too clayey.	Moderate: too clayey.	Moderate: too clayey.
GeD2: Georgeville	Moderate: slope, too clayey.	Moderate: slope, too clayey.	Severe: slope.	Moderate: too clayey.	Moderate: slope.
GoB: Goldston	Moderate: small stones.	Moderate: small stones.	Moderate: depth to rock.	Moderate: small stones.	Moderate: depth to rock.
GoD: Goldston	Moderate: small stones, slope.	Moderate: small stones, slope.	Severe: depth to rock, slope.	Moderate: small stones.	Severe: slope, depth to rock.
HeB: Helena	Moderate: percs slowly.	Moderate: wetness.	Moderate: percs slowly.	Moderate: wetness.	Moderate: wetness.

See footnote at end of table.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
HuB*:					
Helena	Moderate: percs slowly.	Moderate: wetness.	Moderate: percs slowly.	Moderate: wetness.	Moderate: wetness.
Urban land.					
IrA, IrB Iredell	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
IuB*:					
Iredell	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Urban land.					
LgB Lignum	Moderate: percs slowly, wetness.	Moderate: percs slowly, wetness.	Severe: small stones.	Moderate: wetness.	Moderate: wetness.
MeB Mecklenburg	Moderate: percs slowly.	Slight	Moderate: slope, percs slowly.	Slight	Slight.
MeD Mecklenburg	Moderate: slope, percs slowly.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
MkB*:					
Mecklenburg	Moderate: percs slowly.	Slight	Moderate: slope, percs slowly.	Slight	Slight.
Urban land.					
MO Monacan	Severe: floods, wetness.	Moderate: floods, wetness.	Moderate: floods, wetness.	Slight	Severe: floods.
MS*:					
Monacan	Severe: floods, wetness.	Moderate: floods, wetness.	Moderate: floods, wetness.	Slight	Severe: floods.
Arents.					
PaE Pacolet	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
PaF Pacolet	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
PB3*:					
Pacolet	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too clayey, slope.	Severe: too clayey, slope.
Udorthents.					
Pt*. Pits					
UL*, UO*. Udorthents					
Ur*. Urban land					

See footnote at end of table.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
VaB------------------- Vance	Moderate: percs slowly.	Slight----------	Moderate: percs slowly.	Slight------------	Slight.
VaD------------------- Vance	Moderate: slope, percs slowly.	Moderate: slope.	Severe: slope, percs slowly.	Slight------------	Moderate: slope.
WkB------------------- Wilkes	Slight----------	Slight----------	Severe: slope.	Slight------------	Moderate: depth to rock.
WkD------------------- Wilkes	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight------------	Moderate: depth to rock, slope.
WkE------------------- Wilkes	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
WkF------------------- Wilkes	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
WuD*:					
Wilkes---------------	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight------------	Severe: slope.
Urban land.					

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

TABLE 13.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that it is not applicable to rate the soils for the features shown on this table]

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
ApB Appling	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
ApD Appling	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
CeB2, CeD2 Cecil	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
DaB Davidson	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
DaD Davidson	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
DaE Davidson	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
EnB Enon	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
EnD Enon	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
GeB2 Georgeville	Fair	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
GeD2 Georgeville	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
GoB Goldston	Poor	Poor	Fair	Poor	Poor	Poor	Very poor.	Poor	Poor	Very poor.
GoD Goldston	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
HeB Helena	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
IrA, IrB Iredell	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
LgB Lignum	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
MeB Mecklenburg	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
MeD Mecklenburg	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
MO Monacan	Fair	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
MS*:										
Monacan	Fair	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
Arents.										

See footnote at end of table.

TABLE 13.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
PaE, PaF: Pacolet	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
PB3*:										
Pacolet	Very poor.	Very poor.	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Udorthents.										
Pt*. Pits										
UL*, UO*. Udorthents										
Ur*. Urban land										
VaB: Vance	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
VaD: Vance	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
WkB, WkD, WkE: Wilkes	Poor	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
WkF: Wilkes	Very poor.	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.

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

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS

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

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
ApB, ApD: Appling	0-11	Sandy loam	SM, SM-SC	A-2	0-5	86-100	80-100	55-75	15-35	<27	NP-5
	11-43	Sandy clay, clay loam, clay.	MH, CL, ML, SC	A-7	0-5	95-100	95-100	70-92	45-80	41-74	15-30
	43-66	Sandy clay, clay loam, sandy clay loam.	SC, CL	A-4, A-6	0-5	95-100	95-100	70-90	40-75	25-45	8-22
CeB2, CeD2: Cecil	0-6	Sandy clay loam	SM, SC, CL, ML	A-4, A-6	0	74-100	72-100	68-95	38-81	21-35	3-15
	6-53	Clay, clay loam	MH, ML	A-7	0	97-100	92-100	72-99	55-95	41-80	9-37
	53-65	Weathered bedrock.	---	---	---	---	---	---	---	---	---
CuB*, CuD*:											
Cecil	0-6	Sandy clay loam	SM, SC, CL, ML	A-4, A-6	0	74-100	72-100	68-95	38-81	21-35	3-15
	6-53	Clay, clay loam	MH, ML	A-7	0	97-100	92-100	72-99	55-95	41-80	9-37
	53-65	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Urban land.											
DaB, DaD, DaE: Davidson	0-7	Sandy clay loam	CL, SC, CL-ML, SM-SC	A-6, A-4	0	94-100	84-100	75-95	40-70	25-40	5-18
	7-16	Clay loam	CL	A-6	0	96-100	90-100	75-95	50-75	25-40	11-25
	16-99	Clay	CL, CH, ML, MH	A-7, A-6	0	96-100	95-100	85-100	65-85	35-65	15-35
EnB, EnD: Enon	0-7	Sandy loam	SM, SM-SC, SC	A-2-4, A-4, A-6, A-2-6	0-5	80-100	80-100	55-85	25-49	<30	NP-15
	7-36	Clay loam, clay	CH	A-7-6	0-5	85-100	80-100	75-95	65-95	51-79	25-80
	36-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
GeB2, GeD2: Georgeville	0-5	Silty clay loam	CL, ML	A-6, A-7-6	0-3	95-100	95-100	90-100	65-100	30-49	11-20
	5-35	Silty clay, silty clay loam, clay loam.	MH, ML	A-7-5	0	95-100	95-100	90-100	75-98	41-75	15-35
	35-49	Silty clay loam, silt loam, clay loam.	MH	A-7-5	0	95-100	90-100	65-100	60-98	50-75	15-35
	49-99	Silt loam	ML, CL, CL-ML	A-4	0-5	90-100	90-100	65-100	60-95	<30	NP-10
GoB, GoD: Goldston	0-8	Slaty silt loam	GM, SM, ML, GM-GC	A-4	5-20	60-80	55-75	50-70	40-60	<35	NP-10
	8-16	Slaty silt loam, slaty very fine sandy loam.	GM, SM, ML, GM-GC	A-2, A-4, A-5	10-30	55-100	50-92	45-90	25-80	<45	NP-10
	16-24	Slaty silt loam	GM	A-2	20-40	25-40	25-40	20-40	15-35	<20	NP-3
	24-62	Weathered bedrock.	---	---	---	---	---	---	---	---	---
HeB: Helena	0-8	Sandy loam	SM, SM-SC, SC	A-2, A-4	0	95-100	90-100	51-86	27-46	<30	NP-9
	8-11	Sandy clay loam, clay loam.	CL	A-6, A-7	0	95-100	95-100	70-90	55-70	30-49	15-25
	11-40	Clay loam, sandy clay, clay.	CH, MH	A-7	0	95-100	95-100	73-93	56-80	50-85	24-50
	40-64	Weathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
HuB*:											
Helena	0-8	Sandy loam	SM, SM-SC, SC	A-2, A-4	0	95-100	90-100	51-86	27-46	<30	NP-9
	8-11	Sandy clay loam, clay loam.	CL	A-6, A-7	0	95-100	95-100	70-90	55-70	30-49	15-25
	11-40	Clay loam, sandy clay, clay.	CH, MH	A-7	0	95-100	95-100	73-93	56-80	50-85	24-50
	40-64	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Urban land.											
IrA, IrB Iredell	0-6	Fine sandy loam	SM	A-2-4, A-4	0-1	90-98	80-90	57-80	30-50	<35	NP-9
	6-24	Clay	CH	A-7	0	99-100	85-100	80-100	65-95	60-115	30-85
	24-28	Loam, sandy clay loam, clay loam.	CL, CH, SC	A-7	0-1	98-100	85-100	70-95	40-75	41-60	20-39
	28-65	Variable	---	---	---	---	---	---	---	---	---
IuB*:											
Iredell	0-6	Fine sandy loam	SM	A-2-4, A-4	0-1	90-98	80-90	57-80	30-50	<35	NP-9
	6-24	Clay	CH	A-7	0	99-100	85-100	80-100	65-95	60-115	30-85
	24-28	Loam, sandy clay loam, clay loam.	CL, CH, SC	A-7	0-1	98-100	85-100	70-95	40-75	41-60	20-39
	28-65	Variable	---	---	---	---	---	---	---	---	---
Urban land.											
LgB Lignum	0-5	Gravelly silt loam.	ML, CL, SM	A-4, A-6, A-7	0-2	70-85	65-80	55-80	40-70	24-48	8-16
	5-37	Silty clay loam, silty clay, clay.	MH, CH	A-7	0-2	80-90	75-90	70-85	55-85	50-75	22-36
	37-50	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
MeB, MeD Mecklenburg	0-7	Fine sandy loam	ML, SM, SM-SC	A-4, A-6, A-7-6	0-5	90-100	80-100	65-90	36-65	<45	NP-15
	7-34	Clay	CH, MH	A-7	0-5	90-100	85-100	80-100	75-95	51-75	20-45
	34-65	Weathered bedrock.	---	---	---	---	---	---	---	---	---
MkB*:											
Mecklenburg	0-7	Fine sandy loam	ML, SM, SM-SC	A-4, A-6, A-7-6	0-5	90-100	80-100	65-90	36-65	<45	NP-15
	7-34	Clay	CH, MH	A-7	0-5	90-100	85-100	80-100	75-95	51-75	20-45
	34-65	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Urban land.											
MO Monacan	0-14	Loam	ML, CL, CL-ML	A-4, A-6	0	95-100	95-100	80-95	55-85	<35	NP-15
	14-43	Fine sandy loam, sandy clay loam, silty clay loam.	CL, SC	A-4, A-6	0	95-100	95-100	60-95	35-85	25-40	7-20
	43-65	Variable	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
MS*:											
Monacan	0-14	Loam	ML, CL, CL-ML	A-4, A-6	0	95-100	95-100	80-95	55-85	<35	NP-15
	14-43	Fine sandy loam, sandy clay loam, silty clay loam.	CL, SC	A-4, A-6	0	95-100	95-100	60-95	35-85	25-40	7-20
	43-65	Variable	---	---	---	---	---	---	---	---	---
Arents.											
PaE, PaF: Pacolet	0-3	Sandy loam	SM, SM-SC	A-2	0-2	85-100	80-100	60-80	20-35	<36	NP-10
	3-31	Sandy clay, clay loam, clay.	ML, MH	A-6, A-7	0	80-100	80-100	60-95	51-75	38-65	11-30
	31-65	Weathered bedrock.	---	---	---	---	---	---	---	---	---
PB3*:											
Pacolet	0-3	Sandy clay loam	SM-SC, SC	A-4, A-6	0-1	95-100	90-100	65-85	36-50	20-40	4-17
	3-31	Sandy clay, clay loam, clay.	ML, MH	A-6, A-7	0	80-100	80-100	60-95	51-75	38-65	11-30
	31-65	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Udorthents.											
Pt*. Pits											
UL*, UO*. Udorthents											
Ur*. Urban land											
VaB, VaD: Vance	0-8	Sandy loam	SM, SM-SC	A-2, A-4	0-5	90-100	80-100	55-80	15-40	<27	NP-5
	8-33	Clay loam, sandy clay, clay.	CH, MH	A-7	0-5	95-100	90-100	75-95	65-80	51-80	25-48
	33-50	Weathered bedrock.	---	---	---	---	---	---	---	---	---
WkB, WkD, WkE, WkF: Wilkes	0-7	Loam	ML, CL-ML, SM, SM-SC	A-2, A-4	0-10	90-100	80-100	60-92	25-55	<35	NP-7
	7-15	Clay loam, clay, sandy clay loam.	CL, CH, MH, ML	A-6, A-7	0-10	80-100	80-100	75-95	50-80	30-60	11-32
	15-45	Weathered bedrock.	---	---	---	---	---	---	---	---	---
WuD*:											
Wilkes	0-7	Loam	ML, CL-ML, SM, SM-SC	A-2, A-4	0-10	90-100	80-100	60-92	25-55	<35	NP-7
	7-15	Clay loam, clay, sandy clay loam.	CL, CH, MH, ML	A-6, A-7	0-10	80-100	80-100	75-95	50-80	30-60	11-32
	15-45	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Urban land.											

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

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

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

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T
	In	In/hr	In/in	pH			
ApB, ApD: Appling	0-11	2.0-6.0	0.10-0.15	4.5-5.5	Low	0.24	4
	11-43	0.6-2.0	0.15-0.17	4.5-5.5	Moderate	0.20	
	43-66	0.6-2.0	0.12-0.16	4.5-5.5	Low	0.24	
CeB2, CeD2: Cecil	0-6	0.6-2.0	0.13-0.15	4.5-6.0	Low	0.28	3
	6-53	0.6-2.0	0.13-0.15	4.5-5.5	Moderate	0.28	
	53-65	---	---	---	---------------	---	
CuB*, CuD*:							
Cecil	0-6	0.6-2.0	0.13-0.15	4.5-6.0	Low	0.28	3
	6-53	0.6-2.0	0.13-0.15	4.5-5.5	Moderate	0.28	
	53-65	---	---	---	---------------	---	
Urban land.							
DaB, DaD, DaE: Davidson	0-7	0.6-2.0	0.14-0.18	4.5-6.5	Low	0.28	5
	7-16	0.6-2.0	0.15-0.18	4.5-6.0	Low	0.32	
	16-99	0.6-2.0	0.12-0.16	4.5-6.0	Low	0.24	
EnB, EnD: Enon	0-7	2.0-6.0	0.11-0.15	5.1-6.5	Low	0.37	4
	7-36	0.06-0.2	0.15-0.20	5.1-7.8	High	0.32	
	36-60	---	---	---	---------------	---	
GeB2, GeD2: Georgeville	0-5	0.6-2.0	0.13-0.18	4.5-6.0	Low	0.37	3
	5-35	0.6-2.0	0.13-0.18	4.5-5.5	Low	0.37	
	35-49	0.6-2.0	0.13-0.18	4.5-5.5	Low	0.43	
	49-99	0.6-2.0	0.05-0.10	4.5-5.5	Low	0.43	
GoB, GoD: Goldston	0-8	2.0-6.0	0.10-0.15	4.0-6.0	Low	0.20	2
	8-16	2.0-6.0	0.10-0.15	4.0-6.0	Low	0.20	
	16-24	2.0-6.0	0.05-0.10	4.0-6.0	Low	0.20	
	24-62	---	---	---	---------------	---	
HeB: Helena	0-8	2.0-6.0	0.10-0.12	4.5-6.0	Low	0.37	3
	8-11	0.2-0.6	0.13-0.15	4.5-5.5	Moderate	0.37	
	11-40	0.06-0.2	0.13-0.15	4.5-5.5	High	0.32	
	40-64	---	---	---	---------------	---	
HuB*:							
Helena	0-8	2.0-6.0	0.10-0.12	4.5-6.0	Low	0.37	3
	8-11	0.2-0.6	0.13-0.15	4.5-5.5	Moderate	0.37	
	11-40	0.06-0.2	0.13-0.15	4.5-5.5	High	0.32	
	40-64	---	---	---	---------------	---	
Urban land.							
IrA, IrB: Iredell	0-6	2.0-6.0	0.12-0.15	5.6-7.3	Low	0.32	3
	6-24	0.06-0.2	0.16-0.22	6.1-7.3	Very high	0.20	
	24-28	0.06-0.6	0.14-0.18	6.1-7.8	High	0.28	
	28-65	---	---	---	---------------	---	
IuB*:							
Iredell	0-6	2.0-6.0	0.12-0.15	5.6-7.3	Low	0.32	3
	6-24	0.06-0.2	0.16-0.22	6.1-7.3	Very high	0.20	
	24-28	0.06-0.6	0.14-0.18	6.1-7.8	High	0.28	
	28-65	---	---	---	---------------	---	
Urban land.							
LgB: Lignum	0-5	0.6-2.0	0.11-0.18	4.5-5.5	Low	0.43	2
	5-37	0.06-0.6	0.10-0.18	4.5-5.5	Moderate	0.43	
	37-50	---	---	---	---------------	---	

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors	
						K	T
	In	In/hr	In/in	pH			
MeB, MeD--------- Mecklenburg	0-7 7-34 34-65	0.6-2.0 0.06-0.2 ---	0.14-0.19 0.12-0.14 ---	5.6-7.3 5.6-7.3 ---	Low------------ Moderate------- ---------------	0.28 0.32 ---	4
MkB*: Mecklenburg-----	0-7 7-34 34-65	0.6-2.0 0.06-0.2 ---	0.14-0.19 0.12-0.14 ---	5.6-7.3 5.6-7.3 ---	Low------------ Moderate------- ---------------	0.28 0.32 ---	4
Urban land.							
MO--------------- Monacan	0-14 14-43 43-65	0.6-2.0 0.6-2.0 ---	0.14-0.20 0.14-0.20 ---	5.1-7.3 5.1-7.3 ---	Low------------ Low------------ ---------------	0.28 0.28 ---	4
MS*: Monacan---------	0-14 14-43 43-65	0.6-2.0 0.6-2.0 ---	0.14-0.20 0.14-0.20 ---	5.1-7.3 5.1-7.3 ---	Low------------ Low------------ ---------------	0.28 0.28 ---	4
Arents.							
PaE, PaF--------- Pacolet	0-3 3-31 31-65	2.0-6.0 0.6-2.0 ---	0.08-0.12 0.12-0.15 ---	4.5-6.0 4.5-6.0 ---	Low------------ Low------------ ---------------	0.20 0.28 ---	3
PB3*: Pacolet---------	0-3 3-31 31-65	0.6-2.0 0.6-2.0 ---	0.10-0.14 0.12-0.15 ---	4.5-6.0 4.5-6.0 ---	Low------------ Low------------ ---------------	0.24 0.28 ---	2
Udorthents.							
Pt*. Pits							
UL*, UO*. Udorthents							
Ur*. Urban land							
VaB, VaD--------- Vance	0-8 8-33 33-50	2.0-6.0 0.06-0.2 ---	0.10-0.14 0.12-0.15 ---	4.5-6.0 4.5-5.5 ---	Low------------ Moderate------- ---------------	0.28 0.37 ---	3
WkB, WkD, WkE, WkF------------- Wilkes	0-7 7-15 15-45	2.0-6.0 0.2-0.6 ---	0.11-0.15 0.15-0.20 ---	5.1-6.5 6.1-7.8 ---	Low------------ Moderate------- ---------------	0.28 0.32 ---	2
WuD*: Wilkes----------	0-7 7-15 15-45	2.0-6.0 0.2-0.6 ---	0.11-0.15 0.15-0.20 ---	5.1-6.5 6.1-7.8 ---	Low------------ Moderate------- ---------------	0.28 0.32 ---	2
Urban land.							

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

TABLE 16.--SOIL AND WATER FEATURES

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

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
ApB, ApD---------- Appling	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
CeB2, CeD2-------- Cecil	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
CuB*, CuD*:											
Cecil------------	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
Urban land.											
DaB, DaD, DaE----- Davidson	B	None---------	---	---	>6.0	---	---	>60	---	High-----	Moderate.
EnB, EnD---------- Enon	C	None---------	---	---	>6.0	---	---	>60	---	High-----	Moderate.
GeB2, GeD2-------- Georgeville	B	None---------	---	---	>6.0	---	---	>60	---	High-----	High.
GoB, GoD---------- Goldston	C	None---------	---	---	>6.0	---	---	20-40	Rippable	Moderate	High.
HeB--------------- Helena	C	None---------	---	---	1.0-2.5	Perched	Jan-Mar	40-60	Rippable	High-----	High.
HuB*:											
Helena-----------	C	None---------	---	---	1.0-2.5	Perched	Jan-Mar	40-60	Rippable	High-----	High.
Urban land.											
IrA, IrB---------- Iredell	D	None---------	---	---	1.0-2.0	Perched	Nov-Mar	>60	---	High-----	Low.
IuB*:											
Iredell----------	D	None---------	---	---	1.0-2.0	Perched	Nov-Mar	>60	---	High-----	Low.
Urban land.											
LgB--------------- Lignum	C	None---------	---	---	1.0-2.5	Apparent	Dec-May	48-72	Hard	High-----	High.
MeB, MeD---------- Mecklenburg	C	None---------	---	---	>6.0	---	---	48-60	Hard	High-----	Moderate.
MkB*:											
Mecklenburg------	C	None---------	---	---	>6.0	---	---	48-60	Hard	High-----	Moderate.
Urban land.											
MO---------------- Monacan	C	Common------	Brief-----	Nov-May	0.5-2.0	Apparent	Nov-May	>60	---	Moderate	High.
MS*:											
Monacan----------	C	Common------	Brief-----	Nov-May	0.5-2.0	Apparent	Nov-May	>60	---	Moderate	High.
Arents.											
PaE, PaF---------- Pacolet	B	None---------	---	---	>6.0	---	---	>60	---	High-----	High.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
PB3*:											
Pacolet	B	None	---	---	>6.0	---	---	>60	---	High	High.
Udorthents.											
Pt*. Pits											
UL*, UO*. Udorthents											
Ur*. Urban land											
VaB, VaD Vance	C	None	---	---	>6.0	---	---	>60	---	High	High.
WkB, WkD, WkE, WkF Wilkes	C	None	---	---	>6.0	---	---	40-80	Hard	Moderate	Moderate.
WuD*:											
Wilkes	C	None	---	---	>6.0	---	---	40-80	Hard	Moderate	Moderate.
Urban land.											

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

TABLE 17.--ENGINEERING TEST DATA

[Dashes indicate data were not available. NP means nonplastic]

Soil name, report number, horizon, and depth in inches	Classification		Grain size distribution										Liquid limit	Plasticity index	Moisture density	
			Percentage passing sieve							Percentage smaller than--						
	AASHTO	Unified	2 inch	3/4 inch	3/8 inch	No. 4	No. 10	No. 40	No. 200	.02 mm	.005 mm	.002 mm			Maximum density	Optimum moisture
													Pct		Lb/Ft3	Pct
Cecil scl;[1] (S74NC-119-002)																
Ap--------0 to 6	A-6 (03)	SC	100	100	100	99	98	81	50	41	31	24	35	12	107	17
B22t-----18 to 35	A-7-5(38)	MH	100	100	100	100	100	96	90	86	70	58	77	32	89	31
Helena sl:[2] (S74NC-119-008)																
Ap--------0 to 8	A-4 (00)	SC	100	100	100	99	95	63	36	32	23	16	27	9	118	12
B22t-----15 to 23	A-7-5(33)	CH	100	100	100	100	98	80	71	70	60	53	75	44	97	24
Iredell fsl:[3] (S74NC-119-005)																
Ap--------0 to 8	A-2-4(00)	SM	100	99	96	92	82	57	32	18	10	6	--	NP	120	13
B21t-----12 to 23	A-7-6(68)	CH	100	100	100	100	100	95	85	74	52	51	78	79	90	26
Iredell fsl:[4] (S74NC-119-009)																
Ap--------0 to 6	A-4 (00)	SM	100	100	100	96	88	61	37	17	10	7	31	6	121	16
B21t------6 to 19	A-7-6(72)	CH	100	100	100	100	100	95	88	82	73	70	99	73	88	30
Mecklenburg fsl:[5] (S74NC-119-011)																
Ap--------0 to 7	A-4 (00)	SM-SC	100	100	99	99	96	69	37	20	11	6	23	4	129	14
B22t-----15 to 22	A-7-5(40)	CH	100	100	100	100	100	95	83	74	59	52	73	43	94	27
Pacolet sl:[6] (S74NC-119-012)																
A1--------0 to 3	A-2-4(00)	SM	100	100	100	100	99	65	32	22	10	7	36	8	107	15
B21t------3 to 17	A-7-5(23)	MH	100	100	100	100	100	90	73	67	54	48	62	30	94	26

See footnotes at end of table.

TABLE 17.--ENGINEERING TEST DATA--Continued

Soil name, report number, horizon, and depth in inches	Classification		Grain size distribution										Liquid limit	Plasticity index	Moisture density	
			Percentage passing sieve							Percentage smaller than--						
	AASHTO	Unified	2 inch	3/4 inch	3/8 inch	No. 4	No. 10	No. 40	No. 200	.02 mm	.005 mm	.002 mm			Maximum density	Optimum moisture
													Pct		Lb/Ft3	Pct
Wilkes 1:[7] (S74NC-119-013)																
A1--------0 to 4	A-4 (01)	SM	100	97	94	92	89	74	50	24	9	5	35	6	106	18
B2t-------7 to 13	A-7-6(24)	CH	100	100	100	100	100	89	74	56	43	36	55	32	105	20

[1]Cecil sandy clay loam:
2.6 mile north of I-85 on U.S. Highway 21, 0.4 mile west of junction of North Carolina 115 on State Route 2108, 25 ft. SE of intersection of State Route 2100.

[2]Helena sandy loam:
2.5 mile south of Hunterville on U.S. Highway 21, 0.4 mile west on Alexanderana Road, 50 ft. south of road in idle field.

[3]Iredell fine sandy loam:
1 mile north of Newell on Old Concord Road, 0.2 mile east on McLean Road, 0.3 mile north on private drive, 0.6 mile east of 850, SE of pond.

[4]Iredell fine sandy loam:
1 mile east of Pineville on North Carolina Highway 51, 1.5 mile north on State Route 3687, 400 yds. east in field.

[5]Mecklenburg fine sandy loam:
9 miles southwest of Charlotte on North Carolina Highway 49, 0.8 mile south on State Route 1122, 40 ft. west of road in field.

[6]Pacolet sandy loam:
Near Lake Wylie, 350 ft. past junction of State Route 1102 and State Route 1101, 50 ft. east of road in woods.

[7]Wilkes loam:
1 mile north of North Carolina Highway 49 at University of North Carolina at Charlotte on State Route 2833, 60 ft. north of road in woods.

TABLE 18.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Appling	Clayey, kaolinitic, thermic Typic Hapludults
Arents	Arents
Cecil	Clayey, kaolinitic, thermic Typic Hapludults
Davidson	Clayey, kaolinitic, thermic Rhodic Paleudults
Enon	Fine, mixed, thermic Ultic Hapludalfs
Georgeville	Clayey, kaolinitic, thermic Typic Hapludults
Goldston	Loamy-skeletal, siliceous, thermic Ruptic-Ultic Dystrochrepts
Helena	Clayey, mixed, thermic Aquic Hapludults
Iredell	Fine, montmorillonitic, thermic Typic Hapludalfs
Lignum	Clayey, mixed, thermic Aquic Hapludults
Mecklenburg	Fine, mixed, thermic Ultic Hapludalfs
Monacan	Fine-loamy, mixed, thermic Fluvaquentic Eutrochrepts
Pacolet	Clayey, kaolinitic, thermic Typic Hapludults
Udorthents	Udorthents
Vance	Clayey, mixed, thermic Typic Hapludults
Wilkes	Loamy, mixed, thermic, shallow Typic Hapludalfs

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